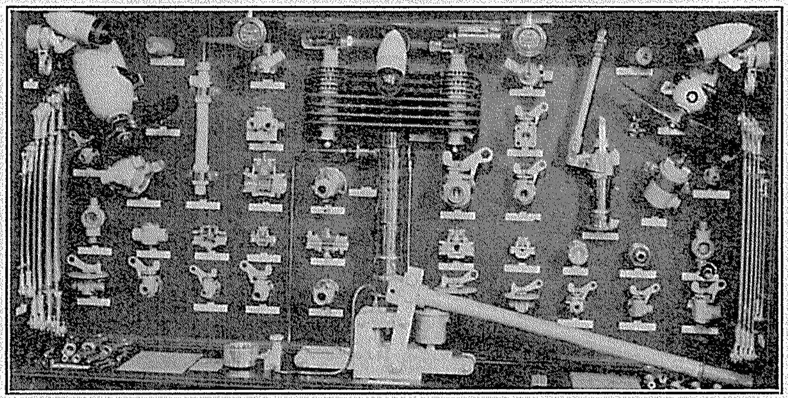
VICKERS
AIRCRAFT ACCESSORIES

VICKERS (AVIATION) LIMITED
WEYBRIDGE, SURREY.

Aircraft Accessories

SECOND EDITION
1931

A Typical Selection
of
Vickers Aircraft Accessories



To save weight, where possible, Duralumin is used protected against corrosion by the Anodic Process. Steel parts, where they are not made of the Rustless variety, are Cadmium coated.

VICKERS
ACCESSORIES
FOR
AIRCRAFT

VICKERS
(AVIATION) LIMITED

BYFLEET ROAD, WEYBRIDGE, SURREY

Telephone: BYFLEET 240 Telegrams: VICKERS, WEYBRIDGE

A NOTE ON ACCESSORIES

NO man with experience of aviation is content to employ accessories that have not been designed, made for, and tested in aircraft. He is not satisfied to fit cheap, shoddy equipment not proven in flight.

The risks are too big for him; the consequences too grave.

Be wise, therefore. Learn from his experience. Use only those accessories that are skilfully and carefully made, and warranted by use over a long period of flying. They are the only ones worthy of your consideration.

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VICKERS HYDRAULIC WHEEL BRAKES FOR AIRCRAFT

(Patent Applied for).

THE NECESSITY FOR BRAKES ON AIRCRAFT.

The airplane is the only high speed transport vehicle not generally fitted with brakes. The distance which an airplane runs on landing before finally coming to rest is therefore unnecessarily long.

Without brakes, the machine on landing may become unmanageable on sloping ground, and is also at the mercy of adverse winds.

Landings during night flying and under emergencies would be rendered safer if brakes were fitted.

The adoption of wheel brakes gives advantages which may be summarized as follows :

Makes the machine safer on the ground.

Permits the use of tail wheels, lessens the wear and tear of aerodromes and reduces the number of ground personnel.

Permits the use of roller bearing wheels, which reduces upkeep costs and shortens the run to " take-off."

Enables the machine to land and pull up in a smaller field.

Braked run may be 50 per cent of unbraked run.

Gives to single engine machine the manœuvrability of a twin.

Lessens the stresses in tail portion of fuselage owing to the abolition of tail skid.

Finally the use of brakes enables higher landing speeds to be safely employed, with the consequent increase in top speed and efficiency.

THE REQUIREMENTS OF THE IDEAL BRAKING SYSTEM.

Various schemes of braking have been tried in the past, but experiments show that the best system consists of hand-applied brakes over which the pilot has full control.

In this case it is essential that the brakes instantly respond to the load applied to the hand lever ; this necessitates a direct connection between the hand lever and the brake shoe.

It is also of the utmost importance that there should be instantaneous release.

In modern aircraft, owing to the motion of the sprung landing wheels and the distance which separates the wheel from the pilot, any system of wire control or tensions rods and bell cranks with all the necessary compensating gear must be very inefficient and thus increase the load on the pilot's brake lever. There is an additional objection to the use of such transmission ; any distortion of the machine framework may render the application of the brakes uncertain.

THE SOLUTION : " THE VICKERS HYDRAULIC BRAKES."

The only solution of these difficulties is to adopt the hydraulic system of transmission.

After several years spent in experiments on these lines, Vickers (Aviation) Ltd., have now perfected the system so that the pilot can by his own unaided efforts apply the brakes to a machine weighing 18,000 lbs., and bring same to rest in less than 100 yards, when landing at 45 m.p.h.

Although the hydraulic system is not new, its many advantages make it the ideal transmission and the following are its chief features :

High efficiency with any mechanical ratio.
Automatic compensation.
Self lubrication.
Adaptability.
Ease of installation and maintenance.

CHOICE OF TYPES.

Vickers (Aviation) Limited have developed two types :—

(*a*) Compensated Brakes.
(*b*) Steerable Brakes.

The components comprising the (*a*) type are :	WEIGHT
One Pilot's Control	4·25 lbs.
One Oil Reservoir	0·50 lbs.
The necessary transmission Pipe Line with Junctions and Couplings	0·10 lbs. per foot run.
One or two Right-hand Wheel Brake Units ..	See table on page 11.
One or two Left-hand Wheel Brake Units ..	See table on page 11.

The (*b*) is similar to above with the addition of one Steering Valve.. 1·75 lbs.

DETAILS OF THE APPARATUS AND ITS OPERATION.

The Vickers improved 1930 type Hydraulic Wheel Brake is similar to that described in the 1929 edition of the catalogue of Vickers Accessories for Aircraft, but various improvements have been made in the use of ultra light alloys to reduce weight.

The Wheel Brake Unit is still of the Servo type. The three shoes, the actuating motor and take off springs are all mounted between two torque plates. The torque plate is simply secured to a flange on the axle by a number of bolts.

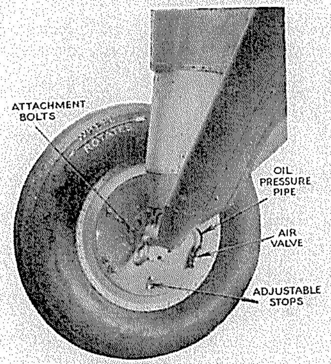
One of the chief advantages of the Vickers hydraulic system and the patented controller is that the adjustment of the shoes for wear is not of vital importance. Neglect to make this adjustment will not in any way affect the efficiency of the brakes. However, three adjustable stops are fitted at the shoes to take up wear, and to reduce clearances and consequently the number of strokes of the pump (controller) necessary for their initial application. This adjustment can be carried out without dismantling anything.

The table of brake sizes given on page 10 cancels and replaces that given on page 14 of the 1929 catalogue.

The action of the various components is as follows :

The Pilot's Control is operated as a pump and raises the pressure of the oil in the system.

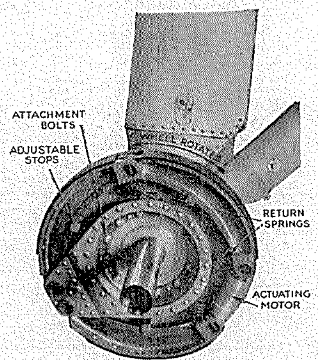
The first stroke takes up all clearances and the second stroke gives maximum braking. If the brake shoe linings are worn and if this wear has not been taken up by the adjustments provided, it may be necessary to increase the number of the preliminary strokes before full braking can be obtained. But once the shoes have been brought into rubbing contact with the drum, they will remain in this position until they are released by the forcible movement of the handlever to the extreme forward position. Having brought the shoes into slight rubbing contact with drums (an operation which may quite safely be carried out before landing as the special non-return valve incorporated in the pump prevents excessive load being applied), the lever is then returned to its forward position in readiness for final braking when the action is exactly similar to a mechanical brake.



During the final pull, the handlever is in direct communication with brake shoes through an uninterrupted column of oil which transmits the pilot's effort with a minimum of loss. This high efficiency makes the brakes very sensitive and enables them to respond immediately to the pilot's demand. The oil column can be split up between two or four wheels with perfect equalization, and the problem of steerable brakes is met by the insertion of a rudder controlled distribution valve between the pilot's control and the right and left brake groups, without in any way reducing their efficiency.

The Oil Reservoir is a simple container with a filler cap, a gauze and the necessary connections. It can be mounted in any convenient position close to and above the pilot's control. The oil recommended is Vacuum Oil Co.'s P.924 which is a thin non-freezing oil (known as Machine Gun Oil). Any thin non-freezing oil of similar characteristics may be used.

The transmission pipe line connecting the pilot's control with the Brake Motors is of solid drawn steel and of small diameter. This pipe may be installed in the



machine in any convenient manner. Where the pipe connects to the moving part of a sprung undercarriage, it is only necessary to put a few coils in the pipe to give flexibility.

The Steering Valve is inserted between pilot's control and the right and left brake systems. The valve is connected to the rudder bar, and acts as a distributor giving the following combinations :

(1) Normal braking. Compensated system
(2) Right or left turns—full braking on inner wheel of turn—outer wheel at minimum braking.

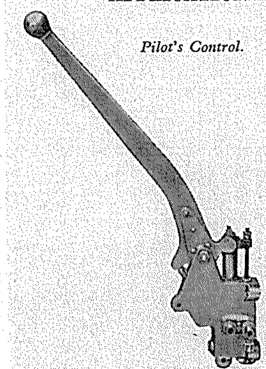
Differential braking is not obtained until the rudder bar is nearing the limit of travel in either direction. On the completion of the turn, the brakes are automatically equalized.

The Wheel Brake Unit (as illustrated) comprises a three shoe internal expanding servo brake, with the necessary operating motor, take-off springs and adjustable stops, all mounted on a disc. This disc transmits the brake torque to the flange on the axle through a ring of bolts.

The brakes are protected efficiently against mud and water. All adjustments can be made from the outside without removing the wheel. The brakes do not in any way interfere with the removal of the wheel.

For table of dimensions see page 11.

APPLICATION AND ADAPTABILITY TO AIRCRAFT TYPES.

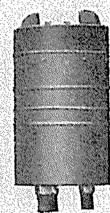


Pilot's Control.

These brakes can, owing to the use of the hydraulic system of transmission, be readily adapted to any machine.

There is no difficulty in applying either the compensated brakes or the steerable brakes to two-wheeled or four-wheeled undercarriages.

The brake unit is mounted on the axle, and it is only necessary to make provision for taking up the torque reaction.



Oil Reservoir.

The magnitude of this reaction depends upon the maximum retarding force which can be safely applied to the machine, and this again depends upon the relation of the centre of gravity of machine to wheels. (See diagram on page 12).

With regard to the best method of applying this brake unit to an existing or projected machine, Vickers (Aviation) Ltd., would be very pleased to give prospective customers the benefit of their experience if they will kindly submit drawings of chassis and complete particulars of machine, including :

(*a*) Weight of machine.
(*b*) Size and number of wheels to be fitted with brakes.
(*c*) Whether compensated or steerable type are required.

There will be no difficulty in installing the various components and the piping.

In the event of an order being placed for these brakes, the following can be supplied :

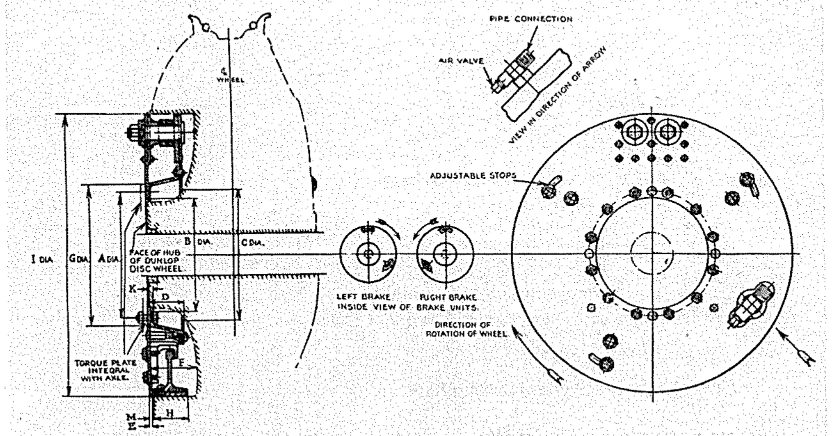
Special aero landing wheels with brake drums (English sizes).
Complete self-contained brake unit for bolting to flange on axle.
All solid drawn steel piping and connections.
Pilot's Control and Oil Reservoir and Steering Valve (when required).
The above applies to compensated brakes for two or four-wheeled chassis.
When the steerable type is supplied it is necessary to include the special Distributor Valve.

A very useful table connecting brake size with weight of machine, Military and civil (two-wheel undercarriage) is given below:—

TABLE CONNECTING SIZE OF BRAKE WITH WEIGHT OF MACHINE.

Brake Size ins.	Brake Size m/m.	Wheel Size m/m.	Machine Weight Gross — Military Lbs.	Military Kg.	Civil Lbs.	Civil Kg.
10 × 1·25	254 × 32	600 × 75	1520	690	1800	820
		600 × 100	2030	925	2400	1090
12 × 1·5	305 × 38	700 × 100	2370	1080	2800	1270
		750 × 125	3170	1430	3750	1710
		800 × 150	4060	1850	4800	2180
16 × 1·75	407 × 44·5	900 × 200	6100	2770	7200	3270
		975 × 225	7430	3380	8780	4000
20 × 2	508 × 51	1100 × 220	8200	3730	9700	4400
		1250 × 250	10600	4800	12500	5700
24 × 2·5	610 × 63	1500 × 300	15200	6900	18000	8200
		1750 × 350	20800	9450	24600	11200

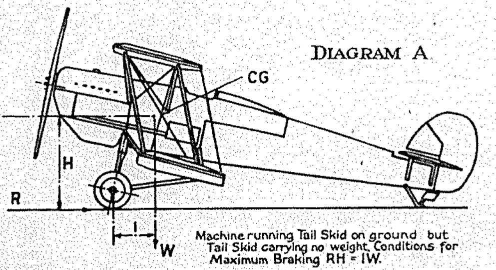
GENERAL ASSEMBLY OF BRAKES



Wheel Size: Wheel Dia. M/M	Wheel Size: Tyre Dia. M/M	Lbs. Maximum Retarding force at Periphery of wheel	Attachment Bolts: Bolt Centres A.	Attachment Bolts: Size	Attachment Bolts: No.	Space Dimensions: B	C	D	E	F	G	K	M		Brake Sizes: I	Brake Sizes: H	Weight of one unit Lbs.	Comp.t Nº
600	75	270							·074	1·7					10	1·25	5·5	A462
600	100	360							·074	1·7					10	1·25	5·5	A462
700	100	420	5·8	1/4	12	5·2	6·1	1·51	·082	2082	6·4	·224	·15		12	1·5	7·0	A468
750	125	560	5·8	1/4	12	5·2	6·1	1·51	·082	2·082	6·4	·224	·15		12	1·5	7·0	A468
800	150	720	5·8	1/4	12	5·2	6·1	1·51	·082	2·082	6·4	·224	·15		12	1·5	7·0	A468
900	200	1080	6·4	1/4	12	5·8	8·0	1·56	·1	2·1	7·0	·234	·15		16	1·75	9·0	A429
975	225	1320	6·4	1/4	12	5·8	8·0	1·56	·1	2·1	7·0	·234	·15		16	1·75	9·0	A429
1100	220	1450	7·8	1/4	16	7·2	8·8	2·0	·1	2·6	8·4	·27	·18		20	2·0	17·0	A460
1250	250	1875	7·8	1/4	16	7·2	8·8	2·0	·1	2·6	8·4	·27	·18		20	2·0	17·0	A460
1500	300	2700	10·8	5/16	16	10·0	13·0	2·4	·1	2·97	11·6	·28	·18		24	2·5	35	A461
1750	350	3680	10·8	5/16	16	10·0	13·0	2·4	·1	2·97	11·6	·28	·18		24	2·5	35	A461

ALL DIMENSIONS GIVEN IN THESE COLUMNS ARE IN INCHES.

DIAGRAM A



Machine running Tail Skid on ground but Tail Skid carrying no weight. Conditions for Maximum Braking RH = lW.

CG = Position of centre of gravity.
W = Weight of machine.
L = Distance of CG behind wheels.
H = Height of CG above ground.
R = Retarding force applied at periphery of wheel, and assumes that wheel is on point of locking. (This is the worst condition).

The RH must not be greater than WL and the maximum retarding force.

$$R = \frac{WL}{H}$$

The brakes will give a retarding force up to 30 per cent of the weight carried by the wheel.

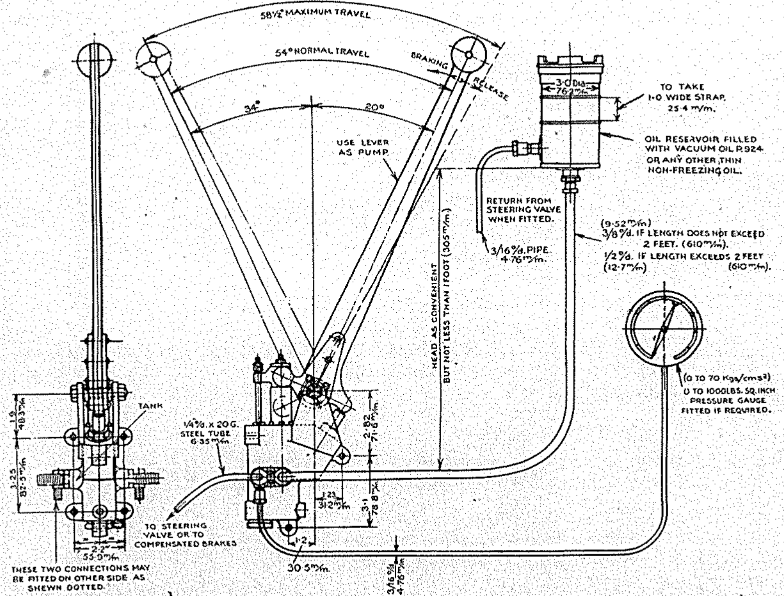
INSTALLATION AND MAINTENANCE.

The *Wheel Brake Unit* is shown on pages 8 and 11, and is a self-contained unit arranged for bolting to a flange on the axle. The brake torque is taken through this point and the undercarriage must be designed accordingly. The maximum unit drag force may be taken as 30 per cent of the maximum unit load carried by the wheel. The disc may be rotated around the axle and secured in the position most convenient for the run of the pipe. The brake unit is sent out with the shoes adjusted, but the adjustment should be checked on final assembly, so that wheel will just revolve when brakes are "off."

The Pilot's Control and Reservoir (see pages 9 and 13,) should be securely mounted in a position convenient for operation. The pump may be mounted with the plunger in the vertical or horizontal position, and the handlever may be modified in form and attached to the pivoted steel bell crank in any convenient position. The effective length of the lever should not be reduced. Six attachment points are provided on the body of the Pump.

The Steering Valve is shown on page 14, and full instructions for mounting are given on drawing.

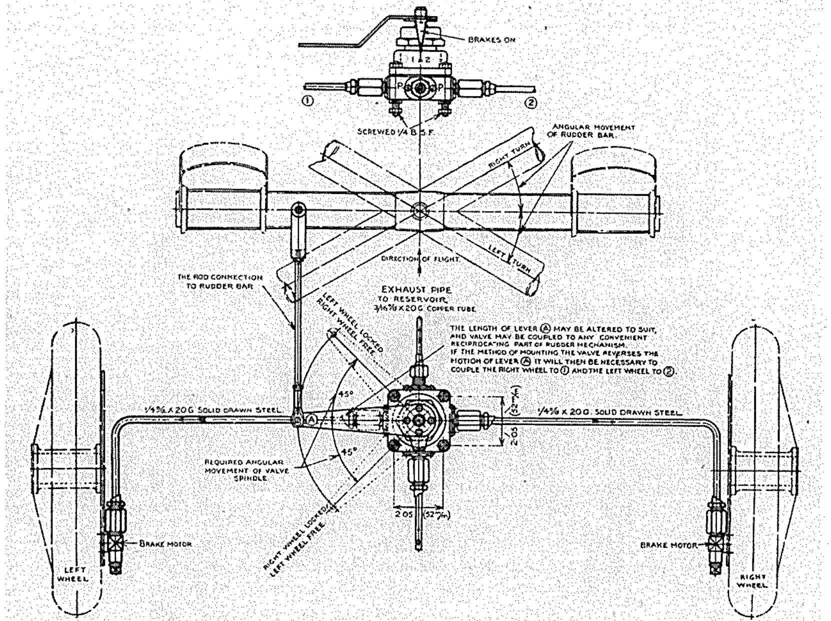
It will be observed that the *Steering Valve has a pointer* registering with marks on the Body 1, 1 and 2 and 2. When the pointer is at 1, the brakes are applied to the wheel connected to port 1. When the pointer is moved to 2, the wheel only connected to port number 2 is braked. When the pointer is at any position short of 1 or 2, both wheels are equally braked.



The Steering Valve maintains a slight pressure in the exhaust chamber and ensures that the shoes of the wheel which is free during a turn shall be kept in rubbing contact ready for immediate re-application on straightening out.

The installation of the *transmission pipe line* does not call for any special care. The coil in the pipe to provide for movement should be approximately 3 inches (76 m/m) in diameter and should consist of say two complete turns. This coil should be placed so that its axis approximately coincides with that of the hinge pin of the moving part. The pipe line can be run in any convenient manner, and there need be no fear of air locks as these can be cleared away by the use of the Pilot's Control when filling.

It will be necessary to pump through a quantity of oil to ensure that all air is driven out, the air valves on the brake motors being opened in turn whilst the Steering Valve (if fitted) is operated.



Vickers Hydraulic Wheel Brakes Steering Arrangement.

VICKERS FUEL OIL AND WATER SYSTEMS

COCKS, VALVES, FILTERS AND PUMPS

The fact that this kind of accessory, made by us, is the standard equipment of the greater majority of aircraft of all types and makes produced in the British Isles is a testimony to its perfection.

Every year a large increase occurs in the numbers supplied to countries outside England.

Below is given a list of these accessories, each of which is described in the following pages.

When ordering, the drawing numbers and sizes of fittings required should be quoted.

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VICKERS FUEL COCKS

English Patent 271156
(and foreign patents)

GENERAL.—These cocks are of the plug type and each consists of three main parts—the body, the plug and the gland. The body is a stamping of "Vickers Duralumin" and the bronze seating for the plug is inserted by a patented process during the stamping operations.

The plug is of Vickers Immaculate Steel (Rustless), hardened and ground.

The handle is a stamping of Duralumin and the gland parts and stop band are of the same metal. The gland is externally adjustable. The plug is spring loaded, has a very smooth action and is automatically locked in any position.

All the Duralumin parts are anodically treated.

These cocks will take the Air Ministry metal couplings with exception of A.288.

TESTS.—All cocks are subject to an internal pressure of 15 lbs. per square inch. See following reports.

ROYAL AIRCRAFT ESTABLISHMENT REPORT No. E.2160.

Subject :—

Fuel Cock with Stainless Steel Plug

(VICKERS ½" B.S.P.)

CONSTRUCTION.—The cock is of the usual tapered seat with a stainless steel plug, seating in a gunmetal body. The plug is pressed into its seating by a strong spring.

TESTS.—The cock was tested for 12 hours in the delivery line of a pump delivering petrol at a pressure of 30 lbs./sq. in. At the same time the plug was oscillated through an angle of 60° approximately 30,000 times. No leakage from the gland took place throughout the tests, and at the conclusion the plug was petrol tight in the closed position at the above pressure.

The cock was then immersed in petrol for 3 days ; on examination it was found that no wear had taken place and no sign of rust was evident on the plug.

It is thought that this cock is very satisfactory and superior to many of the existing petrol cocks now in use.

REPORT ON THE VICKERS FUEL COCK

TYPE 1919

Engine Section,
Imperial College, S.W.7.

The petrol tap tested was for ⅜" piping. When open there was a straight-through bore of ¼". Its resistance was tested and found to be equal to that of less than 4 feet of ⅜" piping. The resistance of a flat surface cork tap, tested under the same conditions, was found to be equivalent to over 40 feet of ⅜" piping. The weight of the Vickers tap without connecting pieces, was found to be 5½ ozs., and the weight of the cork-seated tap was 6¼ ozs.

The Vickers tap can be rotated continuously, so that there are two positions at which it is open and two at which it is closed. The tap was placed in a petrol system and the following tests were made. The various positions of the barrel for opening and shutting were used in regular order.

I. *At 10 lbs. pressure when shut off.*

Turned off and on 50 times : No leak.
Left running for 10 minutes : No leak.
Shut off for 10 minutes : No leak, no petrol through.
Turned off and on 50 times : No leak, no petrol through when off.
System closed beyond the tap so that there was a pressure of 10 lbs. on both sides of tap.
Turned off and on 50 times : No leak.

II. *At 20 lbs. pressure when shut off.*

Turned off and on 10 times : When shut off there was no petrol through but there was a very small leak through the gland at the spindle. Petrol *very slowly* oozed out, but only sufficient to form a drop every two or three minutes.

System closed beyond the tap : Same result.

III. *Endurance test at 10 lbs. pressure.*

The spindle was slowly motored round at 150 r.p.m. for one hour in a clockwise direction and for one hour in an anti-clockwise direction. The leak found above continued during the first hour, but ceased when the direction of rotation was changed, and there was no leak afterwards.

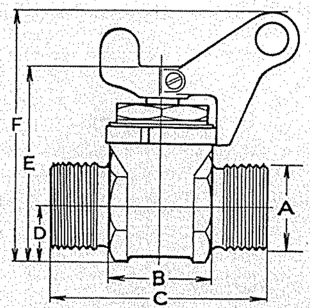
IV. *At 10 and 20 lbs. pressure.*

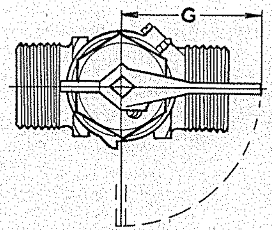
Tests I and II were repeated. No leak was ever obtained and no petrol through when shut off.

V. The spindle was jerked out and in several times. (The spring permits a small movement in this direction.) It was found that the small leak was restarted and continued both at 10 and 20 lbs. when tap was several times opened and shut. The spindle was pressed hard in and turned several times, and the leak no longer took place at 10 or 15 lbs. but persisted slightly at 20 lbs. The leaks were all extremely small, and it is probable that in a warm place there would never be sufficient to form a drop, but that it would evaporate as it appeared.

VICKERS FUEL COCKS

SCREW AND SCREW PLUG TYPES—2-WAY



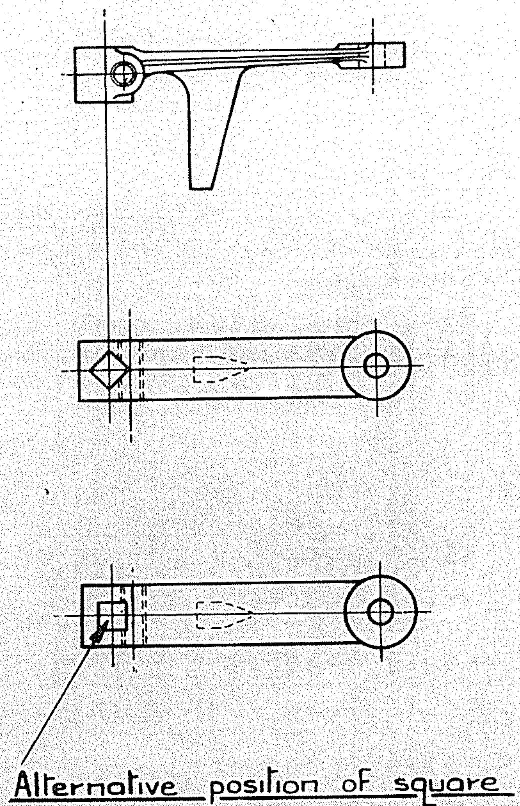


2-WAY PLUG TYPE

Drawing No.		A	B	C	D	E	F	G	Weight ozs.	A.G.S. No.
Dural	Brass									
	A174	⅛″ B.S.P.	0·7	1·5	0·3	1·3	1·65	1·0	2·5	
A253		¼″ ,,	1·25	2·1	0·4	2·0	2·7	1·85	4·0	731–B
	A427	¼″ ,,	1·25	2·1	0·4	2·0	2·7	1·85	9·25	
A250		⅜″ ,,	1·2	2·3	0·55	2·1	2·8	1·85	4·5	731–D
	A405	⅜″ ,,	1·2	2·3	0·55	2·1	2·8	1·85	9·75	
A249		½″ ,,	1·2	2·5	0·65	2·3	3·0	1·85	5·0	731–F
	A380	½″ ,,	1·2	2·5	0·65	2·3	3·0	1·85	11·5	
A251		⅝″ ,,	1·5	3·0	0·8	2·8	3·7	2·1	9·25	731–G
	A473	⅝″ ,,	1·5	3·0	0·8	2·8	3·7	2·1	19	
A254		¾″ ,,	1·5	3·0	0·8	2·8	3·7	2·1	10·0	731–H
	A470	¾″ ,,	1·5	3·0	0·8	2·8	3·7	2·1	20	
A246		⅞″ ,,	1·5	3·2	0·85	3·0	3·85	2·2	13·5	731–I
	A474	⅞″ ,,	1·5	3·2	0·85	3·0	3·85	2·2	23	
A255		1·0″ ,,	1·5	3·2	0·85	3·0	3·85	2·2	14·5	731–J
	A475	1·0″ ,,	1·5	3·2	0·85	3·0	3·85	2·2	33	
A332		1¼″ ,,	2·2	3·8	1·2	4·05	5·45	3·15	38	
	A531	1¼″ ,,	2·2	3·8	1·2	4·05	5·45	3·15	54	
A343		1½″ ,,	2·2	4·0	1·2	4·05	5·45	3·15	41	
	A532	1½″ ,,	2·2	4·0	1·2	4·05	5·45	3·15	58	

VICKERS 2-WAY FUEL COCKS

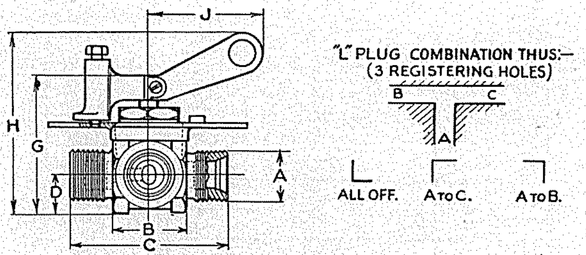
SPECIAL LEVER HANDLE

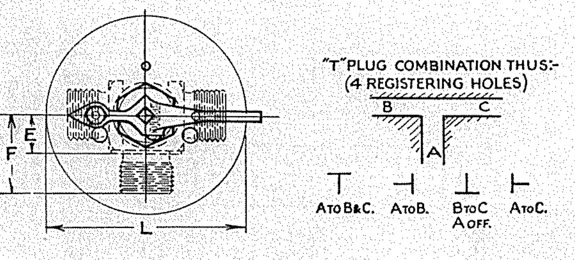


In lieu of the butterfly type of handle, a special lever handle, as illustrated above, can be supplied with Vickers 2-Way Fuel Cocks, if specially ordered.

VICKERS FUEL COCKS

SCREW AND SCREW PLUG TYPE 3-WAY





VICKERS FUEL COCKS

SCREW AND SCREW PLUG TYPE—3-WAY

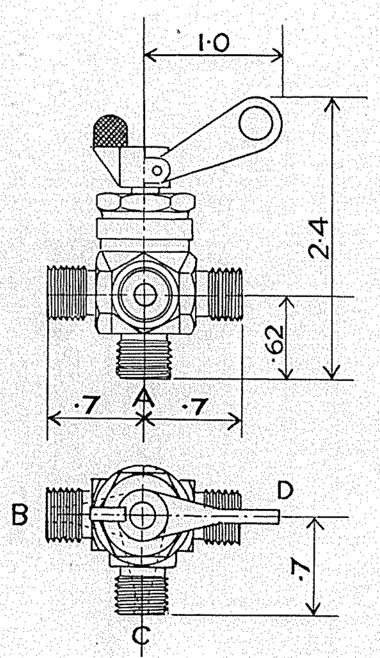
Drawing No. Dural	Drawing No. Brass	A	B	C	D	E	F	G	H	J	K	L	Weight ozs.	A.G.S. No.	Remarks
	A271	⅛″ B.S.P.	·7	1·5	·3	·35	·75	1·37	1·75	1·0			2·25		"L" Plug
A517		¼″ „	1·2	2·1	·6	·6	1·05	2·2	2·9	1·85	2·95	3·25			"T" „
A349		¼″ „	1·2	2·1	·6	·6	1·05	2·2	2·9	1·85	2·95	3·25		732–B	"L" „
	A533	¼″ „	1·2	2·1	·6	·6	1·05	2·2	2·9	1·85	2·95	3·25			"T" „
	A534	¼″ „	1·2	2·1	·6	·6	1·05	2·2	2·9	1·85	2·95	3·25			"L" „
A256		⅜″ „	1·2	2·3	·6	·6	1·15	2·25	2·95	1·85	2·95	3·25	7·0	732–D	"T" „
A406		⅜″ „	1·2	2·3	·6	·6	1·15	2·25	2·95	1·85	2·95	3·25	7·0	732–D	"L" „
	A535	⅜″ „	1·2	2·3	·6	·6	1·15	2·25	2·95	1·85	2·95	3·25			"T" „
	A536	⅜″ „	1·2	2·3	·6	·6	1·15	2·25	2·95	1·85	2·95	3·25			"L" „
A257		½″ „	1·2	2·5	·6	·6	1·25	2·25	2·95	1·85	2·95	3·25	7·5	732–F	"T" „
A407		½″ „	1·2	2·5	·6	·6	1·25	2·25	2·95	1·85	2·95	3·25	7·5	732–F	"L" „
	A467	½″ „	1·2	2·5	·6	·6	1·25	2·25	2·95	1·85	2·95	3·25	14·0		"T" „
	A469	½″ „	1·2	2·5	·6	·6	1·25	2·25	2·95	1·85	2·95	3·25	14·0		"L" „
A258		⅝″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8	13·0	732–G	"T" „
A398		⅝″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8	13·0	732–G	"L" „
	A481	⅝″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8			"T" „
	A488	⅝″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8			"L" „
A318		¾″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8	13·5	732–H	"T" „
A399		¾″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8	13·5	732–H	"L" „
	A482	¾″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8	23·5		"T" „
	A489	¾″ „	1·5	3·0	·75	·75	1·5	2·8	3·7	2·1	3·5	3·8			"L" „
A486		⅞″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"T" „
A480		⅞″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"L" „
	A537	⅞″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"T" „
	A538	⅞″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"L" „
A285		1·0″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0		732–J	"T" „
A487		1·0″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0		732–J	"L" „
	A539	1·0″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"T" „
	A540	1·0″ „	1·6	3·2	·8	·8	1·6	2·95	3·85	2·1	3·7	4·0			"L" „
A590		1¼″ „	2·25	3·85	1·125	1·125	1·925	3·975	5·02	2·75	4·8	5·1			"T" „
A591		1¼″ „	2·25	3·85	1·125	1·125	1·925	3·975	5·02	2·75	4·8	5·1			"L" „
	A592	1¼″ „	2·25	3·85	1·125	1·125	1·925	3·975	5·02	2·75	4·8	5·1			"T" „
	A593	1¼″ „	2·25	3·85	1·125	1·125	1·925	3·975	5·02	2·75	4·8	5·1			"L" „

K=Pitch circle of bolt holes in flange.

VICKERS FUEL COCKS

⅛" B.S.P. PLUG TYPE—4-WAY

A 156



Combinations:

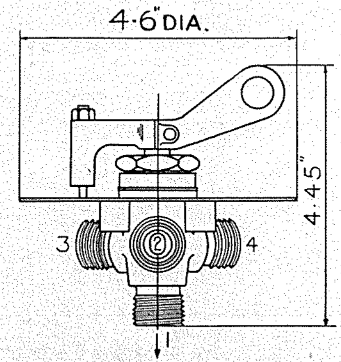
A to B
A to C
A to D

Weight 2·5 ozs (Brass)

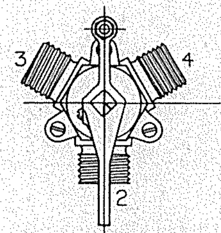
VICKERS FUEL COCK

SPECIAL 4-WAY. ½" B.S.P.

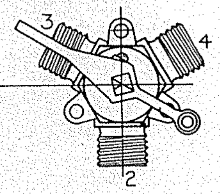
A 376



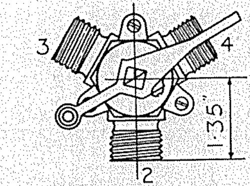
THIS PORT ALWAYS OPEN



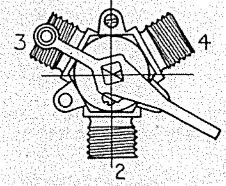
BRANCHES 1 TO 2 OPEN
3 TO 4 SHUT



BRANCHES 1 TO 3 OPEN
2 TO 4 SHUT



BRANCHES 1 TO 4 OPEN
2 TO 3 SHUT



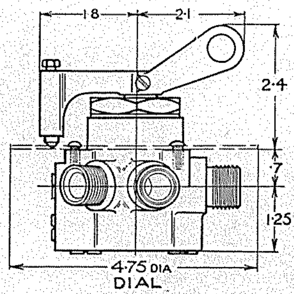
BRANCHES 1 TO 3 & 4 OPEN
2 SHUT

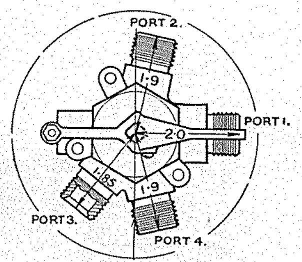
VICKERS FUEL COCKS

SPECIAL 4-WAY TYPE

All branches $\frac{1}{2}$" B.S.P.

A 387

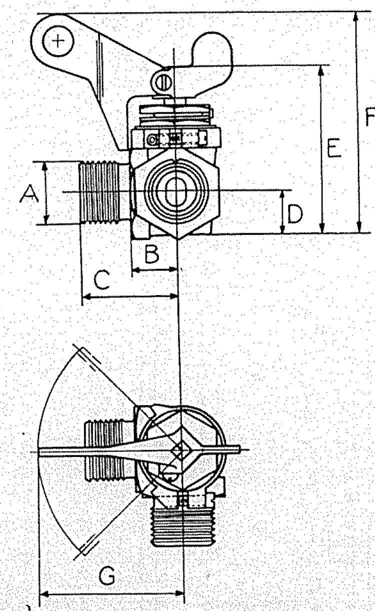




This Cock has been designed for special duties and is of similar construction to our standard type shown on pages 18 and 20. The following combinations can be obtained :—

1 to 2 ;
1 to 3 ;
1 to 3 and 4 ;
1 to 4 ;
All off (*i.e.*, connection 1 sealed).

The indication dial has positive stops at all positions and a bar for " all-off " position. The dial would be engraved to suit purchaser's requirements. Weight =1·5 lbs.



VICKERS FUEL COCK

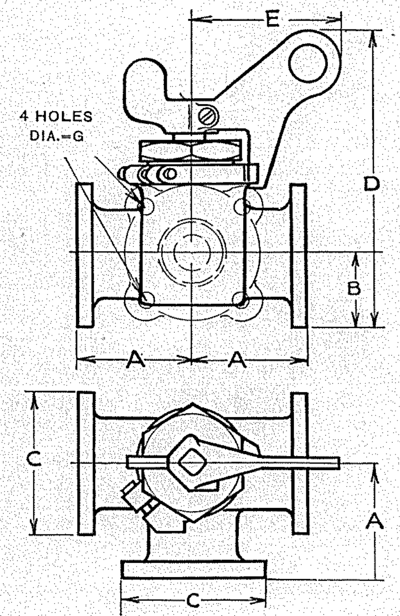
SCREW , AND SCREW " L " TYPE

Drawing No.		A	B	C	D	E	F	G	Weight ozs.
Dural	Brass								
A544		$\frac{1}{4}$" B.S.P.	·6	1·25	·55	2·17	2·87	1·85	
	A550	$\frac{1}{4}$" ,,	·6	1·25	·55	2·17	2·87	1·85	
A545		$\frac{3}{8}$" ,,	·6	1·25	·55	2·17	2·87	1·85	5·25
	A551	$\frac{3}{8}$" ,,	·6	1·25	·55	2·17	2·87	1·85	
A390		$\frac{1}{2}$" ,,	·6	1·25	·55	2·17	2·87	1·85	5·5
	A552	$\frac{1}{2}$" ,,	·6	1·25	·55	2·17	2·87	1·85	
A546		$\frac{5}{8}$" ,,	·75	1·5	·7	2·73	3·63	2·1	
	A553	$\frac{5}{8}$" ,,	·75	1·5	·7	2·73	3·63	2·1	20
A508		$\frac{3}{4}$" ,,	·75	1·5	·7	2·73	3·63	2·1	
	A554	$\frac{3}{4}$" ,,	·75	1·5	·7	2·73	3·63	2·1	21
A547		$\frac{7}{8}$" ,,	·75	1·6	·8	2·95	3·85	2·1	
	A555	$\frac{7}{8}$" ,,	·75	1·6	·8	2·95	3·85	2·1	
A506		1·0" ,,	·75	1·6	·8	2·95	3·85	2·1	
	A556	1·0" ,,	·75	1·6	·8	2·95	3·85	2·1	
A548		$1\frac{1}{4}$" ,,							
	A557	$1\frac{1}{4}$" ,,							
A549		$1\frac{1}{2}$" ,,							
	A558	$1\frac{1}{2}$" ,,							

VICKERS FUEL COCKS

FLANGED PLUG TYPE

A 288



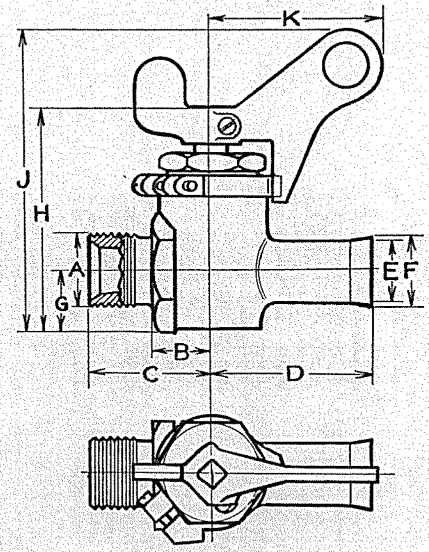
Drawing No.	Size and Type	A	B	C	D	E	F	G	Weight
A290	¾″ 2-way	1·5	0·875	1·75	3·9	2·1	1·6	17/64	—
A288	1·0″ 2-way	1·6	1·0	2·0	4·1	2·1	1·875	17/64	—
A289	1·0″ 3-way	1·6	1·0	2·0	4·1	2·1	1·875	17/64	—

Dimensions=Inches.

This Cock is similar to the standard plug type cock, except that the connections are flanged instead of screwed.

VICKERS FUEL COCKS

SCREW AND OLIVE TYPE

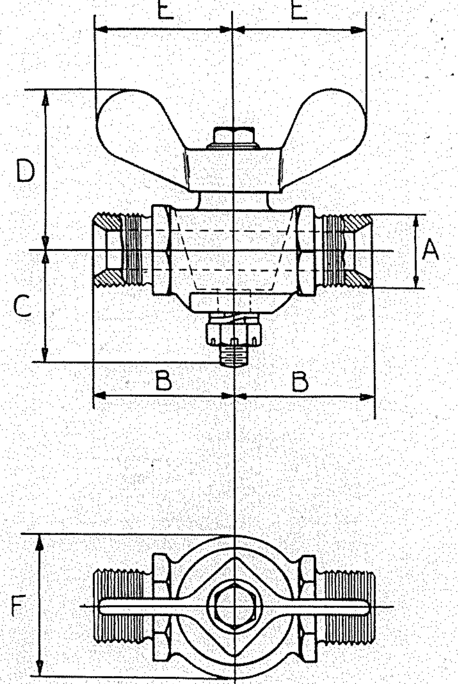


Drawing No.		A	B	C	D	E	F	G	H	J	K	Weight ozs.
Dural	Brass											
A347		¼″ B.S.P.	·625	1·05	1·05	·35	·4	·5	2·12	2·82	1·85	4·5 oz.
	A541	¼″ ,,	·625	1·05	1·05	·35	·4	·5	2·12	2·82	1·85	
A401		⅜″ ,,	·6	1·15	1·5	·39	·437	·5	2·0	2·7	1·85	
	A238	⅜″ ,,	·6	1·15	1·5	·39	·437	·5	2·0	2·7	1·85	
A309		½″ ,,	·6	1·25	1·85	·5	·562	·65	2·27	3·0	1·85	5
	A477	½″ ,,	·6	1·25	1·85	·5	·562	·65	2·27	3·0	1·85	10
A269		⅝″ ,,	·75	1·5	2·0	·75	·8	·75	2·78	3·7	2·1	10·25
	A542	⅝″ ,,	·75	1·5	2·0	·75	·8	·75	2·78	3·7	2·1	
A264		¾″ ,,	·75	1·5	2·0	·75	·8	·75	2·78	3·7	2·1	10 oz.
	A543	¾″ ,,	·75	1·5	2·0	·75	·8	·75	2·78	3·7	2·1	

This cock is similar to the standard 2-way plug type cock, except that one connection is arranged for the attachment of rubber hose.

VICKERS OIL COCKS

SCREW AND SCREW 2-WAY PLUG TYPE

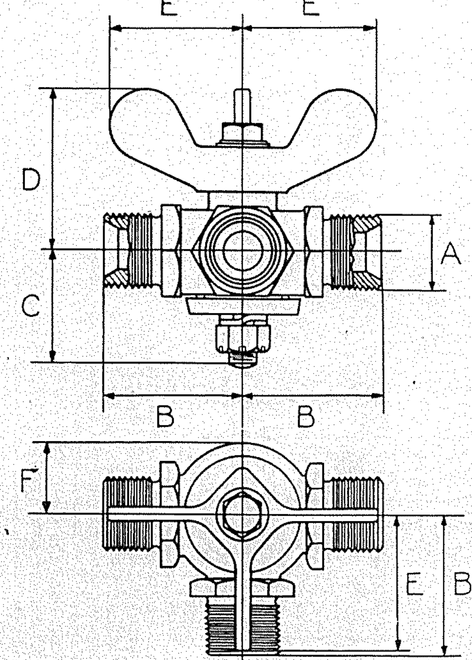


Drawing No.	A	B	C	D	E	F	Weight
A484	¼" B.S.P.	1·27	1·05	1·44	1·22	1·35	
A559	⅜" ,,						
A497	½" ,,	1·55	1·25	1·8	1·5	1·6	8
A383	⅝" ,,	1·7	1·35	1·85	1·5	1·8	9
A485	¾" ,,	1·83	1·4	1·92	1·5	1·95	11
A525	⅞" ,,	2·0	1·5			2·0	
A268	1·0" ,,	2·0	1·5			2·0	

These cocks have been designed for use in oil systems and have large bores. End connections are screwed BSP thread and take Air Ministry standard couplings.

VICKERS OIL COCKS

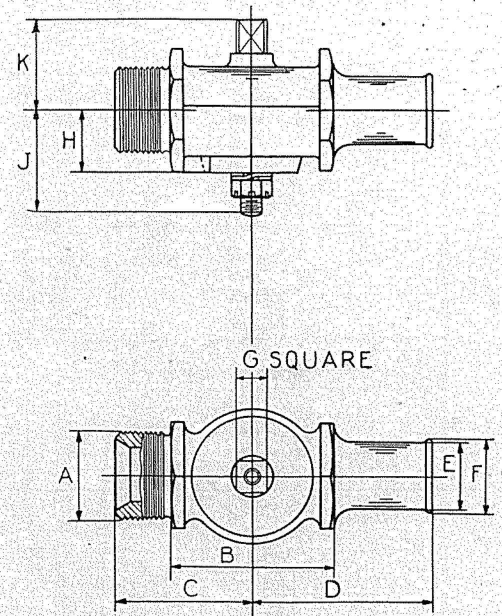
SCREW AND SCREW 3-WAY PLUG TYPE



Drawing No.	A	B	C	D	E	F	Weight	Remarks
A560	¼" B.S.P.							"T" Plug
A561	¼" ,,							"L" ,,
A562	⅜" ,,							"T" ,,
A563	⅜" ,,							"L" ,,
A384	½" ,,	1·55	1·25	1·8	1·5	·8		"T" ,,
A564	½" ,,	1·55	1·25	1·8	1·5	·8		"L" ,,
A565	⅝" ,,							"T" ,,
A566	⅝" ,,							"L" ,,
A567	¾" ,,							"T" ,,
A568	¾" ,,							"L" ,,
A569	⅞" ,,							"T" ,,
A570	⅞" ,,							"L" ,,
A382	1·0" ,,	2·0	1·45	2·0	1·5	1·1		"T" ,,
A498	1·0" ,,	2·0	1·45	2·0	1·5	1·1		"L" ,,

VICKERS OIL COCKS

SCREW AND HOSE 2-WAY PLUG TYPE

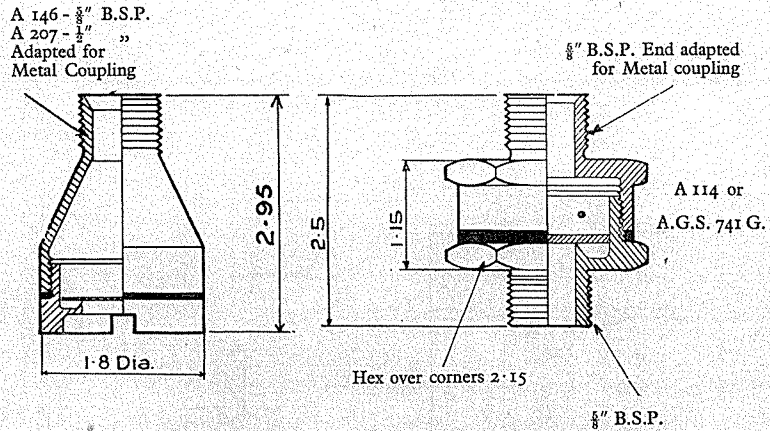


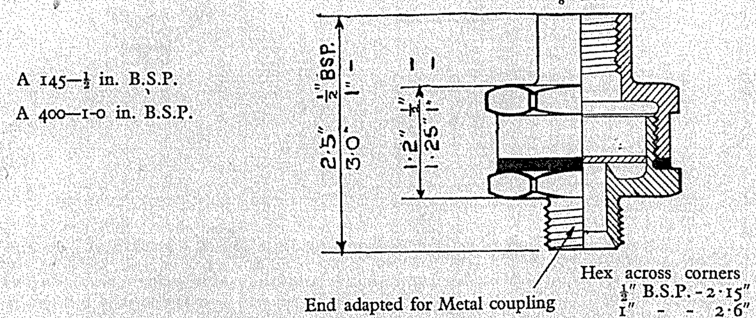
Drawing No. Dural		A	B	C	D	E	F	G	H	J	K	Weight
A185		$1\frac{3}{8}''$ × 16 T.P.I.	2·4	2·0	2·65	1·0	1·1	·45	·91	1·5	1·35	15·5
A494		1·0″ B.S.P.	2·4	2·0	2·65	1·0	1·1	·45	·91	1·5	1·35	16·0

GENERAL.—These cocks have been designed for use in oil systems for insertion between the oil tank and the engines to prevent flooding in cases where the tank is above the engine. The body is of "Vickers Duralumin" and the spring-loaded plug of Vickers "Immaculate" steel (rustless), hardened and ground.

VICKERS FOOT VALVES

AND NON-RETURN VALVES FOR FUEL SYSTEMS





GENERAL.—In fuel systems it is occasionally necessary to fit valves which will ensure that the flow takes place in one direction only. It is also necessary, when centrifugal pumps are used on suction lifts, to fit a foot valve. Three such valves are illustrated here. There are also numerous variations of these and we shall be pleased to submit sketches of valves to suit special conditions.

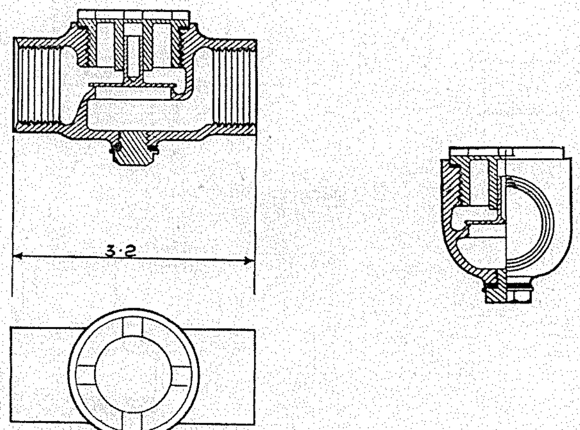
TESTS.—All valves are tested to 15 lbs. per square inch.

WEIGHT.—These vary from 4 to 8 ozs. according to type.

VICKERS NON-RETURN VALVES

HORIZONTAL TYPE FOR FUEL SYSTEMS

A 165—$\frac{1}{2}$″ B.S.P.
A 171—$\frac{5}{8}$″ ,,
A 172—$\frac{3}{4}$″ ,,
A 476—1″ ,,



This non-return valve has been designed for insertion in a horizontal pipe line.

The body is of "Vickers Duralumin" and the valve, which is of Vickers "Immaculate" steel (rustless) hardened and ground, is carried in a removable brass guide. The valve faces are of the metal to metal knife edge type. The internal passages are carefully machined and the moving valve is extremely light so that the loss of head through the valve is small.

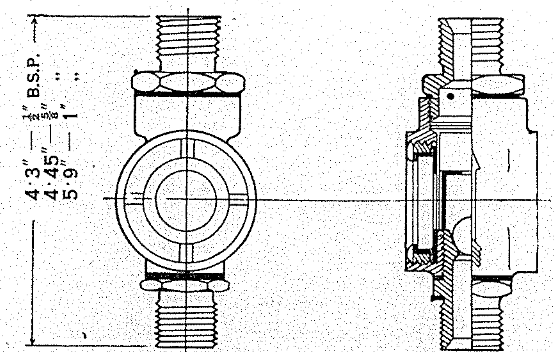
TESTS.—All valves are tested to 15 lbs. per square inch, and on flow test will pass one gallon of fuel per minute with a head of 2 inches at inlet.

WEIGHT.—A165—171—172=7$\frac{1}{2}$ oz. each.

VICKERS FUEL FLOW INDICATORS

AND NON-RETURN VALVES

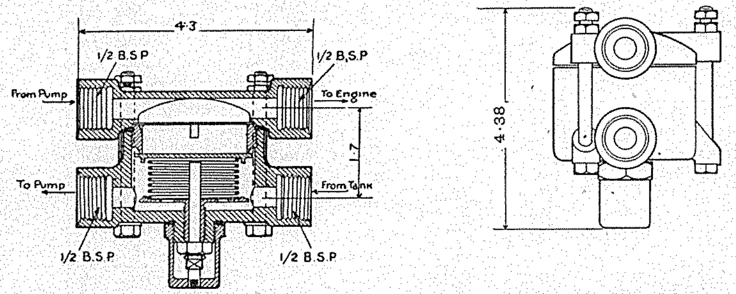
A 188—$\frac{1}{2}$″ B.S.P.
A 198—$\frac{5}{8}$″ ,,
A 278—1″ ,,

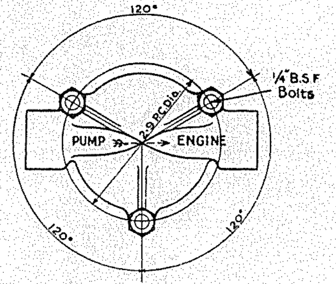


GENERAL.—This indicator is placed in the delivery pipe of the main pump, and gives visible indication of the rate of flow. It consists of a tubular body enclosing a ball and float, both of which are visible through a window at the lower end of same. The float is machined from "Vickers Duralumin" and is readily lifted by the flow of fuel. The non-return valve is a phosphor bronze ball resting on the usual conical seat and serves to isolate the lower pipe in the event of breakage of same. The rapidity of motion of the ball is an indication of the rate of flow. The body is of Duralumin and the inlet and outlet connections take the Air Ministry metal coupling.

TESTS.—All indicators are tested to 15 lbs. per square inch.

WEIGHT.—$\frac{1}{2}$″ and $\frac{5}{8}$″=7 ozs. approx.
1″ =17·5 ozs.





RELIEF VALVE

FOR

FUEL SYSTEMS

A 372

GENERAL.—This valve should be placed as near as possible to the wind-driven centrifugal fuel pump ; its duty is to by-pass all fuel delivered by the pump in excess of the engine requirements and prevent the pressure in the delivery system rising beyond a predetermined figure. The body of the valve is in two portions machined from " Vickers Duralumin " stampings. The large diameter plate valve and seating are of brass, the valve being held on its seat by an adjustable spring. Springs can be supplied to give any pressure from 1½ to 10 lbs. per square inch. The valve is guaranteed to by-pass 150 gallons per hour, with a rise in pressure of not more than 10 per cent over normal. The action of the valve can be readily seen from the accompanying illustrations.

All four connections are screwed internally ½" B S.P., and can be adapted to take Air Ministry metal coupling by the addition of V.G.S. 241.

TESTS.—All valves are tested to 15 lbs. per square inch.

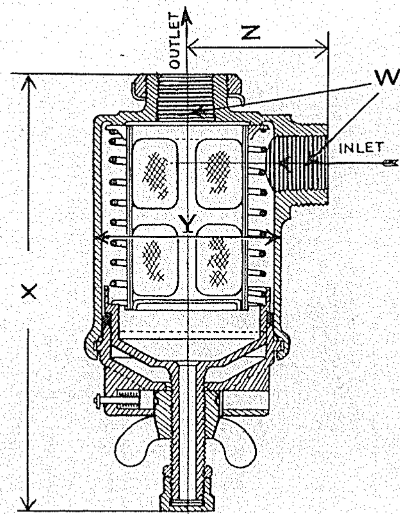
WEIGHT.—2 lbs. 2½ ozs., fitted with V.G.S. 241.

When ordering state pressure at which the valve is required to work, and whether it is to work in conjunction with a 2" or 3" centrifugal fuel pump.

B.E.S.A. FUEL FILTERS

A 202 similar to A.G.S. 600

A 113 " " " {601, 602}

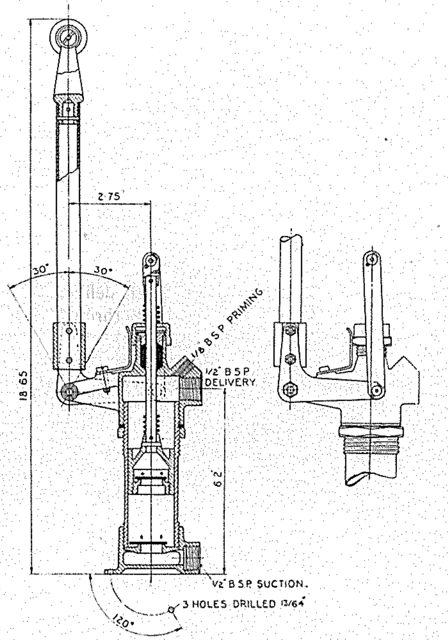


	W	X	Y	Z	Weight
A.G.S. 600	⅜" B.S.P.	4·65	2·6	1·95	1 lb. 4·75 ozs.
A.G.S. 601	½" "	6·15	2·6	1·95	1 lb. 7 ozs.
A.G.S. 602	¾" "	9·7	2·7	2·0	2 lb. 5·5 ozs.

May be supplied on special request with coarse gauze for use as oil filters.

VICKERS HAND FUEL PUMP

(Lever Action) Mark III A 130



USES.—This pump can be used in various ways, viz. :—

(1) Auxiliary supply from main tank to gravity or service tank.

(2) Inserted in the delivery side of a centrifugal pump pipe line to prime this pump in cases where it is placed higher than the bottom of the main tank. The special disposition of the valves in the hand pump enables the centrifugal pump to deliver through the hand pump, and both pumps to be operated independently or together.

GENERAL.—The pump is of simple construction and comprises a barrel with upper and lower caps, a piston, piston rod, and lever action handle. The valves are of the usual plate and knife edge type, the suction valve and inlet connection being embodied in the base and the delivery valve in the piston. The upper cap carries the outlet connection and piston rod gland, the latter being packed with graphited asbestos yarn. The action of the pump is quite simple ; the reciprocating motion of the piston causes the liquid column inside the barrel to move continuously in an upward direction, due to the non-return action of the two valves. The valves both open in the same direction, and it is this principle which enables the pump to be used as indicated above. It will be observed that even when the pump is working on suction lifts, the gland is never under the influence of that suction, and there is therefore no possibility of air being drawn into the system.

PERFORMANCE.—This pump is guaranteed to deliver 60 gallons of fuel per hour with average working.

Typical Test Result :

Machine : Vickers " Vulture."

Hand Pump : No suction lift, 11 ft. delivery head.

Duty : Main tank to service tank through approximately 25 lin. ft. of ½" o./d. piping, one cock and usual bends, etc.

Output : 70 gallons per hour with average working.

It is always advisable to use a foot valve on suction lifts, and in this way lifts of 10 feet are easily obtained.

CONNECTIONS.—The suction and delivery openings are screwed ½" B.S.P. internal thread. Half-inch Olive connections, or V.G.S. 241 (to fit Air Ministry metal couplings), can be fitted as an extra.

It is seldom necessary to resort to priming, but a boss is provided (tapped ⅛" gas) for use when conditions make it essential.

The method of connecting the upper cap to the barrel is such that the inlet and outlet connections can be readily displaced with respect to each other around the axis of the pump.

DIMENSIONS.

Height.—Base to top of handle, 18·65". Stroke of pump, 3 ins.

Weight.—4 lbs.

Tests.—All Pumps are tested for the above delivery and are subjected to an internal air pressure test of 10 lbs. per square inch.

Pumps of all-brass construction can also be supplied for use on seaplanes.

We also supply a Twin Coupled Hand Pump (A 150) with an output of 100 gals. per hour.

VICKERS HAND FUEL PUMP

Direct Action Type A 299

USES.—This Pump can be used in place of the lever action type (see page 36), and has the same general characteristics.

GENERAL.—The pump is of simple construction and comprises a barrel with end caps carrying the suction and delivery connections, a bucket piston with rod projecting through a spring loaded gland and a handle which may be of either the offset or spade grip types. The valves are of Rustless Steel of the plate and knife edge type. The action of the pump is similar to that of the type described on page 37.

PERFORMANCE.—Will work under a suction lift of over 10 ft. and deliver to a height of over 10 ft. Will deliver under normal conditions just over one gallon per minute when working at 55—60 strokes per minute. A delivery of two gallons per minute can be obtained for short periods.

CONNECTIONS.—The suction and delivery openings are screwed ½" B.S.P. internal thread, ½" Olive connections or V.G.S. 241 (to fit Air Ministry Metal Coupling) can be fitted as an extra. The complete pump can be secured to machine by clips placed round the end caps as indicated.

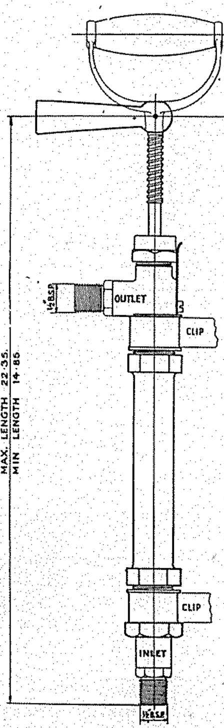
WEIGHT.—1½ lbs.

TESTS.—All pumps are tested for delivery and are subjected to an internal Air Pressure of 10 lbs. per square inch.

This pump has been tested at the Royal Aircraft Establishment, Farnborough, and we are permitted to give the following extract from the official report E.2298, dated 26-1-27 :—

The Volumetric Efficiency is very good—One gallon of petrol was delivered in 55 Strokes.

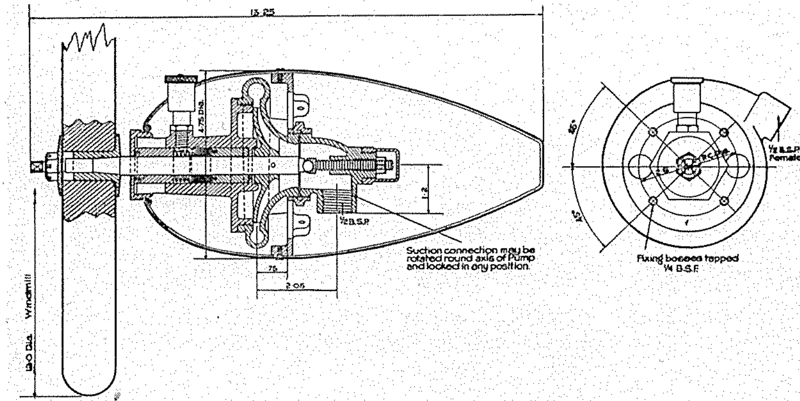
The following table shows the mean results of the tests :—



Delivery Head feet	Suction Lift feet	No. of Strokes required to commence delivery	No. of Strokes per min.	Delivery in galls. per min.	Delivery press : mean in lbs. per sq. in.
5	2·25	7	60	1·1	3
5	2·25	7	106	2·0	Max. 15
—	10·75	12	60	1·1	3
—	10·75	30	20	·36	2

VICKERS CENTRIFUGAL FUEL PUMP

3 Inch. Mark II*. A 126



USES.

(1) Pumping direct from main tank to carburetter. The non-pulsating character of the delivery makes it specially suitable for this purpose. In modern high speed machines it is necessary to fit a special relief and by-pass valve in order to maintain the pressure within predetermined limits throughout the whole speed range.

(2) Pumping from main tank to service tank.

(3) A combination of the above systems, usually with an auxiliary hand pump. This pump is best fitted below or level with the bottom of the Main Tank. In cases where this is not possible it will be necessary to fit a hand pump so that the former may be primed. With proper precautions suction lifts as great as 10 feet may be adopted.

For General Description and Performance see next page.

VICKERS CENTRIFUGAL FUEL PUMP

Mark II*.

GENERAL.—This pump is of the direct wind-driven type, the windmill and impeller being mounted on the same spindle. The spindle is of steel, case-hardened and ground, and runs in hard phosphor bronze bearings. The volute casing is of gunmetal and takes the suction and delivery connections. The suction connection is adjustable and may be rotated round the axis of the pump and locked in any position. The nose piece is of " Vickers Duralumin " and carries the gland and renewable bushes. The gland, which is packed with graphited asbestos yarn, is spring loaded and a screw-down greaser is fitted to lubricate the outer bearings. The complete pump is enclosed in a spun aluminium streamline case.

FIXING.—Four tapped bosses are provided on the volute casing. The suction and delivery connections are screwed internally ½" B.S.P., and can be adapted to take Air Ministry metal coupling by the addition of A.G.S. 627.

PERFORMANCE.—The pump is fitted as standard with a two-bladed windmill suitable for all speeds from 45 to 120 m.p.h. All pumps pass the following tests.

Delivery, 150 gals. per hour against 25 feet head at 3,500 r.p.m. (approximating to 72 m.p.h. wind).

Pressure test, 10 lbs. per square inch.

For other deliveries, see curve on opposite page.

The pump absorbs approximately ⅕ h.p.

WEIGHT.—Pump complete, with fairing and windmill 5 lbs. 7 ozs.

This pump can also be supplied fitted with brake gear (A. 265).

VICKERS CENTRIFUGAL FUEL PUMP

MARK II*.

3" IMPELLER WINDMILL NO. 28083 (12" DIA. PITCH 1·56 FEET)

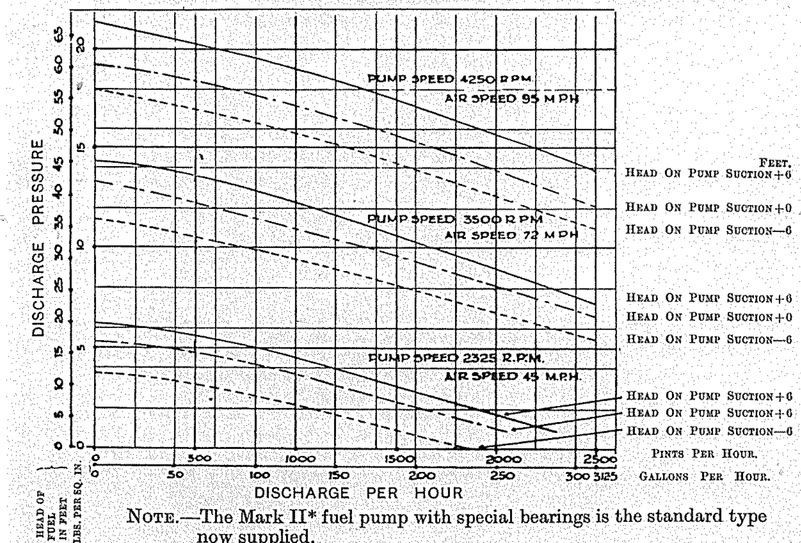
COPY OF TEST AT THE ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH 9-7-18.

Subject :—Vickers Mark II* Fuel Pump, with Special Bearings

This report details tests of a modified standard " Vickers " centrifugal pump fitted with plain phosphor bronze bearings instead of ball bearings, and a simplified packing device to keep the pump spindle leak tight.

The pump, as received, was mounted in a wind channel, and ran a duration test of 100 hours at 4,000 r.p.m. at its maximum full bore load of 3,270 pints per hour at a delivery pressure of 4·4 lbs. per square inch. The pump was then fitted in an aeroplane and flown for 75 minutes. It was then dismantled for examination of the modified parts. Finally, it was reassembled and run for another 4 hours in a wind channel.

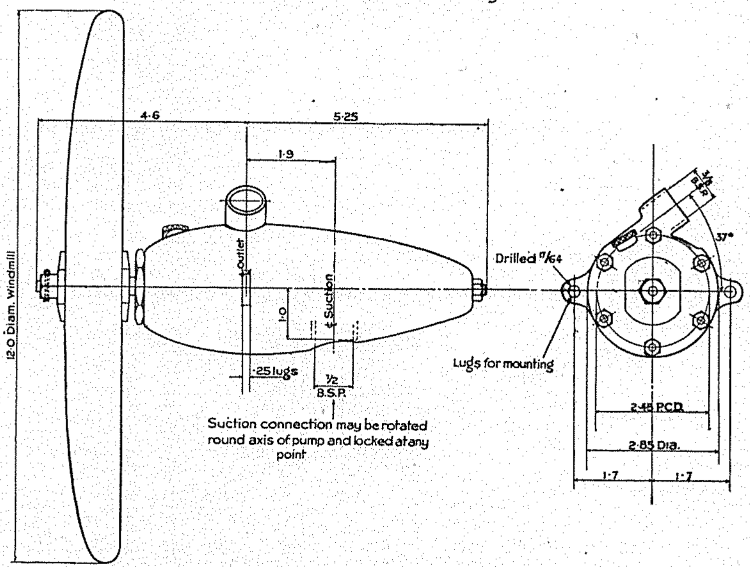
Both when starting and finishing the 100 hours run the spindle gland was tight with no leakage, and the pump showed no signs of fuel leakage throughout the tests ; the bearings and modified packing are very satisfactory. The spindle friction is very much less than the " Vickers " pumps previously tested. After the 100 hours run the load necessary to just rotate the spindle was only ·375 ounces at 6 in. radius.



NOTE.—The Mark II* fuel pump with special bearings is the standard type now supplied.

VICKERS CENTRIFUGAL FUEL PUMP

2 Inch. Mark VI. A 163



USES.—See remarks re 3 inch, Mark II* (page 39).

GENERAL.—Similar construction to 3 inch.

INSTALLATION.—Two lugs are provided on the volute casing. The suction and delivery connections are screwed $\frac{1}{2}$" B.S.P. and $\frac{3}{8}$" B.S.P. respectively, and can be adapted to take Air Ministry metal coupling by the addition of A.G.S. 627.

PERFORMANCE.—The pump is fitted with a two-bladed windmill suitable for all speeds from 45 to 120 m.p.h. All pumps pass the following tests :—

Delivery—50 gallons per hour against 10 ft. head at 3,500 r.p.m. (approx. 72 m.p.h. wind).

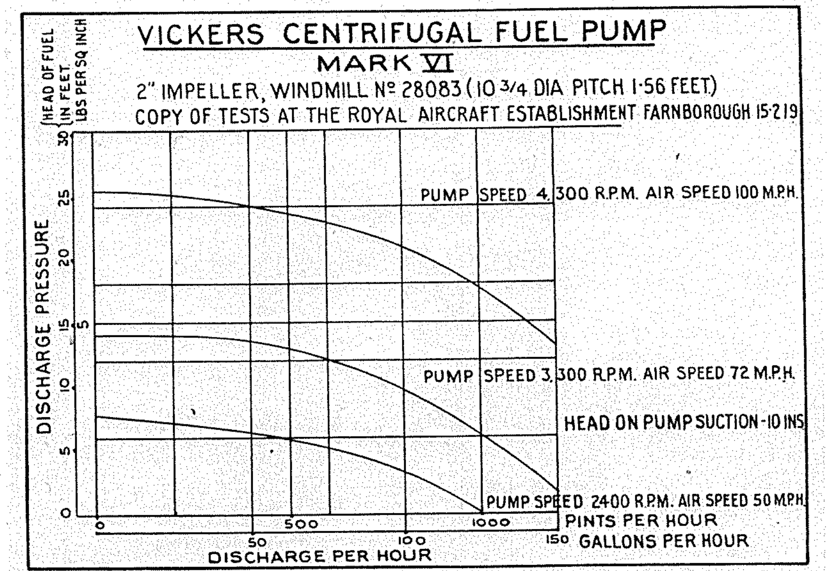
Pressure test—10 lbs. per sq. inch.

For other deliveries see curve on page 45.

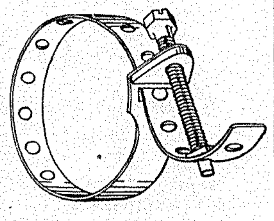
The pump absorbs approximately $\frac{1}{8}$ h.p.

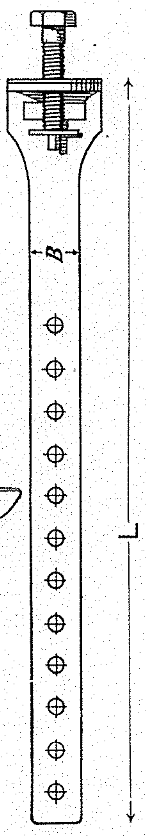
WEIGHT.—Pump complete, with fairing and windmill, 2 lbs. 10 ozs.

SPARE PACKINGS.—10928. Sheet I.



VICKERS PIPE CLIPS





Made from brass strip, this clip has the advantage over many others that it can be used for a number of pipes of different external diameters. It is, therefore, well worth standardising.

Easy to fit; lasting a long time and easy to remove, it will save money in the long run.

V.G.S. 17 Mark	Pipe Diameter	B	L
1	$0-\frac{3}{4}$	0·35	5·05
2	$\frac{13}{16}-2$	0·55	10·15
3	$2\frac{1}{8}-2\frac{5}{8}$	0·7	11·32
4	$2\frac{3}{4}-4$	0·7	15·8

Dimensions=Inches.

CHAMBER FOR REMOTE READING OIL THERMOMETER

VGS 611

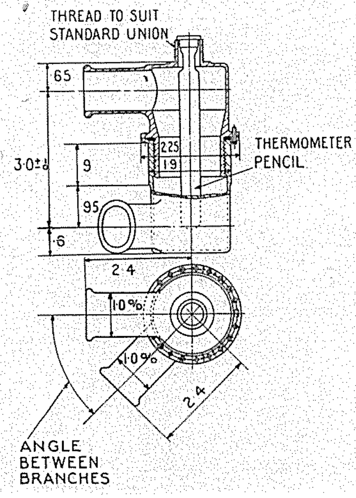
In modern aero engine installations it is necessary that the temperature of the oil in the lubrication system should be kept under observation. For this purpose, it is usual to employ a Thermometer of the remote reading type which depends for its action upon the expansibility of some volatile liquid such as ether.

There are often difficulties encountered in finding a suitable location for the insertion of the " pencil " or cylinder in the circulation system since if the pencil is directly inserted in the pipe line, serious obstruction occurs. To overcome this difficulty Vickers (Aviation) Ltd. have developed a small chamber, VGS 611, which forms a convenient unit and has been so proportioned as to offer no restriction to the flow.

As will be seen from the illustration, the pipe branches are formed integral with the two parts of the chamber and are set at any desired angle to order; thus "VGS 611-45" denotes, as in the illustration, an angle of 45° between the branches which are 1" overall diameter with beaded ends.

These units are subjected to a test pressure of 40 lbs. per square inch.

The smaller illustration shews a method of supporting the chamber upon the bulkhead by means of a suitable flanged fitting.



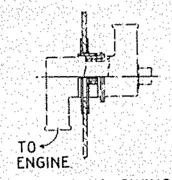


DIAGRAM SHOWING METHOD OF MOUNTING THERMOMETER CHAMBER UPON BULKHEAD

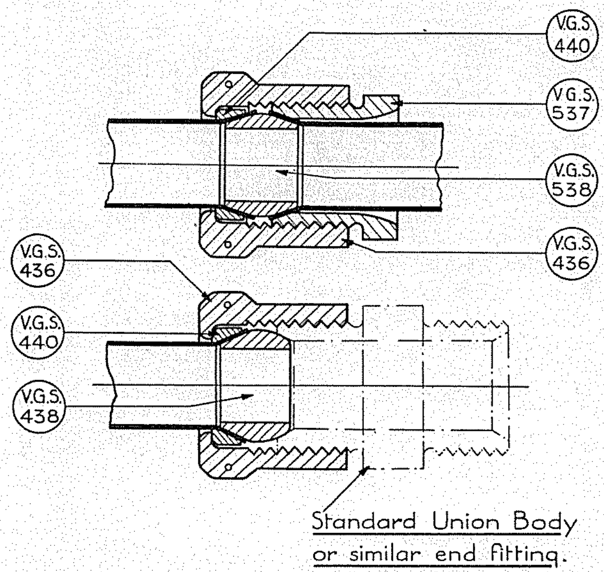
VICKERS AVIATION LIMITED

VICKERS METAL COUPLINGS

FOR FUEL PIPES

Vickers Metal couplings replace rubber joints in the fuel pipes; they conform to British Air Ministry standards. Standard sizes of the assembled couplings and their component parts are set out in the following tables.

DURAL COUPLING—ASSEMBLY

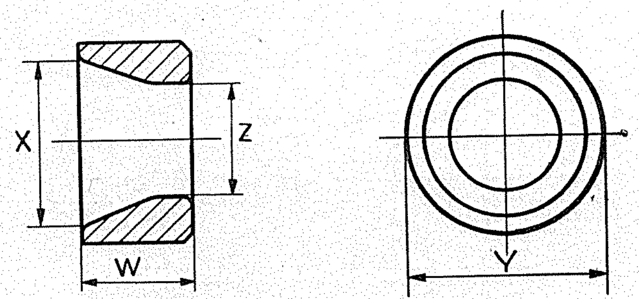


Mark	A	B	BB	C	CC	D	E	F	G	H
External Diameter of Pipe ..	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1·0"

VICKERS AVIATION LIMITED

DURAL COUPLING—PIPE COLLAR

(V.G.S. 440)

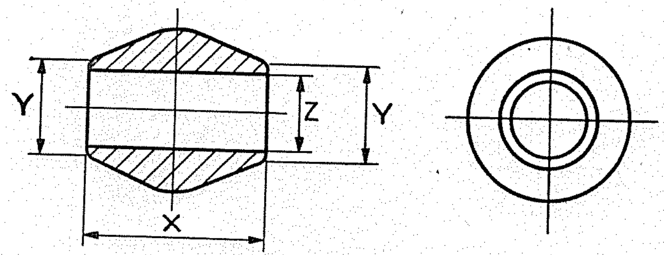


Mark	External Diameter of Pipe	Z	Y	X	W
A	3/16	13/64	0·325	0·25	0·155
B	1/4	17/64	0·44	0·345	0·25
BB	5/16	21/64	0·523	0·415	0·25
C	3/8	25/64	0·575	0·48	0·25
CC	7/16	29/64	0·65	0·54	0·25
D	1/2	33/64	0·72	0·6	0·25
E	5/8	41/64	0·795	0·735	0·25
F	3/4	49/64	0·935	0·86	0·25
G	7/8	57/64	1·085	0·98	0·25
H	1·0	1 1/64	1·175	1·108	0·25

Dimensions = Inches.

DURAL COUPLING—NIPPLE

(V.G.S. 538)

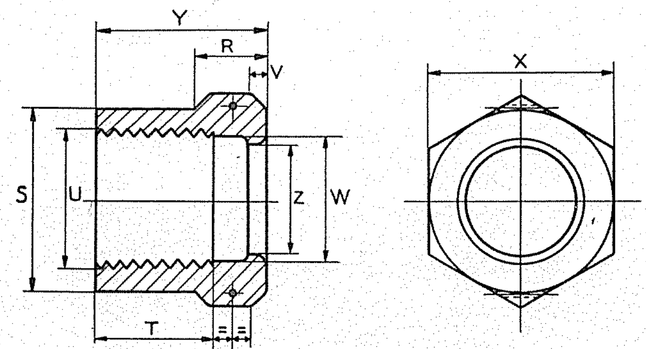


Mark	External Diameter of Pipe	Z	Y	X
A	$\frac{3}{16}$	$\frac{7}{64}$	0·145	0·315
B	$\frac{1}{4}$	$\frac{11}{64}$	0·208	0·38
BB	$\frac{5}{16}$	$\frac{7}{32}$	0·252	0·5
C	$\frac{3}{8}$	$\frac{9}{32}$	0·318	0·5
CC	$\frac{7}{16}$	$\frac{11}{32}$	0·377	0·5
D	$\frac{1}{2}$	$\frac{13}{32}$	0·438	0·5
E	$\frac{5}{8}$	$\frac{17}{32}$	0·575	0·5
F	$\frac{3}{4}$	$\frac{21}{32}$	0·7	0·5
G	$\frac{7}{8}$	$\frac{49}{64}$	0·82	0·5
H	1·0	$\frac{29}{32}$	0·945	0·5

Dimensions = Inches.

DURAL COUPLING—OUTER SLEEVE

(V.G.S. 436)

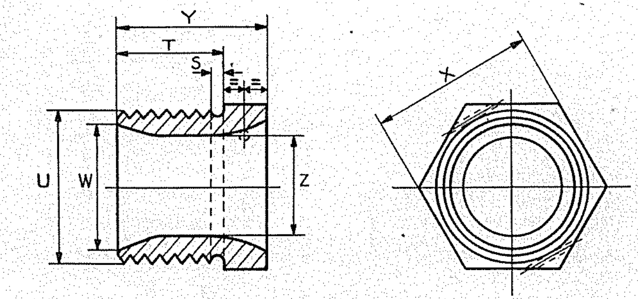


Mark	External Diameter of Pipe	Z	Y	X		W	V	U B.S.P.	T	S	R
				Max.	Min.						
A	$\frac{3}{16}$	$\frac{7}{32}$	0·7	0·525	0·52	0·337	0·1	$\frac{1}{8}$	0·445	0·465	0·25
B	$\frac{1}{4}$	$\frac{9}{32}$	0·83	0·6	0·595	0·451	0·11	$\frac{1}{4}$	0·5	0·6	0·3
BB	$\frac{5}{16}$	$\frac{11}{32}$	0·87	0·71	0·705	0·533	0·12	19 T.P.I. Whit. Form 0·6 o/d	0·53	0·7	0·3
C	$\frac{3}{8}$	$\frac{13}{32}$	0·91	0·82	0·815	0·589	0·12	$\frac{3}{8}$	0·57	0·8	0·4
CC	$\frac{7}{16}$	$\frac{15}{32}$	0·94	0·92	0·915	0·659	0·12	14 T.P.I. Whit. Form 0·75 o/d	0·6	0·9	0·4
D	$\frac{1}{2}$	$\frac{17}{32}$	0·96	1·01	1·002	0·734	0·12	$\frac{1}{2}$	0·62	0·97	0·4
E	$\frac{5}{8}$	$\frac{21}{32}$	1·01	1·1	1·092	0·811	0·12	$\frac{5}{8}$	0·67	1·06	0·45
F	$\frac{3}{4}$	$\frac{25}{32}$	1·06	1·2	1·192	0·95	0·12	$\frac{3}{4}$	0·72	1·2	0·45
G	$\frac{7}{8}$	$\frac{29}{32}$	1·06	1·39	1·382	1·098	0·12	$\frac{7}{8}$	0·72	1·37	0·45
H	1·0	$1\frac{1}{32}$	1·06	1·67	1·662	1·193	0·12	1·0	0·72	1·55	0·45

Dimensions = Inches.

DURAL COUPLING—INNER SLEEVE

(V.G.S. 537)

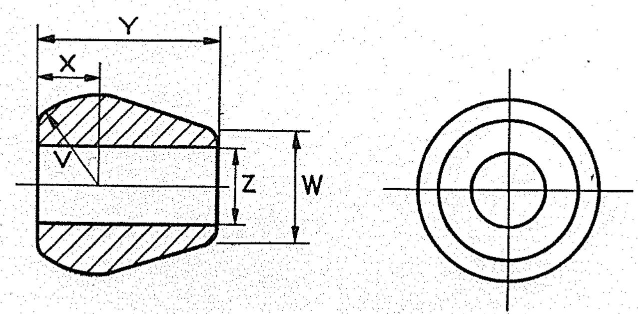


Mark	External Diameter of Pipe	Z	Y	X Max.	X Min.	W	U B.S.P.	T	S
A	3/16	13/64	0·7	0·445	0·44	0·25	1/8	0·45	0·06
B	1/4	17/64	0·7	0·525	0·52	0·345	1/4	0·5	0·06
BB	5/16	21/64	0·75	0·6	0·595	0·415	19 T.P.I. Whit. Form ·6 o/d	0·55	0·06
C	3/8	25/64	0·82	0·71	0·705	0·483	3/8	0·57	0·06
CC	7/16	29/64	0·85	0·82	0·815	0·54	14 T.P.I. Whit. Form ·75 o/d	0·6	0·09
D	1/2	33/64	0·87	0·92	0·915	0·605	1/2	0·62	0·09
E	5/8	41/64	0·92	1·01	1·002	0·735	5/8	0·67	0·09
F	3/4	49/64	0·97	1·1	1·092	0·86	3/4	0·72	0·09
G	7/8	57/64	1·0	1·3	1·292	0·98	7/8	0·75	0·1
H	1·0	1 1/64	1·0	1·39	1·382	1·108	1·0	0·75	0·1

Dimensions=Inches.

DURAL COUPLING—ADAPTOR NIPPLE

(V.G.S. 438)



Mark	External Diameter of Pipe	V	W	X	Y Max.	Y Min.	Z
A	3/16	0·134	0·145	0·1	0·3	0·29	7/64
B	1/4	0·2	0·208	0·14	0·4	0·39	11/64
BB	5/16	0·24	0·252	0·17	0·43	0·42	7/32
C	3/8	0·27	0·318	0·19	0·46	0·45	9/32
CC	7/16	0·3	0·377	0·21	0·47	0·46	11/32
D	1/2	0·33	0·438	0·22	0·48	0·47	13/32
E	5/8	0·41	0·575	0·29	0·5	0·49	17/32
F	3/4	0·46	0·7	0·3	0·53	0·52	21/32
G	7/8	0·57	0·82	0·37	0·62	0·6	43/64
H	1·0	0·61	0·945	0·36	0·56	0·54	23/32

Dimensions=Inches.

VICKERS
UNIVERSAL PULLEYS AND GUARDS
(Patented)

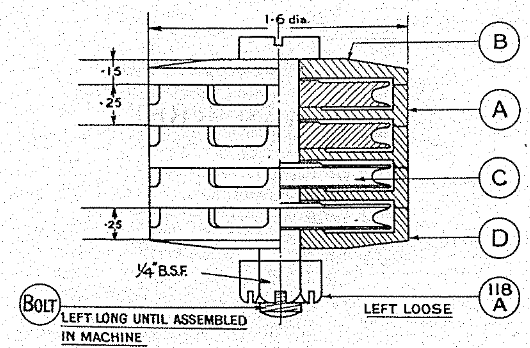
This pulley unit has been designed to facilitate the running of wires for bomb gear or for other light duties.

The complete unit can be made up to contain from one to twelve pulleys, and has a single fixing bolt.

The pulleys are 1·15 diameter at the bottom of the groove which is suitable for 5 cwt. cable.

The guards permit of the entry and exit of the wire at any convenient angle.

The complete unit is made of Duralumin with the exception of the bolt which is of mild steel.



MARK Nº	NUMBER OFF A	B	C	D	BOLT	WT. OZS.	MARK Nº	NUMBER OFF A	B	C	D	BOLT	WT. OZS.
1	-	1	1	1	Z	·83	7	6	1	7	1	T	3·58
2	1	1	2	1	Y	1·3	8	7	1	8	1	S	4·04
3	2	1	3	1	X	1·75	9	8	1	9	1	R	4·5
4	3	1	4	1	W	2·2	10	9	1	10	1	Q	5
5	4	1	5	1	V	2·67	11	10	1	11	1	P	5·4
6	5	1	6	1	U	3·13	12	11	1	12	1	O	5·9

Dimensions=Inches

VICKERS
OLEO - PNEUMATIC
SHOCK ABSORBERS

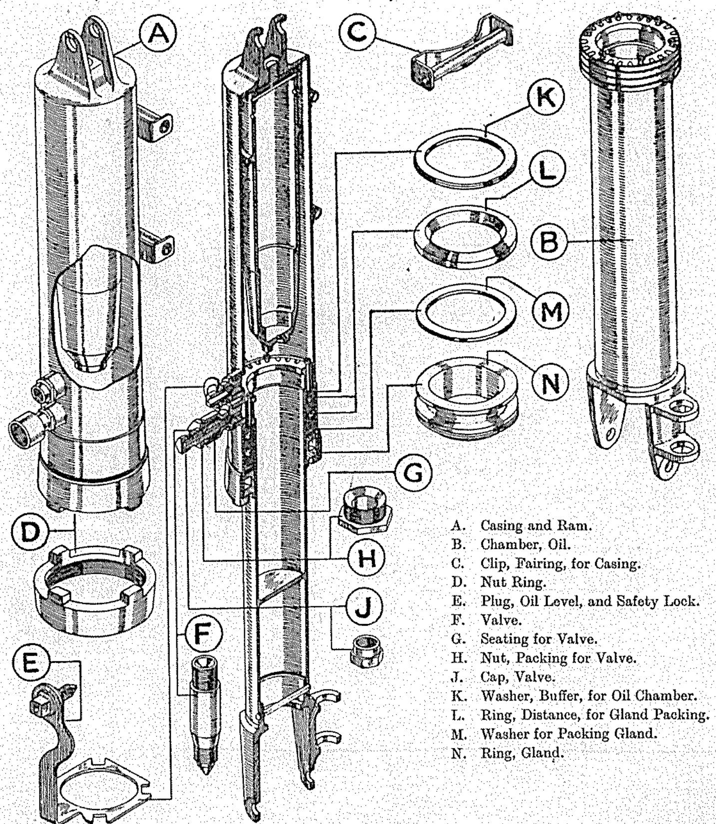
FOR

UNDERCARRIAGES
AND TAIL SKIDS.

VICKERS (PATENT) OLEO-PNEUMATIC SHOCK ABSORBER

FOR AIRCRAFT UNDERCARRIAGE

Component Parts.



A. Casing and Ram.
B. Chamber, Oil.
C. Clip, Fairing, for Casing.
D. Nut Ring.
E. Plug, Oil Level, and Safety Lock.
F. Valve.
G. Seating for Valve.
H. Nut, Packing for Valve.
J. Cap, Valve.
K. Washer, Buffer, for Oil Chamber.
L. Ring, Distance, for Gland Packing.
M. Washer for Packing Gland.
N. Ring, Gland.

VICKERS OLEO-PNEUMATIC UNDERCARRIAGES AND TAIL SKIDS

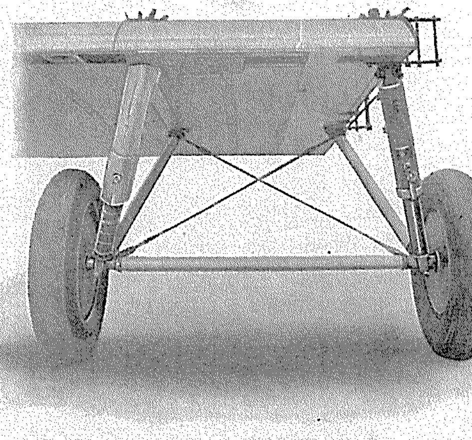


Plate 1.—Vickers Oleo-Pneumatic Chassis.
As fitted to twin engine machine.
The four oleo units are interchangeable. One unit shown with cowling removed.

All aircraft must have some system of spring suspension to take up landing and taxi-ing shocks. The vertical velocity of a machine on landing may vary from 10 to 20 feet per second and the energy possessed by the machine at these speeds will be considerable. If the machine is brought to rest rapidly, or if, in other words, the travel of the shock absorbing apparatus is short the stresses occasioned in the machine structure will be relatively high due to its rapid deceleration. Spring suspensions of various types have been used in the past, such as steel compression springs, rubber cord in tension, and also rubber blocks in compression; they are all open to the objection that they are heavy when compared with the amount of energy they can take up; they are of relatively large dimensions and for that reason are bad aerodynamically; and, finally, these types do not readily permit of a long travel being given to the landing wheel.

The Vickers system uses compressed air for the resilient medium and all damping is effected by the use of an Oil Brake. The compressed air is retained in a steel chamber and the working piston passes through an oil sealed gland. The construction of the Oleo-Pneumatic Unit will be readily understood by reference to the sectional diagram on Page 54.

The construction is extremely simple, there are few moving parts, and these are constantly lubricated. The main gland is oil sealed and no air can possibly escape at this point ; the filling valve is also oil covered, and this valve and the oil level valve are of the needle type and can be depended upon to retain the air indefinitely. The gland on the stem of the filling valve only comes into action during filling or testing operations. In order to obviate the risk which might be attached to the removal of the main gland plug whilst there is still pressure in the air cylinder the oil level valve has been interlocked with this part. It is, therefore, necessary to remove completely the oil level valve before proceeding to dismantle the unit. The working surfaces of the air cylinder and the piston are ground. Initial air pressures have been used varying from 300 to 1,000 lbs. per square inch, so that it

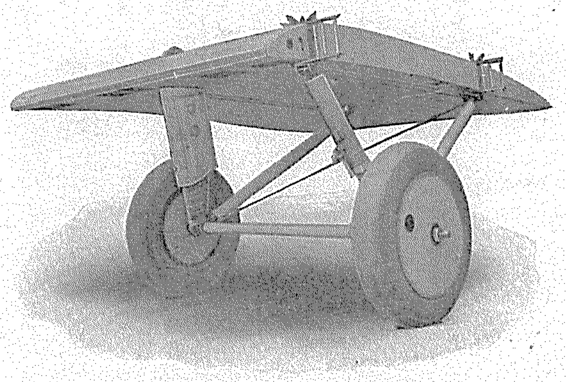
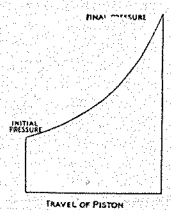


Plate 2.—Vickers Oleo-Pneumatic Chassis.

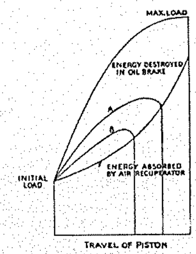
See Plate I.

will be readily appreciated how adaptable this unit is. In this connection it is interesting to note that the maximum initial allowable pressures on compression rubber spring suspension systems is of the order of 250 lbs. per square inch, so that for a given load the cross sectional area of the rubber column must be at least three times that of the piston in the compressed air system. With regard to the principle on which this system works, it will be seen that any inward movement of the piston will compress the air and, since the initial and final volumes of the air are known, the increase of load due to increasing air pressure follows a definite law, and can be illustrated by the accompanying curve, and further, that under these conditions it is practically independent of speed.



By choosing appropriate initial and final air volumes a large degree of lateral stability can be given to the machine when taxi-ing. The piston is always under air load and is always striving to return to its extended position.

When the piston is forced inwards the oil is forcibly ejected by the entry of the Brake Ram and caused to pass into the interior of the air cylinder through the annular orifice. This orifice is of relatively small area and the velocity of the oil through same is very great and consequently gives rise to a high pressure in the chamber with a corresponding retarding effect on the piston. The oil brake converts the excess energy of the landing into heat. This heat appears in the oil and is immediately dissipated by radiation from the exterior of the unit. The amount of energy which the oil brake is called upon to deal with, and the retarding force which it exerts depends upon the speed at which the piston moves. If the piston is pushed in gently the retarding force of the brake will be negligible. The form of the brake ram is carefully calculated to provide the necessary retarding force as the speed of the machine falls away in coming to rest and may be illustrated by the accompanying diagram. With this combination enormous quantities of energy can be absorbed and dissipated without over-stressing the machine structure. The outward movement of the piston is controlled by an oil dashpot of simple type, which acts as follows :—



Maximum load imposed on structure will not usually exceed 1·25 times the mean load.

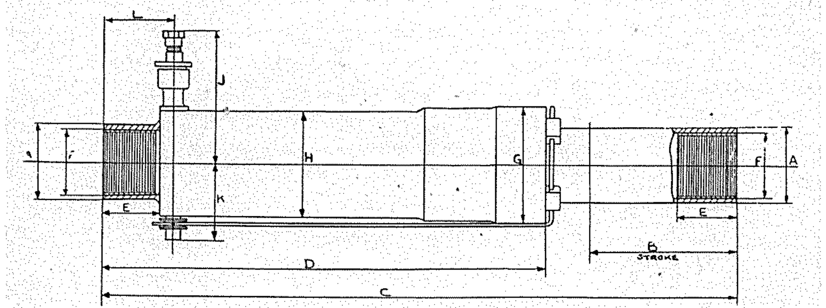
As the piston moves inward an annular space is formed between the piston head and the lower part of the cylinder. This space is filled with oil which passes freely through holes in the piston head and around the plate valve, which is suspended from the piston head. When the piston commences to move outward the plate valve closes and traps the oil. The rate of return of the piston is controlled by allowing the oil to pass back to the air chamber through a small hole in the plate valve. The speed at which the piston returns is sufficiently great to enable the wheels to meet recurring shocks in taxi-ing, but not sufficiently great to cause bouncing. The main gland is self adjusting, and is packed with special rings which are absolutely oil tight. The complete unit can be supplied with end connections to suit customers' requirements, and it is intended that it should be mounted in such a manner that it is only subjected to axial loads. The unit will function satisfactorily in any position from an angle of 45° to the vertical.

These units have been made with pistons ranging from 1″ to 3½″ dia., and for initial and final loads having a range of between 1 to 3 and 1 to 5. Complete undercarriages embodying these units have been designed and manufactured for a weight as low as 3·5 % of machine fully loaded.

The units for tail skids are generally of similar construction to those described above.

All enquiries for these units should be accompanied by the following information :—

(*a*) Total weight of aircraft, fully loaded.
(*b*) Number of units per machine.
(*c*) Initial load on one unit.
(*d*) Maximum permissible load on one unit fully compressed.
(*e*) Maximum permissible travel or stroke of plunger.
(*f*) Position of unit in undercarriage.
(*g*) Vertical landing velocity of machine.
(*h*) The number of machines for which units are required.



VICKERS STANDARD OLEO-PNEUMATIC SHOCK ABSORBER UNITS

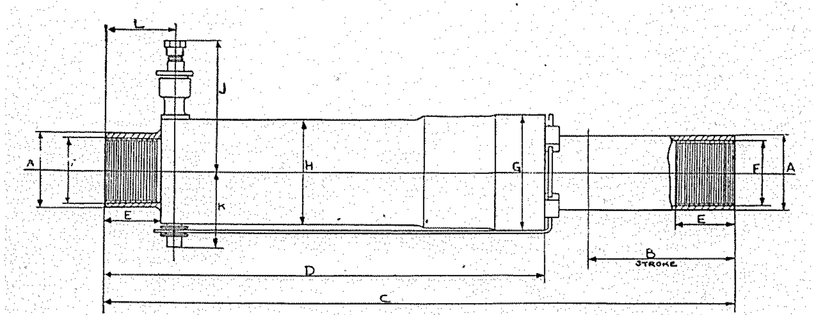
ENGLISH MEASUREMENTS

Type No.	L1 Min.	L1 Max.	L2	Energy	Stroke in Inches	Dim. A	B	C	D	E	F	G	H	J	K	L	Weight per Unit lbs.
153	0	1600		·156×L2	3·0	1·5	3·0	14·2	9·9	1·0	1¼×16	2·7	2·28	4·2	2·1	1·4	6·75
156	0	1600		·312×L2	6·0	1·5	6·0	20·2	12·9	1·0	1¼×16	2·7	2·28	4·2	2·1	1·4	7·5
159	0	1600		·468×L2	9·0	1·5	9·0	26·2	15·9	1·0	1¼×16	2·7	2·28	4·2	2·1	1·4	8·25
203	1610	2900		·156×L2	3·0	2·0	3·0	16·05	11·7	1·5	1¾×16	3·25	2·81	4·45	2·35	1·9	9·6
206	1610	2900		·312×L2	6·0	2·0	6·0	22·05	14·7	1·5	1¾×16	3·25	2·81	4·45	2·35	1·9	11·0
209	1610	2900		·468×L2	9·0	2·0	9·0	28·05	17·7	1·5	1¾×16	3·25	2·81	4·45	2·35	1·9	12·4
2012	1610	2900		·625×L2	12·0	2·0	12·0	34·05	20·7	1·5	1¾×16	3·25	2·81	4·45	2·35	1·9	13·8
253	2910	4500		·156×L2	3·0	2·5	3·0	17·55	12·65	2·0	2¼×16	4·05	3·5	4·8	2·7	2·4	13·2
256	2910	4500		·312×L2	6·0	2·5	6·0	23·55	15·65	2·0	2¼×16	4·05	3·5	4·8	2·7	2·4	15·35
259	2910	4500		·468×L2	9·0	2·5	9·0	29·55	18·65	2·0	2¼×16	4·05	3·5	4·8	2·7	2·4	17·5
2512	2910	4500		·625×L2	12·0	2·5	12·0	35·55	21·65	2·0	2¼×16	4·05	3·5	4·8	2·7	2·4	19·65
306	4510	6500		·312×L2	6·0	3·0	6·0	24·55	16·65	2·0	2¾×16	4·55	4·03	5·1	3·0	2·4	23·0
309	4510	6500	See Below	·468×L2	9·0	3·0	9·0	30·55	19·65	2·0	2¾×16	4·55	4·03	5·1	3·0	2·4	26·7
3012	4510	6500		·625×L2	12·0	3·0	12·0	36·55	22·65	2·0	2¾×16	4·55	4·03	5·1	3·0	2·4	30·5
356	6510	8850		·312×L2	6·0	3·5	6·0	26·5	18·1	2·5	3⅛×12	5·35	4·77	5·5	3·35	2·9	32·7
359	6510	8850		·468×L2	9·0	3·5	9·0	32·5	21·1	2·5	3⅛×12	5·35	4·77	5·5	3·35	2·9	37·6
3512	6510	8850		·625×L2	12·0	3·5	12·0	38·5	24·1	2·5	3⅛×12	5·35	4·77	5·5	3·35	2·9	42·5
406	8860	11550		·312×L2	6·0	4·0	6·0	27·3	18·9	2·5	3⅝×12	5·85	5·3	5·7	3·55	2·9	44·9
409	8860	11550		·468×L2	9·0	4·0	9·0	33·3	21·9	2·5	3⅝×12	5·85	5·3	5·7	3·55	2·9	49·75
4012	8860	11550		·625×L2	12·0	4·0	12·0	39·3	24·9	2·5	3⅝×12	5·85	5·3	5·7	3·55	2·9	54·6
456	11560	14600		·312×L2	6·0	4·5	6·0	27·9	19·5	2·5	4·0×12	6·4	5·83	5·95	3·85	2·9	55·5
459	11560	14600		·468×L2	9·0	4·5	9·0	33·9	22·5	2·5	4·0×12	6·4	5·83	5·95	3·85	2·9	61·0
4512	11560	14600		·625×L2	12·0	4·5	12·0	39·9	25·5	2·5	4·0×12	6·4	5·83	5·95	3·85	2·9	66·5
506	14610	18050		·312×L2	6·0	5·0	6·0	28·25	19·8	2·5	4½×12	6·9	6·36	6·2	4·8	2·9	
509	14610	18050		·468×L2	9·0	5·0	9·0	34·25	22·8	2·5	4½×12	6·9	6·36	6·2	4·8	2·9	
5012	14610	18050		·625×L2	12·0	5·0	12·0	40·25	25·8	2·5	4½×12	6·9	6·36	6·2	4·8	2·9	

L1 = The range of initial loads in lbs. for which the unit can be used.

L2 = The final load in lbs. which the unit will carry. L2 should not exceed L1×4 and may be as low as L1×3.

Energy = The maximum energy in ft. lbs. which the unit can absorb. This figure can be reduced to meet requirements.



VICKERS STANDARD OLEO-PNEUMATIC SHOCK ABSORBER UNITS

METRIC DATA

Type No.	L1		L2	Energy	A	B	C	D	E	F	G	H	J	K	L	Weight Per Unit kgs.
	Min.	Max.														
153	0	725		·048×L2	38·0	76·0	360	252	25·5	30×1·5	68·5	58·0	106·5	53·5	35·5	3·1
156	0	725		·095×L2	38·0	152·0	515	328	25·5	30×1·5	68·5	58·0	106·5	53·5	35·5	3·4
159	0	725		·143×L2	38·0	228·0	665	405	25·5	30×1·5	68·5	58·0	106·5	53·5	35·5	3·74
203	730	1315		·048×L2	50·8	76·0	410	299	38·0	45×1·5	82·5	71·5	113·0	59·5	48·0	4·36
206	730	1315		·095×L2	50·8	152·0	560	374	38·0	45×1·5	82·5	71·5	113·0	59·5	48·0	5·0
209	730	1315		·143×L2	50·8	228·0	710	450	38·0	45×1·5	82·5	71·5	113·0	59·5	48·0	5·65
2012	730	1315		·191×L2	50·8	305·0	865	525	38·0	45×1·5	82·5	71·5	113·0	59·5	48·0	6·3
253	1320	2040		·048×L2	63·5	76·0	450	320	51·0	55×1·5	103·0	89·0	122·0	68·5	61·0	6·0
256	1320	2040		·095×L2	63·5	152·0	600	397	51·0	55×1·5	103·0	89·0	122·0	68·5	61·0	7·0
259	1320	2040		·143×L2	63·5	228·0	750	474	51·0	55×1·5	103·0	89·0	122·0	68·5	61·0	7·95
2512	1320	2040		·191×L2	63·5	305·0	900	550	51·0	55×1·5	103·0	89·0	122·0	68·5	61·0	8·9
306	2045	2950		·095×L2	76·2	152·0	625	423	51·0	70×1·5	115·5	102·5	129·5	76·0	61·0	10·4
309	2045	2950	See Below	·143×L2	76·2	228·0	775	500	51·0	70×1·5	115·5	102·5	129·5	76·0	61·0	12·1
3012	2045	2950		·191×L2	76·2	305·0	925	575	51·0	70×1·5	115·5	102·5	129·5	76·0	61·0	13·8
356	2955	4010		·095×L2	89·0	152·0	675	460	63·5	80×2·0	136·0	121·0	140·0	85·0	73·5	14·85
359	2955	4010		·143×L2	89·0	228·0	825	535	63·5	80×2·0	136·0	121·0	140·0	85·0	73·5	17·1
3512	2955	4010		·191×L2	89·0	305·0	980	612	63·5	80×2·0	136·0	121·0	140·0	85·0	73·5	19·3
406	4015	5250		·095×L2	101·6	152·0	695	480	63·5	90×2·0	148·5	134·5	145·0	90·0	73·5	20·4
409	4015	5250		·143×L2	101·6	228·0	845	556	63·5	90×2·0	148·5	134·5	145·0	90·0	73·5	22·6
4012	4015	5250		·191×L2	101·6	305·0	1000	632	63·5	90×2·0	148·5	134·5	145·0	90·0	73·5	24·8
456	5255	6625		·095×L2	114·3	152·0	710	495	63·5	100×2·0	162·5	148·0	151·0	97·5	73·5	25·2
459	5255	6625		·143×L2	114·3	228·0	860	571	63·5	100×2·0	162·5	148·0	151·0	97·5	73·5	27·7
4512	5255	6625		·191×L2	114·3	305·0	1010	649	63·5	100×2·0	162·5	148·0	151·0	97·5	73·5	30·2
506	6630	8200		·095×L2	127·0	152·0	715	504	63·5	115×2·0	175·0	161·5	157·5	122·0	73·5	
509	6630	8200		·143×L2	127·0	228·0	870	579	63·5	115×2·0	175·0	161·5	157·5	122·0	73·5	
5012	6630	8200		·191×L2	127·0	305·0	1020	655	63·5	115×2·0	175·0	161·5	157·5	122·0	73·5	

L1 = The range of initial loads in kgs. for which the unit can be used.
L2 = The final load in kgs. which the unit will carry. L2 should not exceed L1×4 and may be as low as L1×3.
Energy = The maximum energy in kg. metres which the unit can absorb. This figure can be reduced to meet requirements.

VICKERS OLEO-PNEUMATIC CHASSIS

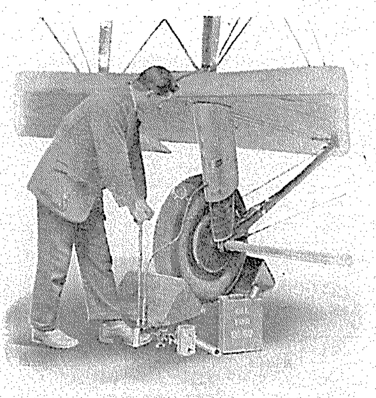


Plate 4.—Vickers Oleo-Pneumatic Chassis. Testing the Air Pressure.

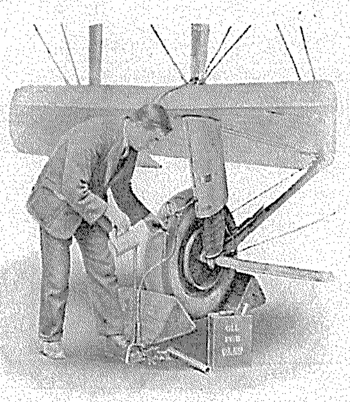


Plate 5.—Replenishing the Oil.

Plate 6.—Checking the Air Pressure after having blown off the excess oil.

A light portable hand air pump is available for use in connection with these units.

There is also a manually operated two stage pump of larger capacity for aerodrome use.

These pumps are fully described in pages 65 and 66.

The Vickers Oleo Units are sent out fully charged with oil and air to the pressure stated on instruction plate, and are ready for installation. Attachments can be provided to take a light Duralumin fairing, but the design of the latter is best left to the customer. Some protection should be given to the piston against sand and grit, and this may consist of an extension of the fairing, or may be a light leather gaiter. These units require very little attention in service. There is no possibility of the air escaping if the valves are securely tightened, therefore the only leakage which can take place will be the slight film of oil which serves to lubricate the main gland. It may therefore be necessary to verify the oil level and pressure at periods of say three to four months. This operation is extremely simple when carried out with the special Hand Pump, and should proceed as follows :—

Connect the pump to the filling valve and raise the pressure in the pipe line to the nominal pressure in the air chamber ; the filling valve should then be opened by unscrewing same half a turn. The air chamber is now in communication with pipe line and pressure gauge. If the oil level valve is now gently unscrewed, air or oil will be blown through the hole in this valve, and will give an indication of the conditions existing inside the air cylinder. It will probably be necessary to insert a small quantity of oil, and this is readily carried out by pouring a quantity of Vacuum P.924 Oil (Machine Gun Oil), into the reservoir at top of pump and continue pumping. When oil commences to flow from the oil level valve it should be firmly closed and pumping continued until the gauge shows that the normal pressure has been reached. The filling valve should then be closed, after which the pump is disconnected. Finally make all valves safe and replace dust cap.

It is essential that the piston be fully extended when the unit is being checked for oil level and air pressure. All units are given a proof test during manufacture, and no attempt should be made to increase the initial air pressure for which the units were designed, and which is stamped on the instruction plate, without consulting the manufacturers.

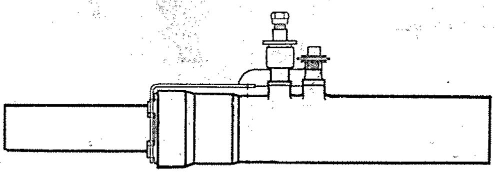
VICKERS
OLEO-PNEUMATIC
UNDERCARRIAGES AND TAIL SKIDS

I would like Ashley to do this job. Pressure to be reduced from 700 lbs □" to 610 lbs □". Pre. ... this, 20/5/24.

Patented in
Great Britain, Nos. 568/1915, 11664/1915
and Foreign Countries.

Explanation of the action of the Gear and the advantages to be derived from its use, together with a few notes on its care and upkeep in service.

£100



All communications to be addressed to:

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VICKERS HOUSE, BROADWAY, LONDON, S.W.1.

Telephone: VICTORIA 6900.
Telegrams: "VICKERS, SOWEST, LONDON"

Works: WEYBRIDGE, SURREY

Ref.: Oleo/1 (July, 1928).

Vickers Oleo-Pneumatic Chassis

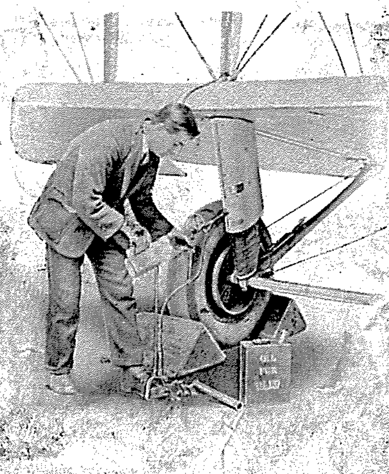

Plate 5.—**Replenishing the Oil.**

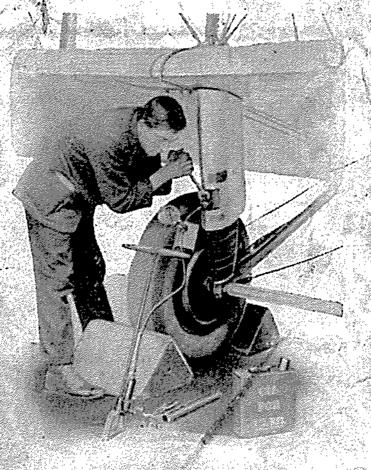

Plate 6.—**Checking the Air Pressure after having blown off the excess oil.**

Vickers Oleo-Pneumatic Tail Skid

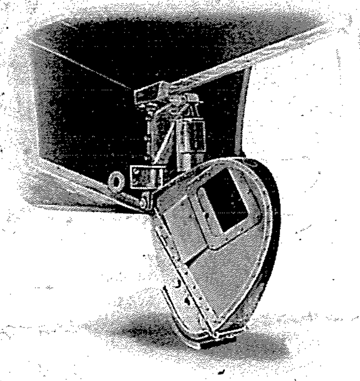

Plate 7.—**As fitted to the Viking Amphibian and machines of Scout type.**

In Amphibians the fairing is of copper and acts as a water rudder.

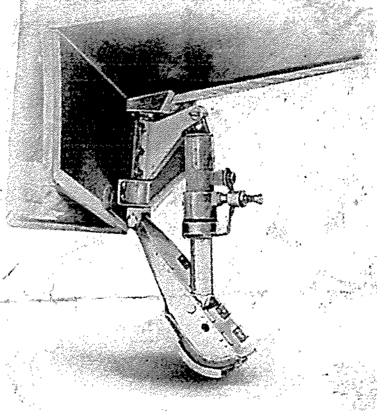

Plate 8.—**Fairing removed.**

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VICKERS OLEO-PNEUMATIC UNDERCARRIAGES & TAIL SKIDS

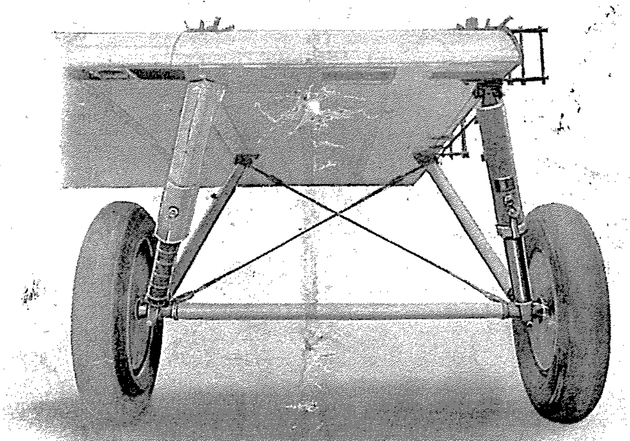


Plate 1.—**Vickers Oleo-Pneumatic Chassis.**

As fitted to twin engine machine.

The four oleo units are interchangeable. One unit shown with cowling removed.

All aircraft must have some system of spring suspension to take up landing and taxi-ing shocks. The vertical velocity of a machine on landing may vary from 10 to 20 feet per second and the energy possessed by the machine at these speeds will be considerable. If the machine is brought to rest rapidly, or if, in other words, the travel of the shock absorbing apparatus is short the stresses occasioned in the machine structure will be relatively high due to its rapid deceleration. Spring suspensions of various types have been used in the past, such as steel compression springs, rubber cord in tension, and also rubber blocks in compression; they are all open to the objection that they are heavy when compared with the amount of energy they can take up; they are of relatively large dimensions and for that reason are bad aerodynamically; and, finally, these types do not readily permit of a long travel being given to the landing wheel.

The Vickers System uses compressed air for the resilient medium and all damping is effected by the use of an Oil Brake. The compressed air is retained in a steel chamber and the working piston passes through an oil sealed gland. The construction of the Oleo-Pneumatic Unit will be readily understood by reference to the sectional diagram on Page 2.

The construction is extremely simple, there are few moving parts and these are constantly lubricated. The main gland is oil sealed and no air can possibly escape at this point; the filling valve is also oil covered and this valve and the oil level valve are of the needle type and can be depended upon to retain the air indefinitely. The gland on the stem of the filling valve only comes into action during filling or testing operations. In order to obviate the risk which might be attached to the removal of the main gland plug whilst there is still pressure in the air cylinder the oil level valve has been interlocked with this part. It is, therefore, necessary to completely remove the oil level valve before proceeding to dismantle the unit. The working surfaces of the

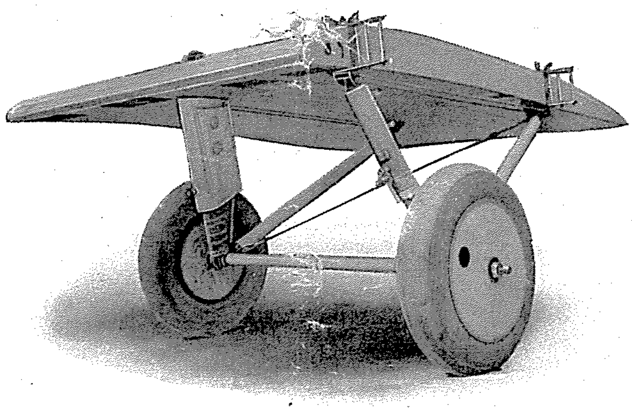
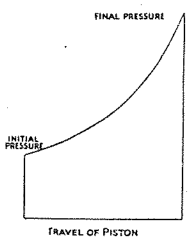


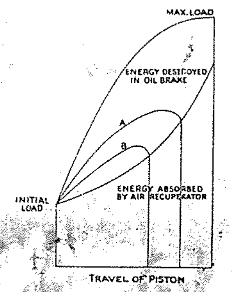
Plate 2.—**Vickers Oleo-Pneumatic Chassis.**
See Plate One.

air cylinder and the piston are ground. In the illustration (Page 2) the piston is shewn near the limit of its outer and normal position, and the air pressure is such that acting upon the dia. b. of the piston B gives a load slightly in excess of the static load. Initial air pressures have been used varying from 300 to 1,000 lbs. per square inch, so that it will be readily appreciated how adaptable this unit is. In this connection it is interesting to note that the maximum initial allowable pressures on compression rubber spring suspension systems is of the order of 250 lbs. per square inch so that for a given load the cross sectional area of the rubber column must be at least three times that of the piston in the compressed air system. With regard to the principle on which this system works, it will be seen that any inward movement of the piston B will compress the air and, since the initial and final volumes of the air are known, the increase of load due to increasing air pressure follows a definite law and can be illustrated by the accompanying curve and further that under these conditions it is practically independent of speed.



By choosing appropriate initial and final air volumes a large degree of lateral stability can be given to the machine when taxi-ing. The piston is always under air load and is always striving to return to its extended position.

When the piston B is forced inwards the oil at B1 is forcibly ejected by the entry of the Brake Ram C and caused to pass into the interior of the air cylinder through the annular orifice formed at H. This orifice is of relatively small area and the velocity of the oil through same is very great and consequently gives rise to a high pressure in the chamber B1 with a corresponding retarding effect on the piston. The oil brake converts the excess energy of the landing into heat. This heat appears in the oil and is immediately dissipated by radiation from the exterior of the unit. The amount of energy which the oil brake is called upon to deal with and the retarding force which it exerts depends upon the speed at which the piston B moves. If the piston is pushed in gently the retarding force of the brake will be negligible. The form of the brake ram C is carefully calculated to provide the necessary retarding force as the speed of the machine falls away in coming to rest and may be illustrated by the accompanying diagram. With this combination enormous quantities of energy can be absorbed and dissipated without over-stressing the machine structure. The outward movement of the piston is controlled by an oil dashpot of simple type which acts as follows :—



Maximum load imposed on structure will not usually exceed 1·25 times the mean load.

As the piston B moves inward an annular space is formed between the piston head and the lower part of the cylinder A. This space is filled with oil which passes freely through holes in the piston head and around the plate valve E which is suspended from the piston head. When the piston commences to move outward the plate valve closes and traps the oil. The rate of return of the piston is controlled by allowing the oil to pass back to the Air Chamber through a small hole in the plate valve. The speed at which the piston returns is sufficiently great to enable the wheels to meet recurring shocks in taxi-ing, but not sufficiently great to cause bouncing. The main gland is self adjusting and is packed with special rings which are absolutely oil tight. The complete unit can be supplied with end connections to suit customer's requirements and it is intended that it should be mounted in such a manner that it is only subjected to axial loads. The unit will function satisfactorily in any position from an angle of 45° to the vertical.

These units have been made with pistons ranging from 1″ to $3\frac{1}{2}$″ dia. and for initial and final loads having a range of between 1 to 3 and 1 to 5. Complete undercarriages embodying these units have been designed and manufactured for a weight as low as 3·5% of machine fully loaded.

The units for tail skids are generally of similar construction to those described above.

All enquiries for these units should be accompanied by the following information :—

Total weight of aircraft, fully loaded.
Number of units per machine.
Initial load on one unit.
Maximum permissible load on one unit fully compressed.
Maximum permissible travel or stroke of plunger.
Position of unit in undercarriage.
Vertical landing velocity of machine.

A light portable hand air pump is available for use in connection with these units.

There is also a manually operated two stage pump of larger capacity for aerodrome use.

These pumps are both fully described in our Accessory Catalogue, pages 22 and 23.

The Vickers Oleo Units are sent out fully charged with oil and air to the pressure stated on instruction plate and are ready for installation. Attachments can be provided to take a light duralumin fairing, but the design of the latter is best left to the customer. Some protection should be given to the piston against sand and grit and this may consist of an extension of the fairing or may be a light leather gaiter. These units require very little attention in service. There is no possibility of the air escaping if the valves are securely tightened, therefore the only leakage which can take place will be the slight film of oil which serves to lubricate the main gland. It may therefore be necessary to verify the oil level and pressure at periods of say three to four months. This operation is extremely simple when carried out with the special Hand Pump and should proceed as follows :—

Connect the pump to the filling valve and raise the pressure in the pipe line to the nominal pressure in the air chamber ; the filling valve should then be opened by unscrewing same half a turn. The air chamber is now in communication with pipe line and pressure gauge. If the oil level valve is now gently unscrewed air or oil will be blown through the hole in this valve and will give an indication of the conditions existing inside the air cylinder. It will probably be necessary to insert a small quantity of oil and this is readily carried out by pouring a quantity of Vacuum P.924 Oil (Machine Gun Oil), into the reservoir at top of pump and continue pumping. When oil commences to flow from the oil level valve it should be firmly closed and pumping continued until the gauge shows that the normal pressure has been reached. The filling valve should then be closed after which the pump is disconnected. Finally make all valves safe and replace dust cap

It is essential that the piston B be fully extended when the unit is being checked for oil level and air pressure. All units are given a proof test during manufacture and no attempt should be made to increase the initial air pressure for which the units were designed, and which is stamped on the instruction plate, without consulting the manufacturers.

VICKERS OLEO-PNEUMATIC CHASSIS

COMPONENT PARTS.

(See Plate 3)

A.—Air Cylinder.
B.—Supporting Ram.
C.—Fork for Do. Fits over axle and connects Radius Rod.
D.—Neck Ring of Gland.
E, G & H.—Packing Rings.
F.—Gland Cap.
I.—Safety Lock.
J.—Gland Nut (Valve).
K.—Needle Valve.
L.—Dust Cap.
M.—Oil Level Plug.
N.—Radius Rod, with swivel fork.
O.—Bracing Cable, with turnbuckle, deadeyes and plates.
P.—Axle, complete with universal joint sleeves, caps and screwdown greasers.

VICKERS OLEO-PNEUMATIC CHASSIS

COMPONENT PARTS OF OLEO CHASSIS

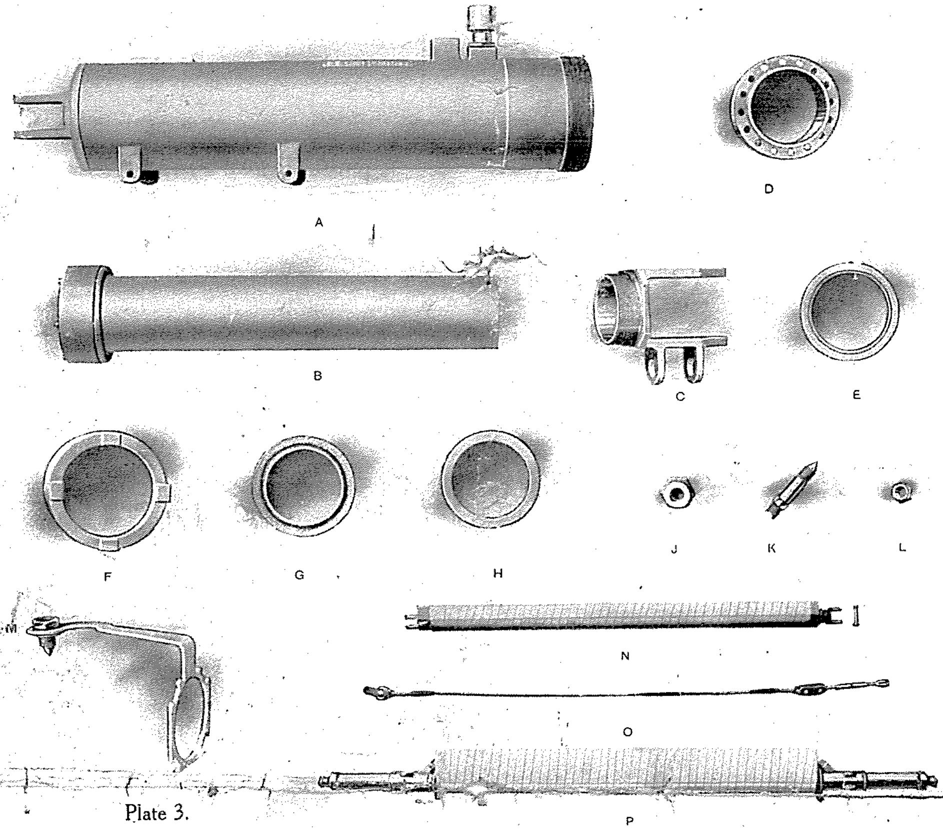


Plate 3.

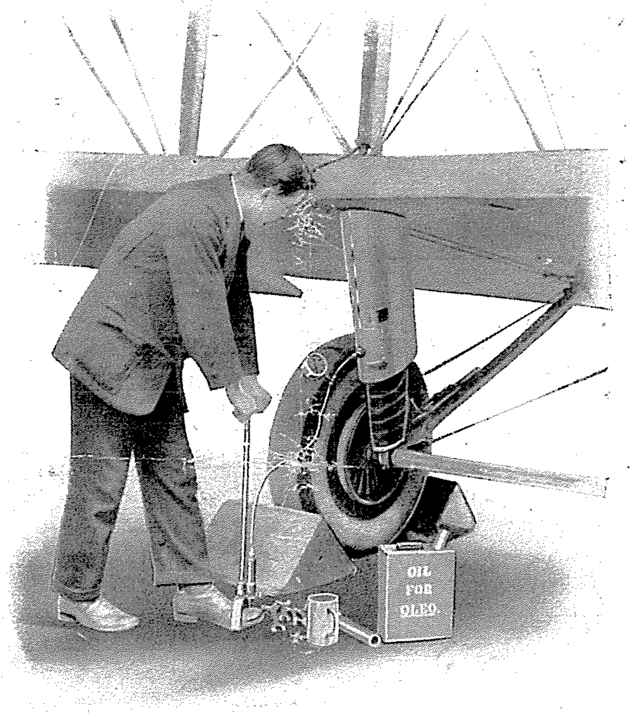


Plate 4.—**Vickers Oleo-Pneumatic Chassis.**

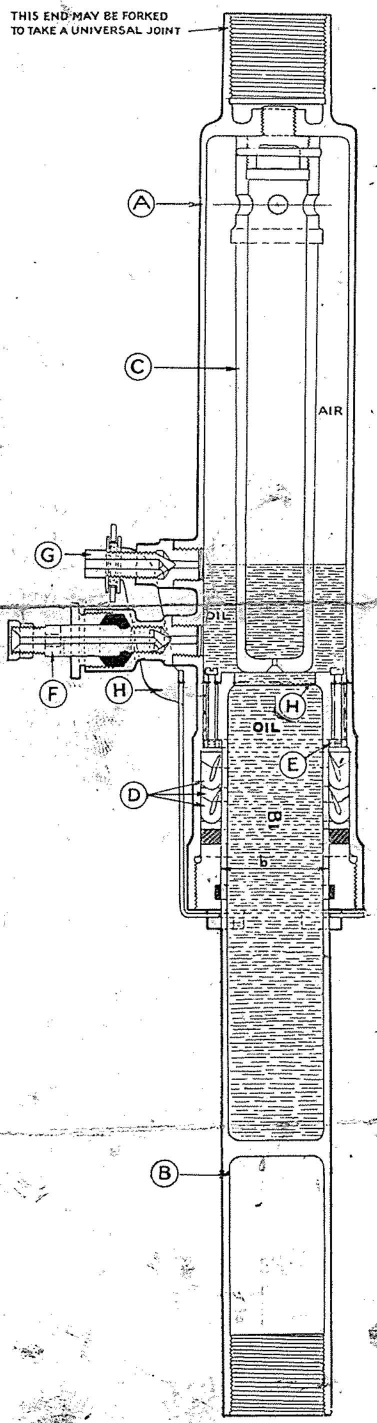
Testing the Air Pressure.

VICKERS OLEO-PNEUMATIC SHOCK ABSORBER

(PATENTED)

GENERAL ARRANGEMENT

(Sectional Diagram)



A.—Air Cylinder machined from High Tensile Steel Bar.

B.—Piston.

C.—Oil Brake Ram.

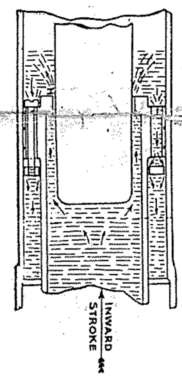
D.—Main gland with self-adjusting packing.

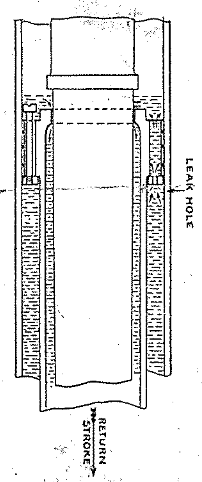
E.—Return dashpot valve.

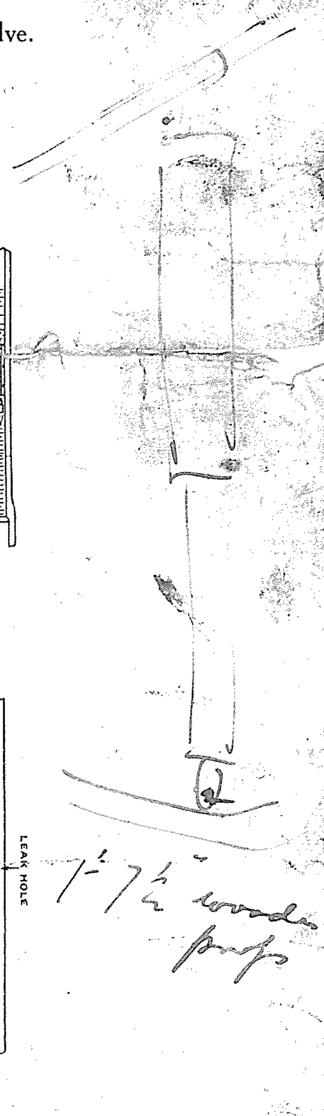
F.—Filling Valve.

G.—Oil Level Valve.

H.—Safety Lock.

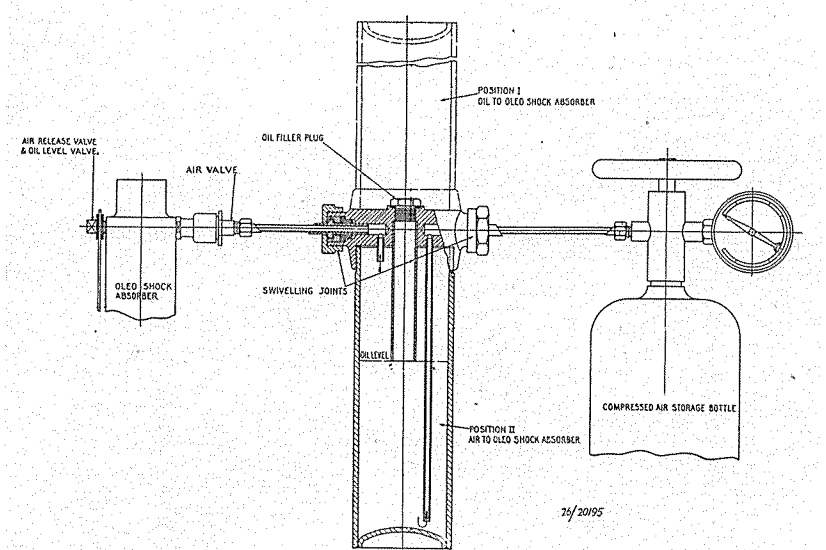






VICKERS OLEO PNEUMATIC SHOCK ABSORBERS

Method of replenishing air and oil by the use of a standard compressed air bottle in lieu of a pump.



Having connected the device as shown in the diagram, a measured quantity of oil is inserted in the swivelling chamber and the plug is secured. By inverting the chamber and opening the Stop Valve on the Air Reservoir the oil in the swivelling chamber will be forced into the shock absorber cylinder ; the air pressure can then be raised to the desired figure, after which the air valve on the shock absorber may be screwed home and the gear dismantled.

VICKERS HIGH PRESSURE AIR PUMP

Single Acting
Single Stage
A 599

This pump has been specially developed for charging the reservoirs of Oleo Pneumatic Shock Absorber Units, and can be used for pressures up to 800 lbs. per square inch.

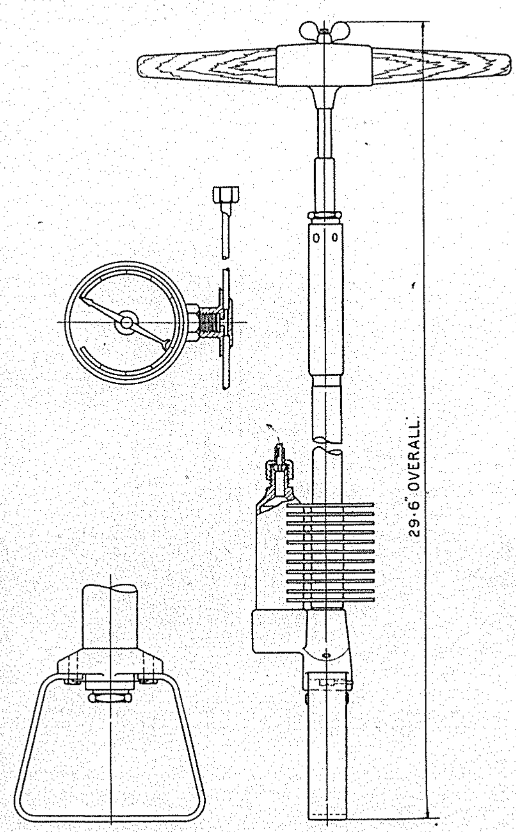
It is very compact and relatively light, and can be carried on aircraft for emergency use.

The delivery valve is of Immaculate Steel (Rustless) hardened and ground.

The piston packing is of special design and can be adjusted for wear by a wing nut on handle.

The body of the pump is air cooled and an oil seal is fitted above delivery valve.

Lubrication of the piston is carried out by compelling the entering air to pass through an oil-saturated cotton wick.



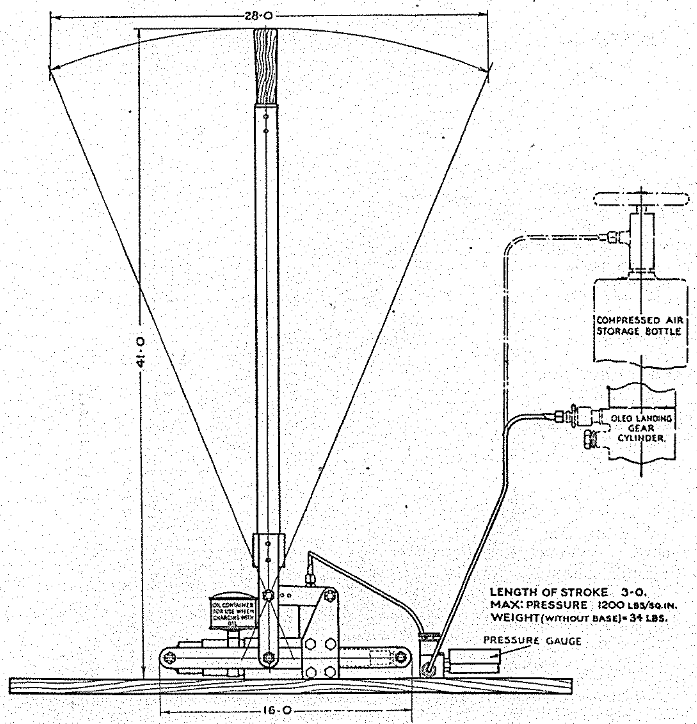
The pump can also be used to inject small quantities of oil which are poured into the barrel after the plunger has been withdrawn.

A connecting pipe and pressure gauge are supplied.

WEIGHT.—6 lbs. complete.

VICKERS HIGH PRESSURE AIR PUMP

Two Stage (Aerodrome Type) A 219



This pump is for use in connection with the air and oil replenishment of Oleo Pneumatic Shock Absorbers and is for aerodrome use.

The compression is carried out in two stages which gives high efficiency and enables air pressures up to 1,200 lbs. per square inch to be easily obtained.

The whole unit is mounted on a wood base which also carries the pressure gauge. The operating lever is conveniently placed for use by one or two mechanics.

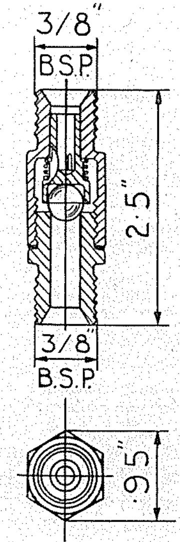
The valves are of Vickers Immaculate Steel (Rustless), hardened and ground, and can be readily removed for inspection.

WEIGHT.—34 lbs. without base.

VICKERS $\frac{3}{8}''$ NON-RETURN VALVE

FOR COMPRESSED AIR MAINS

A 608



This non-return Valve should be inserted in the Pipe Line between the Hand Air Compressor A594 (see page 68) and the Air Reservoir as an additional safeguard against loss of air.

VICKERS DUPLEX AIR COMPRESSOR

TO GIVE PRESSURES UP TO 200 LBS. PER SQ. INCH FOR ENGINE STARTING

A 594

The difficulties and uncertainties encountered in starting the average aero engine by direct cranking, are too well known to need elaboration. The trend towards high powers and the inaccessibility of some engines, adds to these difficulties.

Starting by means of compressed carburetted air is a great advance over the earlier method and the use of a motor driven air compressor (ground equipment) makes engine starting the certainty it should be.

This essential ground equipment is not always available in the case of forced landings, and in any case, it is advisable to have the aircraft so equipped that it is independent of outside aid, provided this can be done for a reasonable addition of weight.

The Vickers Hand Air Compressor takes over the duties of the motor pump and weighs 9¾ lbs. It is a very compact unit and can be mounted in any position convenient for operation.

The disposition of the twin cylinders and the mechanical action adopted enables the load on the hand lever to be kept within reasonable limits at all times.

The pump throughout is made from light alloy castings and forgings and has steel cylinder liners so that the initial high efficiency may be maintained.

In order to reduce the number of parts and to secure absolute reliability in action, the usual inlet valves have been replaced by ports cut in the cylinder barrel. These ports are uncovered by the piston at the end of the suction stroke.

The only valves necessary therefore, are the discharge valves which are of the duplex ball type and are mounted in the discharge branch of the end covers.

The provision of two discharge valves per cylinder independently operated, in series, makes for absolute reliability of action.

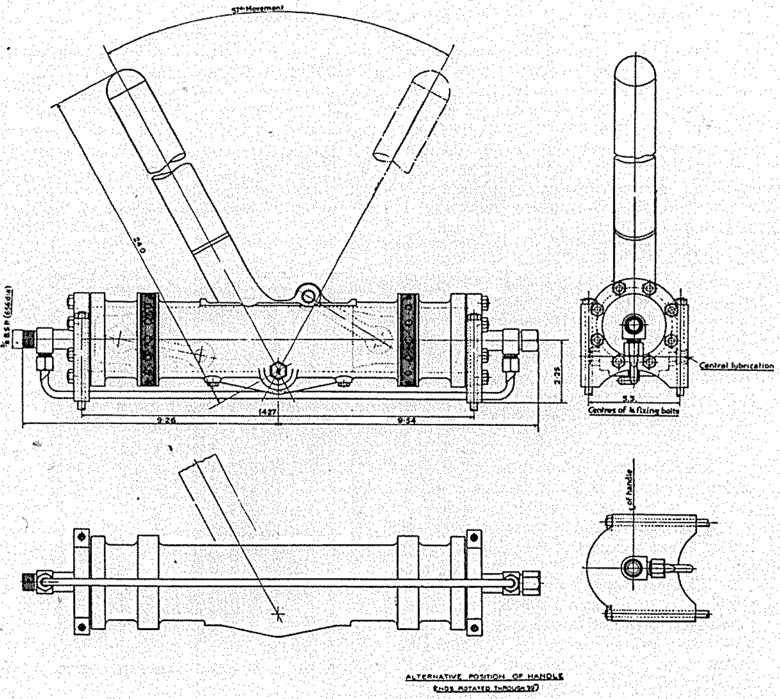
The lubrication of all the working parts takes place through the main axis bolt, the crank and connecting rods being suitably drilled.

The inlet ports are protected by gauze covers and the exposed working parts are protected by a Willesden canvas cover.

This Pump is guaranteed to raise the air pressure in a standard air bottle of 390 cubic inches, from 0 to 200 lbs. per sq. inch, in 10 minutes, when operated by two men, working alternately.

When only one man operates the pump, the times are as follows :—100 lbs. per sq. inch in 3 to 4 minutes, and 200 lbs. per sq. inch in 12 to 14 minutes.

An engine of approximately 500 horsepower usually can be started when the pressure reaches 75 lbs. per square inch ; thus, 4 to 5 starts should be obtainable with one charge of the air bottle when charged to 200 lbs. per sq. inch.



VICKERS-POTTS OIL COOLER

FOR AIRCRAFT

(Oil Cooler, Standard, Air Ministry Type A 325)

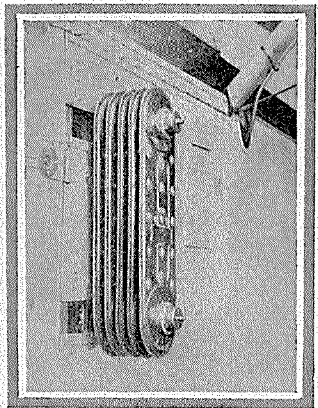
(ENGLISH PATENT NO. 285,524 (25040/26)

(FOREIGN PATENTS APPLIED FOR)

1. PURPOSE.

Owing to the high powers developed by modern aero engines and the necessity for cowling as much of the engine as possible, the heat which is imparted to the lubricating oil in its journey through the engine cannot be readily radiated from the crankcase. It then becomes necessary to adopt other means for reducing the temperature of the oil before it is returned to the engine. The best method of doing this is to insert a special oil cooler in the pipe line between the engine scavenger pump and the tank. The VICKERS-POTTS OIL COOLER, having comparatively low aerodynamic resistance, can be placed in the slipstream of the air screw or other convenient place. It is used largely in aircraft for the British Royal Air Force, and in foreign countries.

2. CONSTRUCTION.



The Vickers-Potts Oil Cooler consists of a series of hollow fins threaded on two tubes and arranged for series flow, *i.e.*, through each fin or element in turn. A by-pass valve is inserted between the inlet and outlet pipes, to provide an alternative path for the oil when starting from cold, and to prevent excessive pressures on the fins.

The internal construction of the cooling element is such that the oil is exposed in thin layers to the cold surface of the fins; also, the spacers between the fins break up the flow of the oil by eddying, and thus cause rapid transfer of heat. The external space between the fins, which space is increased by the local flattening of the latter, enables the air to pass freely between them without causing undue drag (air resistance). (See H.P. drag figures, para 7.)

The general arrangement, with dimensions, of Vickers-Potts Oil Cooler is shewn on pages 72 and 73.

3. CAPACITY.

The cooling surface per fin is approximately 145 square inches (930 square cms.), and the reduction of temperature of the oil in passing through one fin will be from 1° to 6° C., according to the rate of flow and the temperature of the air.

The Vickers-Potts Oil Cooler can be supplied with from 3 to 13 fins, to suit all engines from 250 to 800 horse-power, working under various conditions, and to permit of the oil being returned to the engine at a temperature of 70° C. Larger engines may have two coolers in series.

The rate of flow of oil through cooler at various pressures and temperatures is shown on page 78.

The most suitable unit for any installation can be indicated and quoted for on receipt of the following particulars:—

(*a*) Horse-power of engine.
(*b*) Extent to which engine is enclosed by cowling.
(*c*) Quantity of oil delivered by pump in gallons per minute or litres per minute.
(*d*) Velocity of air over cooler.

4. INSTALLATION.

The unit may be mounted in any suitable position near the engine, and can be arranged so that the air flow is along either the major or minor axis of the fins.

The installation of cooler on an aircraft fitted with "Jupiter" air-cooled engine is illustrated on page 70.

5. TESTS.

Each Vickers-Potts Oil Cooler is subjected on completion to an internal test pressure of 25 lbs. per square inch (1·75 kgms. per square cm.).

6. WEIGHTS.

Weights, complete—	3 fin unit	8·5 lbs.	(3·85 kgs.)
	5 ,, ,,	9·75 ,,	(4·4 ,,)
	7 ,, ,,	11·75 ,,	(5·3 ,,)
	9 ,, ,,	14 ,,	(6·35 ,,)
	11 ,, ,,	16·5 ,,	(7·5 ,,)
	13 ,, ,,	20·25 ,,	(9·6 ,,)

7. AIR RESISTANCE.

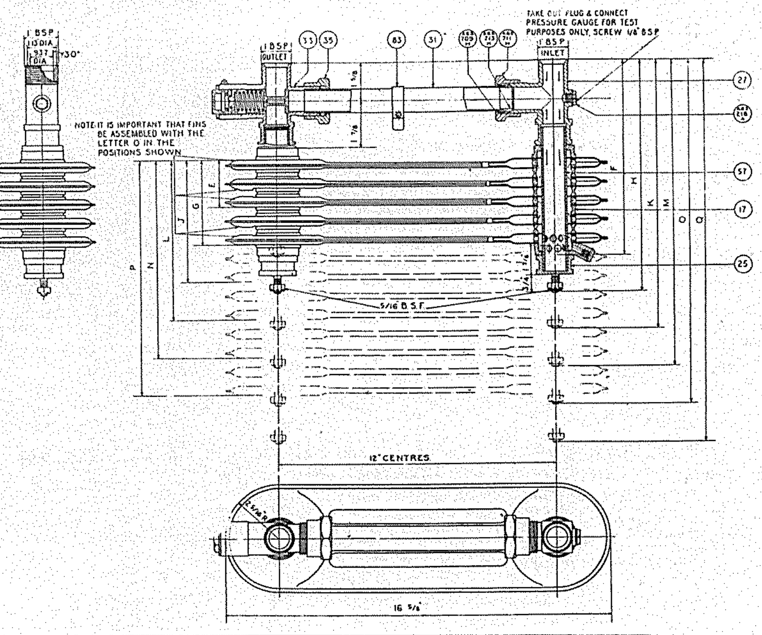
Drag of Vickers-Potts Oil Cooler at 100 m.p.h., with air flow along major axis of fins, expressed as horse-power:—

5 fin unit,	1·16 h.p.
7 ,, ,,	1·46 ,,
9 ,, ,,	1·79 ,,
11 ,, ,,	2·1 ,,

VICKERS-POTTS OIL COOLER

FOR AIRCRAFT

(Oil Cooler, Standard, Air Ministry Type A 325)

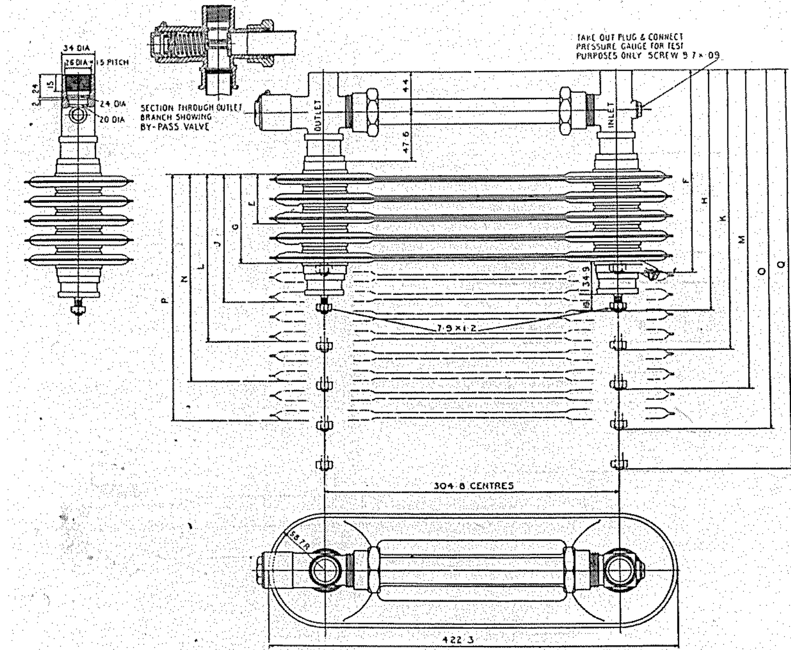


Mark 3	Oil Cooler with 3 Fins & Relief Valve	Dim. E–1 $\frac{11}{32}$″	Dim. F–8 $\frac{5}{32}$
5	„ „ 5 „ „ „	„ G–3 $\frac{9}{16}$″	„ H–9$\frac{3}{4}$″
7	„ „ 7 „ „ „	„ J–5 $\frac{5}{32}$″	„ K–11 $\frac{11}{32}$″
9	„ „ 9 „ „ „	„ L–6$\frac{3}{4}$″	„ M–12 $\frac{15}{16}$″
11	„ „ 11 „ „ „	„ N–8 $\frac{11}{16}$″	„ O–14 $\frac{17}{32}$″
13	„ „ 13 „ „ „	„ P–9 $\frac{15}{16}$″	„ Q–16$\frac{1}{8}$″

Cooler Tested to 25 lbs. per sq. inch.
Relief Valve set to By-pass at 15 lbs. per sq. inch.

VICKERS-POTTS OIL COOLER—*continued*

METRIC DIMENSIONS.

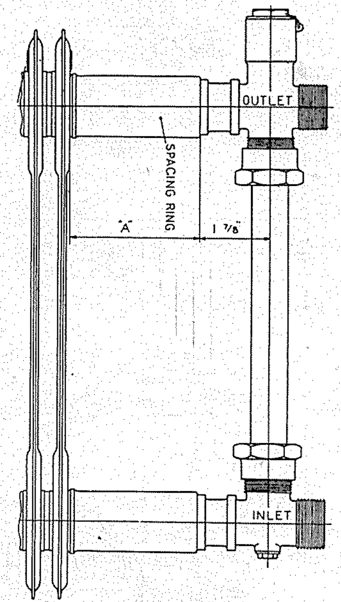


Mark 3	Oil Cooler with 3 Fins & Relief Valve	Dim. E–50	Dim. F–207·1
5	„ „ 5 „ „ „	„ G–90·5	„ H–247·6
7	„ „ 7 „ „ „	„ J–131	„ K–288·1
9	„ „ 9 „ „ „	„ L–171·4	„ M–328·6
11	„ „ 11 „ „ „	„ N–220·6	„ O–369
13	„ „ 13 „ „ „	„ P–252·4	„ Q–409·5

Cooler Tested to 1·76 kgs./cm^2
Relief Valve set to By-pass at 1·05 kgs./cm^2.

VICKERS-POTTS OIL COOLER

FITTED WITH SPECIAL SPACING RINGS A325.



A325 Mark No.	Length Mark of Tube	No. of Fins	Spacing Ring required
3/5	5	3	Pt. 89–A325
3/7	7	3	Pt. 93–A325
5/7	7	5	Pt. 89–A325
5/9	9	5	Pt. 93–A325
7/9	9	7	Pt. 89–A325
7/11	11	7	Pt. 93–A325
9/11	11	9	Pt. 89–A325
9/13	13	9	Pt. 93–A325

Description	" A " Dim.	Part No.
2 Element Spacing Ring	$2\frac{1}{8}$"	89–A325
4 Element Spacing Ring	$3\frac{1}{4}$"	93–A325

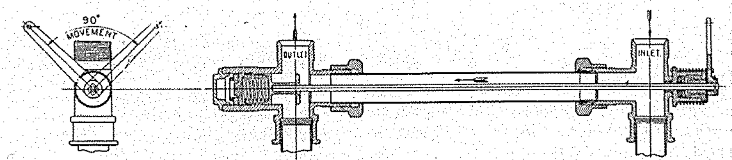
In the mounting of the cooler, occasions sometimes arise in which the inner fins are brought very close to the cowling with a great loss in cooling. To overcome this difficulty coolers can be supplied in which 2 or 4 of the inner fins are replaced by a distance piece.

Existing coolers of standard type can be readily converted by the use of these spacers and longer main tubes.

VICKERS
OIL COOLER VALVE LIFTING GEAR

VARIABLE CONTROL

Scheme "B"



Whilst an oil cooler is an admitted necessity in modern aircraft with high powered engines there are times when it is necessary that it should be short circuited, e.g., when flying at high altitudes and during the initial " warming up " of the engine on the ground. To enable the oil cooler to be cut out at will, two schemes (A and B) have been developed. In scheme " A " (which is adjusted on the ground before flight) the bypass valve is opened by a rod inserted in the cross connecting bypass tube. The amount of valve opening and the consequent relative flow through the cooler and through the bypass is determined by the length of the rod.

In Scheme " B " similar means are provided for opening the bypass valve, but the control can be operated at any time even during flight, the amount of opening being capable of fine control between minimum and maximum.

This method of control is readily adapted to existing coolers.

VICKERS-POTTS OIL COOLER

(Oil Cooler, Standard, Air Ministry Type A 325)

INSTRUCTIONS FOR ASSEMBLING.

This Cooler consists of a number of fins assembled on two parallel tubes, and so arranged that the flow of oil takes place through the fins in series. This series flow is ensured by the special openings in the fins and the manner in which they are assembled. Inspection of the sectional drawing A.325 on page 72 will show that the entering oil passes along the central tube and emerges from a series of holes into the first fin, then along the fin, and at the other end the oil leaves on the opposite side of fin and passes along the second and so on, finally leaving the last fin and passing into the outlet tube. In order to ensure that the fins are correctly assembled on the central tubes and to assist the inspection of the finished article, a letter O is embossed at one end of each fin on the side corresponding to the large opening or transfer port.

If a complete cooler is placed with the central tubes vertical and the inlet and outlet connections on top, and if the fins are examined at the outlet end, the embossed O will appear as follows :—

Top fin	O on top
Second fin	,, ,, bottom
Third	,, ,, top. Mark 3
Fourth	,, ,, bottom
Fifth	,, ,, top. Mark 5
Sixth	,, ,, bottom
Seventh	,, ,, top. Mark 7
Eighth	,, ,, bottom
Ninth	,, ,, top. Mark 9
Tenth	,, ,, bottom
Eleventh	,, ,, top. Mark 11

The correct order of the fins is important. If a fin is incorrectly assembled there will be a serious restriction of the oil flow.

When the fins are assembled on the central tubes, it is important to observe that the duralumin spacers are central before finally tightening the end nuts. When a new group of Fins is about to be assembled, it is advisable to clamp them together with the special steel bolts supplied. The use of these bolts allows of a greater load being applied than could safely be obtained with the light steel tubes, and the parts being thoroughly bedded together will make a good joint on final assembly.

In order to safeguard the fins against excessive oil pressures when starting up on cold oil, a Relief Valve is fitted between the inlet and outlet pipes to bypass the oil when the pressure in the inlet pipe exceeds 15 lbs. per sq. inch (fins are tested to 25 lbs. per sq. inch).

VICKERS-POTTS OIL COOLER—*continued*

(For reference numbers see drawing on page 72).

ASSEMBLY.

The recommended method of assembly is as follows :—

The various components are collected in accordance with Schedule for the size of cooler it is proposed to build. The cap nuts 25 are screwed on the tubes 57 etc., leaving say one or two turns for final tightening and the various fins and spacers are slipped on in the order shown on drawing and finally the inlet and outlet connections 27 and 33 are screwed on, before 33 is brought in line with 27 the by-pass tube 31 should be inserted, the nuts 35 and A.G.S.711-H and collar A.G.S.709-H having previously been assembled in order shown.

The olive A.G.S.713-H is now inserted in the bellmouthed end of tube and the whole is swung into line to engage with 27. The nut A.G.S.711-H is now screwed up and the gland formed between 35 and 33 is packed by coiling several turns of asbestos graphite packing round the tube 31 ; the nut 35 may then be screwed on. (See note re use of special steel bolts).

The Relief Valve operates inside the outlet connection 33 and is supplied set and sealed and does not call for any adjustment.

TESTING.

The only tests necessary on the completion of the cooler are :—

(*a*) Flow Test.

The cooler should be connected to a tank containing Hot Oil which should be allowed to flow freely through the cooler entering at the inlet and the temperature of the fins should increase in turn commencing with the fin furthest from the inlet and outlet connections ; this will prove that there are no restrictions and that the fins are assembled in the correct order.

(*b*) Pressure Test.

The outlet end of cooler should now be closed with the special plug and nut provided and the pressure in the tank supplying the Hot Oil should be increased to 25 lbs. per sq. inch. The exterior of the cooler should be wiped clean and an inspection made for leaks ; any leakage between the fins and spacers can be remedied by tightening nuts 25 after oil pressure has been released. It is unlikely that any faults will be found in the fins as they are tested during manufacture, but should any suffer slight damage they can be made good by soft soldering or the fin can be replaced.

The tag on clip 83 is provided for the final stamp of the inspector.

Should it be necessary at any time to add two elements to an existing cooler it will be necessary to change the central tubes to the next size and to add the additional fins with the indicating O in the positions called for on table. Each additional fin will require two spacers 17.

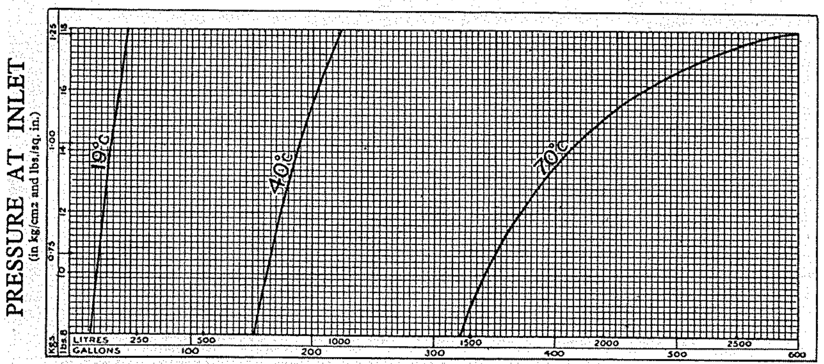
Should it be necessary at any time to verify the freedom of the relief valve this can be done by unscrewing the plug A.G.S.216-A. on 27 and inserting a length of ¼″ rod when the valve can be eased from its seat.

VICKERS-POTTS OIL COOLER

(Oil Cooler, Standard, Air Ministry Type A 325)

Flow Test through 5 Fins in Series

Oil (Castrol R) at various temperatures and sustained inlet pressures

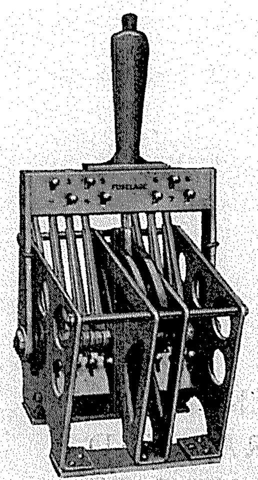


FLOW PER HOUR

(in Litres and Gallons)

VICKERS CENTRALIZED BOMB RELEASE CONTROL

(English Patent No. 300,218)



VICKERS CENTRALIZED BOMB RELEASE CONTROL

(English Patent No. 300,218)

The congestion in the pilot's and observer's cockpits of modern aircraft, due to the installation of ever-increasing quantities of various types of gear, has made it imperative to produce a special type of bomb release control.

The new type of Vickers Centralized Control embodies many novel and distinctly advantageous features over the older patterns, in that :—

(1) It is very compact and enables any number of Bomb Cables to be localised in a minimum of space, and the bombs to be released by means of one control handle.

(2) The bomber is enabled to select and release any single bomb, or alternatively any number of bombs in salvo, without unduly diverting his attention from his sighting apparatus.

(3) The release " pull " is reduced to a minimum.

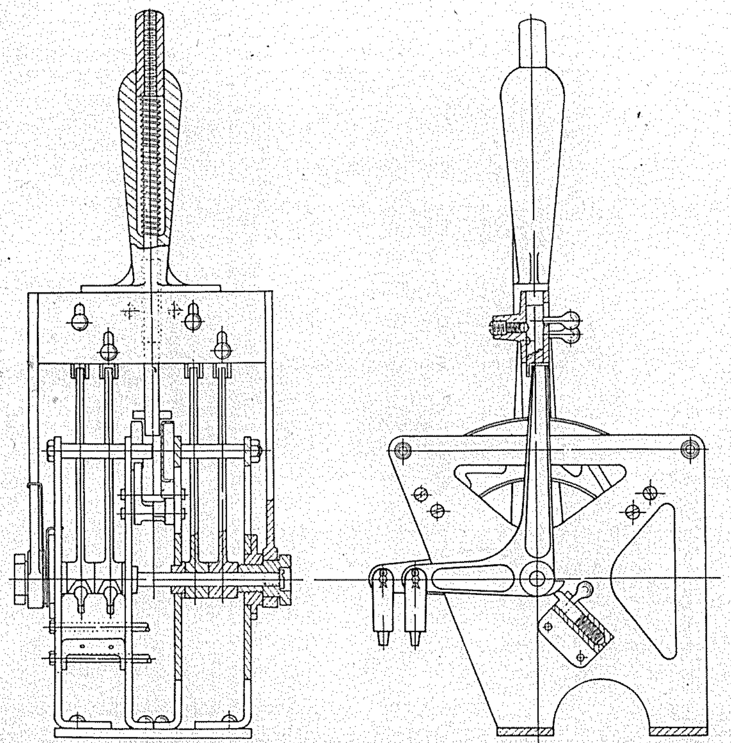
(4) It is so designed that the bomber is enabled readily to ascertain the number and types of bombs already released.

The following combinations are in production, and others can be readily made up to customer's requirements :—

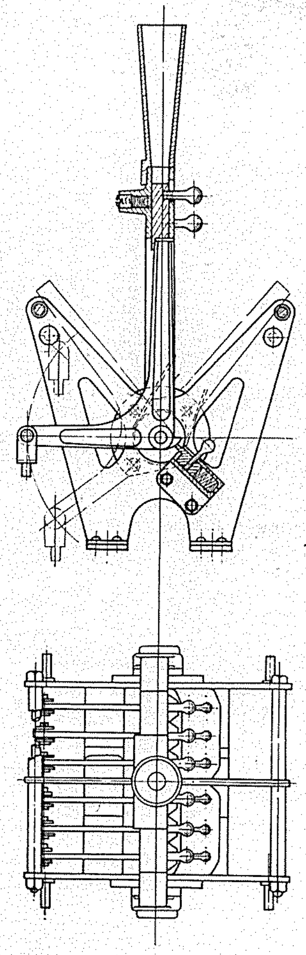
Ref. No.	Description.	Weight.
A.615	Four-Way	2 lbs. 8 ozs.
A.389	Six- „	3 „
A.402	Eight- „	3 „ 7 „

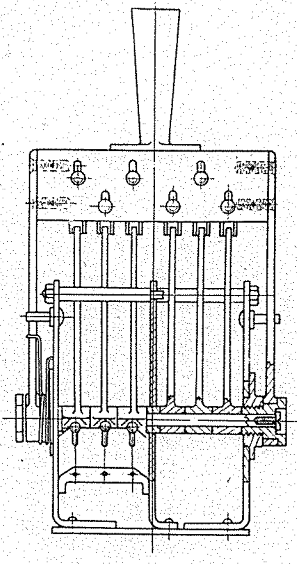
The " Light Release " Control, included in the following, is for dropping bombs from the " Light Series " Rack, which carries four practice bombs or, alternatively, 20 lb. high explosive bombs.

Ref. No.	Description.	Weight.
A.602	Four-Way and Light Release	3 lbs. 14 ozs.
A.388	Six- „ „ „ „	3 „ 6 „
A.366	Seven-„ „ „ „	4 „ 9 „



Vickers Centralized Bomb Release Control (*4-way Type, with " Light Release "—A.602*)





Vickers' Centralized Bomb Release Control
(6-way Type—A.389)

Quotations will be submitted on receipt of enquiries, which should mention the types and quantities required and the type of bomb carrier in use.

VICKERS

STREAMLINE WIRES

AND

SWAGED TIERODS

WITH FORKED ENDS

Specialising in the production of streamline wires and swaged tierods, we can supply these in any specified lengths, dimensions and other conditions laid down by the British Engineering Standards Association. Special wires will be quoted for upon receipt of full particulars of sizes, lengths, quantities etc., required.

Anti-corrosion Coating. All finished wires and fork ends are cadmium coated by an approved process, coating being no thicker than 0.0005 inch.

All wires are marked with Specification and Part Number, together with the approved inspection stamp.

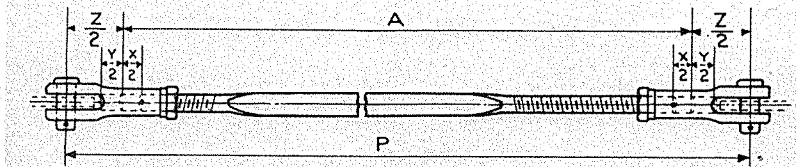
i.e., a 2 B.A. wire 54·5″ long will be marked, 5 W. 3—112/54·5″.

Wires to millimetres sizes having the same sections can be made to order.

[5 W. 3. *January*, 1928.]
(*Cancelling B.S. Specification* 4 W. 3.)

FINISHED STREAMLINE WIRES
(SCREWED)

NOTE.—When ordering finished streamline wires, only the Specification Number, Part Number, and the required Overall Length to the nearest even half inch should be quoted. (If the calculated length " A " (see sketch) be not an even inch or half-inch, then the nearest half-inch above " A " should be quoted).



A = P-Z.
Where P = Calculated Pin Centres.
and Z = Figure shewn in Table below for the respective sizes of Wire.

VALUE Z.
For Plain Forks to B.S. Specification 2 SP. 3.

Size of Wire	Z	Size of Wire	Z
	in.		in.
4 B.A.	1·07	$\frac{11}{32}$ in. B.S.F.	2·09
2 B.A.	1·31	$\frac{3}{8}$ in. ,,	2·33
$\frac{7}{32}$ in. B.S.F.	1·58	$\frac{13}{32}$ in. ,,	2·67
$\frac{1}{4}$ in. ,,	1·55	$\frac{7}{16}$ in. ,,	2·81
$\frac{9}{32}$ in. ,,	1·85	$\frac{15}{32}$ in. ,,	3·00
$\frac{5}{16}$ in. ,,	2·04	$\frac{1}{2}$ in. ,,	3·12

The Figures for the Maximum " Outward " and " Inward " adjustment (X and Y), which correspond with the above values for Z, are given in the following Table :—

Type of End Fitting	Adjustment	4 B.A.	2 B.A.	$\frac{7}{32}$ in. B.S.F.	$\frac{1}{4}$ in. B.S.F.	$\frac{9}{32}$ in. B.S.F.	$\frac{5}{16}$ in. B.S.F.	$\frac{11}{32}$ in. B.S.F.	$\frac{3}{8}$ in. B.S.F.	$\frac{13}{32}$ in. B.S.F.	$\frac{7}{16}$ in. B.S.F.	$\frac{15}{32}$ in. B.S.F.	$\frac{1}{2}$ in. B.S.F.
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Plain Forks to B.S. Specification 2 SP. 3	X (=Y)	0·53	0·59	0·72	0·65	0·75	0·76	0·81	0·87	0·93	0·99	1·00	0·98

[5 W. 3. *January*, 1928.]
(*Cancelling B.S. Specification* 4 W. 3.)

STREAMLINE WIRES—*contd.*

EXAMPLES :—

(1) *Suppose that for a $\frac{1}{4}$ inch wire the calculated length " A " = 61·1 inches.*

The finished length " A " to the nearest half-inch above is 61·5 inches, and should be ordered thus :—

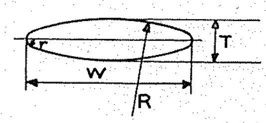
" B.S. Specification 5 W. 3, Part No. 314, ' A ' 61·5 in."

(2) *Suppose that for a $\frac{5}{16}$ inch wire A = 52·0 inches.*

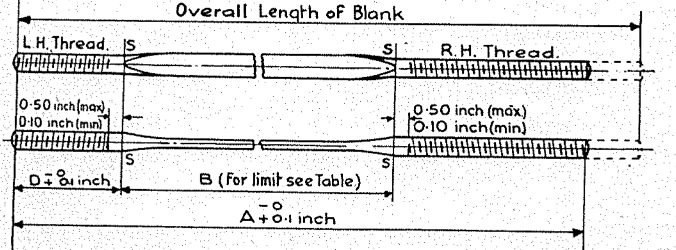
As this length is not between an even inch or half-inch it may be quoted as the finished length thus :—

" B.S. Specification 5 W. 3, Part No. 512, ' A ' 52·0 in."

[**5 W. 3.** *January,* 1928.]
(Cancelling B.S. Specification 4 W. 3.)



STREAMLINE WIRES—*contd*



NOTE.—The term "shoulder" is used to define the point S at which the section of the round end begins to change to the oval shape of the blade.

SCHEDULE.

Size: 4 B.A. Ultimate Tensile Strength: 1,050 lb. Thread: No. 4 B.A. D = 1·5 inches.
Oval: W = 0·192 inch (min.); T = 0·048 inch (min.); R = 0·288 inch; r = 0·011 inch.
Area of Oval = 0·0071 sq. inch (min.); 0·0085 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1	3·5	10·5	7	10·5	28	111·5	118·5	115	118·5
2	7·5 } +0 —·25	14·5	11	14·5	29	115·5 } +0 —2·0	122·5	119	122·5
3	11·5	18·5	15	18·5	30	119·5	126·5	123	126·5
4	15·5	22·5	19	22·5	31	123·5	130·5	127	130·5
5	19·5 } +0 —·5	26·5	23	26·5	32	127·5 } +0 —2·0	134·5	131	134·5
6	23·5	30·5	27	30·5	33	131·5	138·5	135	138·5
7	27·5	34·5	31	34·5	34	135·5	142·5	139	142·5
8	31·5 } +0 —·75	38·5	35	38·5	35	139·5 } +0 —2·0	146·5	143	146·5
9	35·5	42·5	39	42·5	36	143·5	150·5	147	150·5
10	39·5	46·5	43	46·5	37	147·5	154·5	151	154·5
11	43·5 } +0 —1·0	50·5	47	50·5	38	151·5 } +0 —2·0	158·5	155	158·5
12	47·5	54·5	51	54·5	39	155·5	162·5	159	162·5
13	51·5	58·5	55	58·5	40	159·5	166·5	163	166·5
14	55·5 } +0 —1·25	62·5	59	62·5	41	163·5 } +0 —2·0	170·5	167	170·5
15	59·5	66·5	63	66·5	42	167·5	174·5	171	174·5
16	63·5	70·5	67	70·5	43	171·5	178·5	175	178·5
17	67·5 } +0 —1·5	74·5	71	74·5	44	175·5 } +0 —2·0	182·5	179	182·5
18	71·5	78·5	75	78·5	45	179·5	186·5	183	186·5
19	75·5	82·5	79	82·5	46	183·5	190·5	187	190·5
20	79·5 } +0 —1·75	86·5	83	86·5	47	187·5 } +0 —2·0	194·5	191	194·5
21	83·5	90·5	87	90·5	48	191·5	198·5	195	198·5
22	87·5	94·5	91	94·5	49	195·5	202·5	199	202·5
23	91·5 } +0 —2·0	98·5	95	98·5	50	199·5 } +0 —2·0	206·5	203	206·5
24	95·5	102·5	99	102·5	51	203·5	210·5	207	210·5
25	99·5	106·5	103	106·5	52	207·5	214·5	211	214·5
26	103·5 } +0 —2·0	110·5	107	110·5	53	211·5 } +0 —2·0	218·5	215	218·5
27	107·5	114·5	111	114·5	54	215·5	222·5	219	222·5

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STREAMLINE WIRES—*contd.*

[**5 W. 3.** *January,* 1928.]
(Cancelling B.S. Specification 4 W. 3.)

Size: 2 B.A.
Ultimate Tensile Strength: 1,900 lb.
Thread: 2 B.A. D = 1·6 inches.
Oval: W = 0·256 inch (min.); T = 0·064 inch (min.); R = 0.384 inch; r = 0·014 inch.
Area of Oval = 0·0126 sq. inch (min.); 0·0142 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
101	3·5	10·5	7	10·5	128	111·5	118·5	115	118·5
102	7·5 } +0 —·25	14·5	11	14·5	129	115·5 } +0 —2·0	122·5	119	122·5
103	11·5	18·5	15	18·5	130	119·5	126·5	123	126·5
104	15·5	22·5	19	22·5	131	123·5	130·5	127	130·5
105	19·5 } +0 —·5	26·5	23	26·5	132	127·5 } +0 —2·0	134·5	131	134·5
106	23·5	30·5	27	30·5	133	131·5	138·5	135	138·5
107	27·5	34·5	31	34·5	134	135·5	142·5	139	142·5
108	31·5 } +0 —·75	38·5	35	38·5	135	139·5 } +0 —2·0	146·5	143	146·5
109	35·5	42·5	39	42·5	136	143·5	150·5	147	150·5
110	39·5	46·5	43	46·5	137	147·5	154·5	151	154·5
111	43·5 } +0 —1·0	50·5	47	50·5	138	151·5 } +0 —2·0	158·5	155	158·5
112	47·5	54·5	51	54·5	139	155·5	162·5	159	162·5
113	51·5	58·5	55	58·5	140	159·5	166·5	163	166·5
114	55·5 } +0 —1·25	62·5	59	62·5	141	163·5 } +0 —2·0	170·5	167	170·5
115	59·5	66·5	63	66·5	142	167·5	174·5	171	174·5
116	63·5	70·5	67	70·5	143	171·5	178·5	175	178·5
117	67·5 } +0 —1·5	74·5	71	74·5	144	175·5 } +0 —2·0	182·5	179	182·5
118	71·5	78·5	75	78·5	145	179·5	186·5	183	186·5
119	75·5	82·5	79	82·5	146	183·5	190·5	187	190·5
120	79·5 } +0 —1·75	86·5	83	86·5	147	187·5 } +0 —2·0	194·5	191	194·5
121	83·5	90·5	87	90·5	148	191·5	198·5	195	198·5
122	87·5	94·5	91	94·5	149	195·5	202·5	199	202·5
123	91·5 } +0 —2·0	98·5	95	98·5	150	199·5 } +0 —2·0	206·5	203	206·5
124	95·5	102·5	99	102·5	151	203·5	210·5	207	210·5
125	99·5	106·5	103	106·5	152	207·5	214·5	211	214·5
126	103·5 } +0 —2·0	110·5	107	110·5	153	211·5 } +0 —2·0	218·5	215	218·5
127	107·5	114·5	111	114·5	154	215·5	222·5	219	222·5

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(Cancelling B.S. Specification 4 W. 3.)

STREAMLINE WIRES—*contd.*

Size : $\frac{7}{32}$ inch.

Ultimate Tensile Strength : 2,600 lb.

Thread : $\frac{7}{32}$ inch, B.S.F. D = 1·8 inches.

Oval : W = 0·301 inch (min.) ; T = 0·075 inch (min.) ; R = 0·451 inch ; r = 0·017 inch.

Area of Oval = 0·0174 sq. inch (min.); 0·0191 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
201	3·5	11	7·5	11	228	111·5	119	115·5	119
202	7·5 } +0 −·25	15	11·5	15	229	115·5 } +0 −2·0	123	119·5	123
203	11·5	19	15·5	19	230	119·5	127	123·5	127
204	15·5	23	19·5	23	231	123·5	131	127·5	131
205	19·5 } +0 −·5	27	23·5	27	232	127·5 } +0 −2·0	135	131·5	135
206	23·5	31	27·5	31	233	131·5	139	135·5	139
207	27·5	35	31·5	35	234	135·5	143	139·5	143
208	31·5 } +0 −·75	39	35·5	39	235	139·5 } +0 −2·0	147	143·5	147
209	35·5	43	39·5	43	236	143·5	151	147·5	151
210	39·5	47	43·5	47	237	147·5	155	151·5	155
211	43·5 } +0 −1·0	51	47·5	51	238	151·5 } +0 −2·0	159	155·5	159
212	47·5	55	51·5	55	239	155·5	163	159·5	163
213	51·5	59	55·5	59	240	159·5	167	163·5	167
214	55·5 } +0 −1·25	63	59·5	63	241	163·5 } +0 −2·0	171	167·5	171
215	59·5	67	63·5	67	242	167·5	175	171·5	175
216	63·5	71	67·5	71	243	171·5	179	175·5	179
217	67·5 } +0 −1·5	75	71·5	75	244	175·5 } +0 −2·0	183	179·5	183
218	71·5	79	75·5	79	245	179·5	187	183·5	187
219	75·5	83	79·5	83	246	183·5	191	187·5	191
220	79·5 } +0 −1·75	87	83·5	87	247	187·5 } +0 −2·0	195	191·5	195
221	83·5	91	87·5	91	248	191·5	199	195·5	199
222	87·5	95	91·5	95	249	195·5	203	199·5	203
223	91·5 } +0 −2·0	99	95·5	99	250	199·5 } +0 −2·0	207	203·5	207
224	95·5	103	99·5	103	251	203·5	211	207·5	211
225	99·5	107	103·5	107	252	207·5	215	211·5	215
226	103·5 } +0 −2·0	111	107·5	111	253	211·5 } +0 −2·0	219	215·5	219
227	107·5	115	111·5	115	254	215·5	223	219·5	223

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STREAMLINE WIRES—*contd.*

(Cancelling B.S. Specification 4 W. 3.)

Size : $\frac{1}{4}$ inch.

Ultimate Tensile Strength : 3,450 lb.

Thread : $\frac{1}{4}$ inch, B.S.F. D = 1·8 inches.

Oval : W = 0·348 inch (min.) ; T = 0·087 inch (min.) ; R = 0·522 inch ; r = 0·019 inch.

Area of Oval = 0·0233 sq. inch (min.) ; 0·0250 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
301	3·5	11	7·5	11	328	111·5	119	115·5	119
302	7·5 } +0 −·25	15	11·5	15	329	115·5 } +0 −2·0	123	119·5	123
303	11·5	19	15·5	19	330	119·5	127	123·5	127
304	15·5	23	19·5	23	331	123·5	131	127·5	131
305	19·5 } +0 −·5	27	23·5	27	332	127·5 } +0 −2·0	135	131·5	135
306	23·5	31	27·5	31	333	131·5	139	135·5	139
307	27·5	35	31·5	35	334	135·5	143	139·5	143
308	31·5 } +0 −·75	39	35·5	39	335	139·5 } +0 −2·0	147	143·5	147
309	35·5	43	39·5	43	336	143·5	151	147·5	151
310	39·5	47	43·5	47	337	147·5	155	151·5	155
311	43·5 } +0 −1·0	51	47·5	51	338	151·5 } +0 −2·0	159	155·5	159
312	47·5	55	51·5	55	339	155·5	163	159·5	163
313	51·5	59	55·5	59	340	159·5	167	163·5	167
314	55·5 } +0 −1·25	63	59·5	63	341	163·5 } +0 −2·0	171	167·5	171
315	59·5	67	63·5	67	342	167·5	175	171·5	175
316	63·5	71	67·5	71	343	171·5	179	175·5	179
317	67·5 } +0 −1·5	75	71·5	75	344	175·5 } +0 −2·0	183	179·5	183
318	71·5	79	75·5	79	345	179·5	187	183·5	187
319	75·5	83	79·5	83	346	183·5	191	187·5	191
320	79·5 } +0 −1·75	87	83·5	87	347	187·5 } +0 −2·0	195	191·5	195
321	83·5	91	87·5	91	348	191·5	199	195·5	199
322	87·5	95	91·5	95	349	195·5	203	199·5	203
323	91·5 } +0 −2·0	99	95·5	99	350	199·5 } +0 −2·0	207	203·5	207
324	95·5	103	99·5	103	351	203·5	211	207·5	211
325	99·5	107	103·5	107	352	207·5	215	211·5	215
326	103·5 } +0 −2·0	111	107·5	111	353	211·5 } +0 −2·0	219	215·5	219
327	107·5	115	111·5	115	354	215·5	223	219·5	223

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STREAMLINE WIRES—*contd.*

Size: $\frac{3}{32}$ inch.
Ultimate Tensile Strength: 4,650 lb.
Thread: $\frac{3}{32}$ inch, B.S.F. D = 1·9 inches.
Oval: W = 0·404 inch (min.); T = 0·101 inch (min.); R = 0·606 inch; r = 0·022 inch.
Area of Oval = 0·0314 sq. inch (min.); 0·0338 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
401	3·5	11·5	8	11·5	428	111·5	119·5	116	119·5
402	7·5 } +0 —·25	15·5	12	15·5	429	115·5 } +0 —2·0	123·5	120	123·5
403	11·5	19·5	16	19·5	430	119·5	127·5	124	127·5
404	15·5	23·5	20	23·5	431	123·5	131·5	128	131·5
405	19·5 } +0 —·5	27·5	24	27·5	432	127·5 } +0 —2·0	135·5	132	135·5
406	23·5	31·5	28	31·5	433	131·5	139·5	136	139·5
407	27·5	35·5	32	35·5	434	135·5	143·5	140	143·5
408	31·5 } +0 —·75	39·5	36	39·5	435	139·5 } +0 —2·0	147·5	144	147·5
409	35·5	43·5	40	43·5	436	143·5	151·5	148	151·5
410	39·5	47·5	44	47·5	437	147·5	155·5	152	155·5
411	43·5 } +0 —1·0	51·5	48	51·5	438	151·5 } +0 —2·0	159·5	156	159·5
412	47·5	55·5	52	55·5	439	155·5	163·5	160	163·5
413	51·5	59·5	56	59·5	440	159·5	167·5	164	167·5
414	55·5 } +0 —1·25	63·5	60	63·5	441	163·5 } +0 —2·0	171·5	168	171·5
415	59·5	67·5	64	67·5	442	167·5	175·5	172	175·5
416	63·5	71·5	68	71·5	443	171·5	179·5	176	179·5
417	67·5 } +0 —1·5	75·5	72	75·5	444	175·5 } +0 —2·0	183·5	180	183·5
418	71·5	79·5	76	79·5	445	179·5	187·5	184	187·5
419	75·5	83·5	80	83·5	446	183·5	191·5	188	191·5
420	79·5 } +0 —1·75	87·5	84	87·5	447	187·5 } +0 —2·0	195·5	192	195·5
421	83·5	91·5	88	91·5	448	191·5	199·5	196	199·5
422	87·5	95·5	92	95·5	449	195·5	203·5	200	203·5
423	91·5 } +0 —2·0	99·5	96	99·5	450	199·5 } +0 —2·0	207·5	204	207·5
424	95·5	103·5	100	103·5	451	203·5	211·5	208	211·5
425	99·5	107·5	104	107·5	452	207·5	215·5	212	215·5
426	103·5 } +0 —2·0	111·5	108	111·5	453	211·5 } +0 —2·0	219·5	216	219·5
427	107·5	115·5	112	115·5	454	215·5	223·5	220	223·5

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Size: $\frac{5}{16}$ inch.
Ultimate Tensile Strength: 5,700 lb.
Thread: $\frac{5}{16}$ inch, B.S.F. D = 2·0 inches.
Oval: W = 0·44 inch (min.); T = 0·11 inch (min.); R = 0·66 inch; r = 0·024 inch.
Area of Oval = 0·0372 sq. inch (min.); 0·0400 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
501	3·5	11·5	8	11·5	528	111·5	119·5	116	119·5
502	7·5 } +0 —·25	15·5	12	15·5	529	115·5 } +0 —2·0	123·5	120	123·5
503	11·5	19·5	16	19·5	530	119·5	127·5	124	127·5
504	15·5	23·5	20	23·5	531	123·5	131·5	128	131·5
505	19·5 } +0 —·5	27·5	24	27·5	532	127·5 } +0 —2·0	135·5	132	135·5
506	23·5	31·5	28	31·5	533	131·5	139·5	136	139·5
507	27·5	35·5	32	35·5	534	135·5	143·5	140	143·5
508	31·5 } +0 —·75	39·5	36	39·5	535	139·5 } +0 —2·0	147·5	144	147·5
509	35·5	43·5	40	43·5	536	143·5	151·5	148	151·5
510	39·5	47·5	44	47·5	537	147·5	155·5	152	155·5
511	43·5 } +0 —1·0	51·5	48	51·5	538	151·5 } +0 —2·0	159·5	156	159·5
512	47·5	55·5	52	55·5	539	155·5	163·5	160	163·5
513	51·5	59·5	56	59·5	540	159·5	167·5	164	167·5
514	55·5 } +0 —1·25	63·5	60	63·5	541	163·5 } +0 —2·0	171·5	168	171·5
515	59·5	67·5	64	67·5	542	167·5	175·5	172	175·5
516	63·5	71·5	68	71·5	543	171·5	179·5	176	179·5
517	67·5 } +0 —1·5	75·5	72	75·5	544	175·5 } +0 —2·0	183·5	180	183·5
518	71·5	79·5	76	79·5	545	179·5	187·5	184	187·5
519	75·5	83·5	80	83·5	546	183·5	191·5	188	191·5
520	79·5 } +0 —1·75	87·5	84	87·5	547	187·5 } +0 —2·0	195·5	192	195·5
521	83·5	91·5	88	91·5	548	191·5	199·5	196	199·5
522	87·5	95·5	92	95·5	549	195·5	203·5	200	203·5
523	91·5 } +0 —2·0	99·5	96	99·5	550	199·5 } +0 —2·0	207·5	204	207·5
524	95·5	103·5	100	103·5	551	203·5	211·5	208	211·5
525	99·5	107·5	104	107·5	552	207·5	215·5	212	215·5
526	103·5 } +0 —2·0	111·5	108	111·5	553	211·5 } +0 —2·0	219·5	216	219·5
527	107·5	115·5	112	115·5	554	215·5	223·5	220	223·5

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[5 W. 3. *January, 1928.* **]**

Cancelling B.S. Specification 4 W. 3.)

STREAMLINE WIRES—*contd.*

Size : 11/32 inch.

Ultimate Tensile Strength : 7,150 lb.

Thread : 11/32 inch, B.S.F. D = 2·1 inches.

Oval : W = 0·496 inch (min.) ; T = 0·124 inch (min.) ; R = 0·744 inch ; r = 0·027 inch.

Area of Oval = 0·0473 sq. inch (min.) ; 0·0508 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
601	3·5 } +0 −·25	11·5	8	11·5	628	111·5 } +0 −2·0	119·5	116	119·5
602	7·5	15·5	12	15·5	629	115·5	123·5	120	123·5
603	11·5	19·5	16	19·5	630	119·5	127·5	124	127·5
604	15·5 } +0 −·5	23·5	20	23·5	631	123·5 } +0 −2·0	131·5	128	131·5
605	19·5	27·5	24	27·5	632	127·5	135·5	132	135·5
606	23·5	31·5	28	31·5	633	131·5	139·5	136	139·5
607	27·5 } +0 −·75	35·5	32	35·5	634	135·5 } +0 −2·0	143·5	140	143·5
608	31·5	39·5	36	39·5	635	139·5	147·5	144	147·5
609	35·5	43·5	40	43·5	636	143·5	151·5	148	151·5
610	39·5 } +0 −1·0	47·5	44	47·5	637	147·5 } +0 −2·0	155·5	152	155·5
611	43·5	51·5	48	51·5	638	151·5	159·5	156	159·5
612	47·5	55·5	52	55·5	639	155·5	163·5	160	163·5
613	51·5 } +0 −1·25	59·5	56	59·5	640	159·5 } +0 −2·0	167·5	164	167·5
614	55·5	63·5	60	63·5	641	163·5	171·5	168	171·5
615	59·5	67·5	64	67·5	642	167·5	175·5	172	175·5
616	63·5 } +0 −1·5	71·5	68	71·5	643	171·5 } +0 −2·0	179·5	176	179·5
617	67·5	75·5	72	75·5	644	175·5	183·5	180	183·5
618	71·5	79·5	76	79·5	645	179·5	187·5	184	187·5
619	75·5 } +0 −1·75	83·5	80	83·5	646	183·5 } +0 −2·0	191·5	188	191·5
620	79·5	87·5	84	87·5	647	187·5	195·5	192	195·5
621	83·5	91·5	88	91·5	648	191·5	199·5	196	199·5
622	87·5 } +0 −2·0	95·5	92	95·5	649	195·5 } +0 −2·0	203·5	200	203·5
623	91·5	99·5	96	99·5	650	199·5	207·5	204	207·5
624	95·5	103·5	100	103·5	651	203·5	211·5	208	211·5
625	99·5 } +0 −2·0	107·5	104	107·5	652	207·5 } +0 −2·0	215·5	212	215·5
626	103·5	111·5	108	111·5	653	211·5	219·5	216	219·5
627	107·5	115·5	112	115·5	654	215·5	223·5	220	223·5

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STREAMLINE WIRES—*contd.*

[5 W. 3. *January, 1928.* **]**

(*Cancelling B.S. Specification* 4 W. 3.)

Size : 3/8 inch.

Ultimate Tensile Strength : 8,500 lb.

Thread : 3/8 inch, B.S.F. D = 2·2 inches.

Oval : W = 0·54 inch (min.) ; T = 0·135 inch (min.) ; R = 0·81 inch ; r = 0·03 inch.

Area of Oval = 0·0561 sq. inch (min.) ; 0·0603 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
701	3·5 } +0 −·25	12	8·5	12	728	111·5 } +0 −2·0	120	116·5	120
702	7·5	16	12·5	16	729	115·5	124	120·5	124
703	11·5	20	16·5	20	730	119·5	128	124·5	128
704	15·5 } +0 −·5	24	20·5	24	731	123·5 } +0 −2·0	132	128·5	132
705	19·5	28	24·5	28	732	127·5	136	132·5	136
706	23·5	32	28·5	32	733	131·5	140	136·5	140
707	27·5 } +0 −·75	36	32·5	36	734	135·5 } +0 −2·0	144	140·5	144
708	31·5	40	36·5	40	735	139·5	148	144·5	148
709	35·5	44	40·5	44	736	143·5	152	148·5	152
710	39·5 } +0 −1·0	48	44·5	48	737	147·5 } +0 −2·0	156	152·5	156
711	43·5	52	48·5	52	738	151·5	160	156·5	160
712	47·5	56	52·5	56	739	155·5	164	160·5	164
713	51·5 } +0 −1·25	60	56·5	60	740	159·5 } +0 −2·0	168	164·5	168
714	55·5	64	60·5	64	741	163·5	172	168·5	172
715	59·5	68	64·5	68	742	167·5	176	172·5	176
716	63·5 } +0 −1·5	72	68·5	72	743	171·5 } +0 −2·0	180	176·5	180
717	67·5	76	72·5	76	744	175·5	184	180·5	184
718	71·5	80	76·5	80	745	179·5	188	184·5	188
719	75·5 } +0 −1·75	84	80·5	84	746	183·5 } +0 −2·0	192	188·5	192
720	79·5	88	84·5	88	747	187·5	196	192·5	196
721	83·5	92	88·5	92	748	191·5	200	196·5	200
722	87·5 } +0 −2·0	96	92·5	96	749	195·5 } +0 −2·0	204	200·5	204
723	91·5	100	96·5	100	750	199·5	208	204·5	208
724	95·5	104	100·5	104	751	203·5	212	208·5	212
725	99·5 } +0 −2·0	108	104·5	108	752	207·5 } +0 −2·0	216	212·5	216
726	103·5	112	108·5	112	753	211·5	220	216·5	220
727	107·5	116	112·5	116	754	215·5	224	220·5	224

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STREAMLINE WIRES—*contd.*

Size : $\frac{13}{32}$ inch.
Ultimate Tensile Strength : 10,250 lb.
Thread : $\frac{13}{32}$ inch, B.S.F. D = 2·3 inches.
Oval : W = 0.596 inch (min.) ; T = 0·149 inch (min.) ; R = 0·894 inch ; r = 0·033 inch.
Area of Oval = 0·0683 sq. inch (min.) ; 0·0734 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
801	3·5	12	8·5	12	828	111·5	120	116·5	120
802	7·5 } +0 −·25	16	12·5	16	829	115·5 } +0 −2·0	124	120·5	124
803	11·5	20	16·5	20	830	119·5	128	124·5	128
804	15·5	24	20·5	24	831	123·5	132	128·5	132
805	19·5 } +0 −·5	28	24·5	28	832	127·5 } +0 −2·0	136	132·5	136
806	23·5	32	28·5	32	833	131·5	140	136·5	140
807	27·5	36	32·5	36	834	135·5	144	140·5	144
808	31·5 } +0 −·75	40	36·5	40	835	139·5 } +0 −2·0	148	144·5	148
809	35·5	44	40·5	44	836	143·5	152	148·5	152
810	39·5	48	44·5	48	837	147·5	156	152·5	156
811	43·5 } +0 −1·0	52	48·5	52	838	151·5 } +0 −2·0	160	156·5	160
812	47·5	56	52·5	56	839	155·5	164	160·5	164
813	51·5	60	56·5	60	840	159·5	168	164·5	168
814	55·5 } +0 −1·25	64	60·5	64	841	163·5 } +0 −2·0	172	168·5	172
815	59·5	68	64·5	68	842	167·5	176	172·5	176
816	63·5	72	68·5	72	843	171·5	180	176·5	180
817	67·5 } +0 −1·5	76	72·5	76	844	175·5 } +0 −2·0	184	180·5	184
818	71·5	80	76·5	80	845	179·5	188	184·5	188
819	75·5	84	80·5	84	846	183·5	192	188·5	192
820	79·5 } +0 −1·75	88	84·5	88	847	187·5 } +0 −2·0	196	192·5	196
821	83·5	92	88·5	92	848	191·5	200	196·5	200
822	87·5	96	92·5	96	849	195·5	204	200·5	204
823	91·5 } +0 −2·0	100	96·5	100	850	199·5 } +0 −2·0	208	204·5	208
824	95·5	104	100·5	104	851	203·5	212	208·5	212
825	99·5	108	104·5	108	852	207·5	216	212·5	216
826	103·5 } +0 −2·0	112	108·5	112	853	211·5 } +0 −2·0	220	216·5	220
827	107·5	116	112·5	116	854	215·5	224	220·5	224

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STREAMLINE WIRES—*contd.*

Size : $\frac{7}{16}$ inch.
Ultimate Tensile Strength : 11,800 lb.
Thread : $\frac{7}{16}$ inch, B.S.F. D = 2·4 inches.
Oval : W = 0·636 inch (min.) ; T = 0·159 inch (min.) ; R = 0·954 inch ; r = 0·035 inch.
Area of Oval = 0·0778 sq. inch (min.) ; 0·0836 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
901	3·5	12·5	9	12·5	928	111·5	120·5	117	120·5
902	7·5 } +0 −·25	16·5	13	16·5	929	115·5 } +0 −2·0	124·5	121	124·5
903	11·5	20·5	17	20·5	930	119·5	128·5	125	128·5
904	15·5	24·5	21	24·5	931	123·5	132·5	129	132·5
905	19·5 } +0 −·5	28·5	25	28·5	932	127·5 } +0 −2·0	136·5	133	136·5
906	23·5	32·5	29	32·5	933	131·5	140·5	137	140·5
907	27·5	36·5	33	36·5	934	135·5	144·5	141	144·5
908	31·5 } +0 −·75	40·5	37	40·5	935	139·5 } +0 −2·0	148·5	145	148·5
909	35·5	44·5	41	44·5	936	143·5	152·5	149	152·5
910	39·5	48·5	45	48·5	937	147·5	156·5	153	156·5
911	43·5 } +0 −1·0	52·5	49	52·5	938	151·5 } +0 −2·0	160·5	157	160·5
912	47·5	56·5	53	56·5	939	155·5	164·5	161	164·5
913	51·5	60·5	57	60·5	940	159·5	168·5	165	168·5
914	55·5 } +0 −1·25	64·5	61	64·5	941	163·5 } +0 −2·0	172·5	169	172·5
915	59·5	68·5	65	68·5	942	167·5	176·5	173	176·5
916	63·5	72·5	69	72·5	943	171·5	180·5	177	180·5
917	67·5 } +0 −1·5	76·5	73	76·5	944	175·5 } +0 −2·0	184·5	181	184·5
918	71·5	80·5	77	80·5	945	179·5	188·5	185	188·5
919	75·5	84·5	81	84·5	946	183·5	192·5	189	192·5
920	79·5 } +0 −1·75	88·5	85	88·5	947	187·5 } +0 −2·0	196·5	193	196·5
921	83·5	92·5	89	92·5	948	191·5	200·5	197	200·5
922	87·5	96·5	93	96·5	949	195·5	204·5	201	204·5
923	91·5 } +0 −2·0	100·5	97	100·5	950	199·5 } +0 −2·0	208·5	205	208·5
924	95·5	104·5	101	104·5	951	203·5	212·5	209	212·5
925	99·5	108·5	105	108·5	952	207·5	216·5	213	216·5
926	103·5 } +0 −2·0	112·5	109	112·5	953	211·5 } +0 −2·0	220·5	217	220·5
927	107·5	116·5	113	116·5	954	215·5	224·5	221	224·5

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[**5 W. 3.** *January*, 1928.]

Cancelling B.S. Specification 4 W. 3.)

STREAMLINE WIRES—*contd.*

Size : $\frac{15}{32}$ inch.

Ultimate Tensile Strength : 13,800 lb.

Thread : $\frac{15}{32}$ inch, B.S.F. D = 2·5 inches.

Oval : W = 0·692 inch (min.) ; T = 0·173 inch (min.) ; R = 1·038 inches ; r = 0·038 inch.

Area of Oval = 0·0921 sq. inch (min.) ; 0·0990 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1001	3·5	12·5	9	12·5	1028	111·5	120·5	117	120·5
1002	7·5 } +0 —·25	16·5	13	16·5	1029	115·5 } +0 —2·0	124·5	121	124·5
1003	11·5	20·5	17	20·5	1030	119·5	128·5	125	128·5
1004	15·5	24·5	21	24·5	1031	123·5	132·5	129	132·5
1005	19·5 } +0 —·5	28·5	25	28·5	1032	127·5 } +0 —2·0	136·5	133	136·5
1006	23·5	32·5	29	32·5	1033	131·5	140·5	137	140·5
1007	27·5	36·5	33	36·5	1034	135·5	144·5	141	144·5
1008	31·5 } +0 —·75	40·5	37	40·5	1035	139·5 } +0 —2·0	148·5	145	148·5
1009	35·5	44·5	41	44·5	1036	143·5	152·5	149	152·5
1010	39·5	48·5	45	48·5	1037	147·5	156·5	153	156·5
1011	43·5 } +0 —1·0	52·5	49	52·5	1038	151·5 } +0 —2·0	160·5	157	160·5
1012	47·5	56·5	53	56·5	1039	155·5	164·5	161	164·5
1013	51·5	60·5	57	60·5	1040	159·5	168·5	165	168·5
1014	55·5 } +0 —1·25	64·5	61	64·5	1041	163·5 } +0 —2·0	172·5	169	172·5
1015	59·5	68·5	65	68·5	1042	167·5	176·5	173	176·5
1016	63·5	72·5	69	72·5	1043	171·5	180·5	177	180·5
1017	67·5 } +0 —1·5	76·5	73	76·5	1044	175·5 } +0 —2·0	184·5	181	184·5
1018	71·5	80·5	77	80·5	1045	179·5	188·5	185	188·5
1019	75·5	84·5	81	84·5	1046	183·5	192·5	189	192·5
1020	79·5 } +0 —1·75	88·5	85	88·5	1047	187·5 } +0 —2·0	196·5	193	196·5
1021	83·5	92·5	89	92·5	1048	191·5	200·5	197	200·5
1022	87·5	96·5	93	96·5	1049	195·5	204·5	201	204·5
1023	91·5 } +0 —2·0	100·5	97	100·5	1050	199·5 } +0 —2·0	208·5	205	208·5
1024	95·5	104·5	101	104·5	1051	203·5	212·5	209	212·5
1025	99·5	108·5	105	108·5	1052	207·5	216·5	213	216·5
1026	103·5 } +0 —2·0	112·5	109	112·5	1053	211·5 } +0 —2·0	220·5	217	220·5
1027	107·5	116·5	113	116·5	1054	215·5	224·5	221	224·5

STREAMLINE WIRES—*contd.*

[**5 W. 3.** *January*, 1928.]

(*Cancelling B.S. Specification* 4 W. 3.)

Size : $\frac{1}{2}$ inch.

Ultimate Tensile Strength : 15,500 lb.

Thread : $\frac{1}{2}$ inch, B.S.F. D = 2·5 inches.

Oval : W = 0·732 inch (min.) ; T = 0·183 inch (min.) ; R = 1·098 inches ; r = 0·04 inch.

Area of Oval = 0·1030 sq. inch (min.) ; 0·1107 sq. inch (max.).

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1101	3·5	12·5	9	12·5	1128	111·5	120·5	117	120·5
1102	7·5 } +0 —·25	16·5	13	16·5	1129	115·5 } +0 —2·0	124·5	121	124·5
1103	11·5	20·5	17	20·5	1130	119·5	128·5	125	128·5
1104	15·5	24·5	21	24·5	1131	123·5	132·5	129	132·5
1105	19·5 } +0 —·5	28·5	25	28·5	1132	127·5 } +0 —2·0	136·5	133	136·5
1106	23·5	32·5	29	32·5	1133	131·5	140·5	137	140·5
1107	27·5	36·5	33	36·5	1134	135·5	144·5	141	144·5
1108	31·5 } +0 —·75	40·5	37	40·5	1135	139·5 } +0 —2·0	148·5	145	148·5
1109	35·5	44·5	41	44·5	1136	143·5	152·5	149	152·5
1110	39·5	48·5	45	48·5	1137	147·5	156·5	153	156·5
1111	43·5 } +0 —1·0	52·5	49	52·5	1138	151·5 } +0 —2·0	160·5	157	160·5
1112	47·5	56·5	53	56·5	1139	155·5	164·5	161	164·5
1113	51·5	60·5	57	60·5	1140	159·5	168·5	165	168·5
1114	55·5 } +0 —1·25	64·5	61	64·5	1141	163·5 } +0 —2·0	172·5	169	172·5
1115	59·5	68·5	65	68·5	1142	167·5	176·5	173	176·5
1116	63·5	72·5	69	72·5	1143	171·5	180·5	177	180·5
1117	67·5 } +0 —1·5	76·5	73	76·5	1144	175·5 } +0 —2·0	184·5	181	184·5
1118	71·5	80·5	77	80·5	1145	179·5	188·5	185	188·5
1119	75·5	84·5	81	84·5	1146	183·5	192·5	189	192·5
1120	79·5 } +0 —1·75	88·5	85	88·5	1147	187·5 } +0 —2·0	196·5	193	196·5
1121	83·5	92·5	89	92·5	1148	191·5	200·5	197	200·5
1122	87·5	96·5	93	96·5	1149	195·5	204·5	201	204·5
1123	91·5 } +0 —2·0	100·5	97	100·5	1150	199·5 } +0 —2·0	208·5	205	208·5
1124	95·5	104·5	101	104·5	1151	203·5	212·5	209	212·5
1125	99·5	108·5	105	108·5	1152	207·5	216·5	213	216·5
1126	103·5 } +0 —2·0	112·5	109	112·5	1153	211·5 } +0 —2·0	220·5	217	220·5
1127	107·5	116·5	113	116·5	1154	215·5	224·5	221	224·5

This Specification was adopted by the Sectional Aircraft Committee on 3rd December, 1927, and approved on behalf of the Main Committee on 6th December, 1927.

NOTE.—*In order to keep abreast of progress in the Industries concerned, the British Standard Specifications are subjected to periodical review.*

Suggestions for improvements, addressed to the Secretary of the British Engineering Standards Association, 28, Victoria Street, London, S.W.1, will be welcomed at all times. They will be recorded and in due course brought to the notice of the Committees charged with the revision of the Specifications to which they refer.

A.G.S. No. 652

STREAMLINE WIRES—*contd.*

In ordering, call up "A" length to nearest half-inch above calculated "A" length.

Size : $\frac{9}{16}$ inch.
Ultimate Tensile Strength : 19,300 lb.
Thread : $\frac{9}{16}$ inch B.S.F. D = 2·5 inches.
Oval : T = 0·211 inch (min.) ; 0·228 inch (max.) ; R = 1·38 inches.
Area = 0·139 sq. in. (min.) ; W = 0·860 inch approx., not to exceed 0·95 in.

Part No. Prefix A.G.S. 652	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1201	3·5	12·5	9	12·5	1228	111·5	120·5	117	120·5
1202	7·5 } +0 —·25	16·5	13	16·5	1229	115·5 } +0 —2·0	124·5	121	124·5
1203	11·5	20·5	17	20·5	1230	119·5	128·5	125	128·5
1204	15·5	24·5	21	24·5	1231	123·5	132·5	129	132·5
1205	19·5 } +0 —·5	28·5	25	28·5	1232	127·5 } +0 —2·0	136·5	133	136·5
1206	23·5	32·5	29	32·5	1233	131·5	140·5	137	140·5
1207	27·5	36·5	33	36·5	1234	135·5	144·5	141	144·5
1208	31·5 } +0 —·75	40·5	37	40·5	1235	139·5 } +0 —2·0	148·5	145	148·5
1209	35·5	44·5	41	44·5	1236	143·5	152·5	149	152·5
1210	39·5	48·5	45	48·5	1237	147·5	156·5	153	156·5
1211	43·5 } +0 —1·0	52·5	49	52·5	1238	151·5 } +0 —2·0	160·5	157	160·5
1212	47·5	56·5	53	56·5	1239	155·5	164·5	161	164·5
1213	51·5	60·5	57	60·5	1240	159·5	168·5	165	168·5
1214	55·5 } +0 —1·25	64·5	61	64·5	1241	163·5 } +0 —2·0	172·5	169	172·5
1215	59·5	68·5	65	68·5	1242	167·5	176·5	173	176·5
1216	63·5	72·5	69	72·5	1243	171·5	180·5	177	180·5
1217	67·5 } +0 —1·5	76·5	73	76·5	1244	175·5 } +0 —2·0	184·5	181	184·5
1218	71·5	80·5	77	80·5	1245	179·5	188·5	185	188·5
1219	75·5	84·5	81	84·5	1246	183·5	192·5	189	192·5
1220	79·5 } +0 —1·75	88·5	85	88·5	1247	187·5 } +0 —2·0	196·5	193	196·5
1221	83·5	92·5	89	92·5	1248	191·5	200·5	197	200·5
1222	87·5	96·5	93	96·5	1249	195·5	204·5	201	204·5
1223	91·5 } +0 —2·0	100·5	97	100·5	1250	199·5 } +0 —2·0	208·5	205	208·5
1224	95·5	104·5	101	104·5	1251	203·5	212·5	209	212·5
1225	99·5	108·5	105	108·5	1252	207·5	216·5	213	216·5
1226	103·5 } +0 —2·0	112·5	109	112·5	1253	211·5 } +0 —2·0	220·5	217	220·5
1227	107·5	116·5	113	116·5	1254	215·5	224·5	221	224·5

Specification :—The material for these Streamline Wires is to be to B.S. Spec. W. 3. All Streamline Wires to this drawing are to have a minimum tensile strength of 19,300 lbs.

STREAMLINE WIRES—*contd.*

A.G.S. No. 653.

In ordering, call up "A" length to nearest half-inch above calculated "A" length.

Size : $\frac{5}{8}$ inch.
Thread : $\frac{5}{8}$ B.S.F. D = 2·8 inches.
Oval : T = 0·238 inch (min.) ; 0·254 inch (max.) ; R = 1·38 inches.
Area = 0·168 sq. inch (min.) ; W = 0·970 inch approx. Not to exceed 1·05 inch.

Part No. Prefix A.G.S. 653	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1301	3·5	13	9·5	13	1328	111·5	121	117·5	121
1302	7·5 } +0 —·25	17	13·5	17	1329	115·5 } +0 —2·0	125	121·5	125
1303	11·5	21	17·5	21	1330	119·5	129	125·5	129
1304	15·5	25	21·5	25	1331	123·5	133	129·5	133
1305	19·5 } +0 —·5	29	25·5	29	1332	127·5 } +0 —2·0	137	133·5	137
1306	23·5	33	29·5	33	1333	131·5	141	137·5	141
1307	27·5	37	33·5	37	1334	135·5	145	141·5	145
1308	31·5 } +0 —·75	41	37·5	41	1335	139·5 } +0 —2·0	149	145·5	149
1309	35·5	45	41·5	45	1336	143·5	153	149·5	153
1310	39·5	49	45·5	49	1337	147·5	157	153·5	157
1311	43·5 } +0 —1·0	53	49·5	53	1338	151·5 } +0 —2·0	161	157·5	161
1312	47·5	57	53·5	57	1339	155·5	165	161·5	165
1313	51·5	61	57·5	61	1340	159·5	169	165·5	169
1314	55·5 } +0 —1·25	65	61·5	65	1341	163·5 } +0 —2·0	173	169·5	173
1315	59·5	69	65·5	69	1342	167·5	177	173·5	177
1316	63·5	73	69·5	73	1343	171·5	181	177·5	181
1317	67·5 } +0 —1·5	77	73·5	77	1344	175·5 } +0 —2·0	185	181·5	185
1318	71·5	81	77·5	81	1345	179·5	189	185·5	189
1319	75·5	85	81·5	85	1346	183·5	193	189·5	193
1320	79·5 } +0 —1·75	89	85·5	89	1347	187·5 } +0 —2·0	197	193·5	197
1321	83·5	93	89·5	93	1348	191·5	201	197·5	201
1322	87·5	97	93·5	97	1349	195·5	205	201·5	205
1323	91·5 } +0 —2·0	101	97·5	101	1350	199·5 } +0 —2·0	209	205·5	209
1324	95·5	105	101·5	105	1351	203·5	213	209·5	213
1325	99·5	109	105·5	109	1352	207·5	217	213·5	217
1326	103·5 } +0 —2·0	113	109·5	113	1353	211·5 } +0 —2·0	221	217·5	221
1327	107·5	117	113·5	117	1354	215·5	225	221·5	225

Specification :—The material for these Streamline Wires is to be to B.S. Spec. W. 3. All Streamline Wires to this drawing are to have a minimum tensile strength of 23,630 lbs.

A.G.S. No. 654.

STREAMLINE WIRES—*contd.*

In ordering, call up "A" length to nearest half-inch above calculated "A" length.

Size : $\frac{11}{16}$ inch.
Thread : $\frac{11}{16}$ B.S.F. D = 3·0 inches.
Oval : T = 0·272 inch (min.) ; 0·291 inch (max.) ; R = 1·58 inches.
Area = 0·217 sq. inch (min.) ; W = 1·05 inches approx. Not to exceed 1·20 inches.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between: Min.	For "A" Lengths between: Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between: Min.	For "A" Lengths between: Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1401	3·5	13·5	10	13·5	1428	111·5	121·5	118	121·5
1402	7·5 (+0 / —·25)	17·5	14	17·5	1429	115·5 (+0 / —2·0)	125·5	122	125·5
1403	11·5	21·5	18	21·5	1430	119·5	129·5	126	129·5
1404	15·5	25·5	22	25·5	1431	123·5	133·5	130	133·5
1405	19·5 (+0 / —·5)	29·5	26	29·5	1432	127·5 (+0 / —2·0)	137·5	134	137·5
1406	23·5	33·5	30	33·5	1433	131·5	141·5	138	141·5
1407	27·5	37·5	34	37·5	1434	135·5	145·5	142	145·5
1408	31·5 (+0 / —·75)	41·5	38	41·5	1435	139·5 (+0 / —2·0)	149·5	146	149·5
1409	35·5	45·5	42	45·5	1436	143·5	153·5	150	153·5
1410	39·5	49·5	46	49·5	1437	147·5	157·5	154	157·5
1411	43·5 (+0 / —1·0)	53·5	50	53·5	1438	151·5 (+0 / —2·0)	161·5	158	161·5
1412	47·5	57·5	54	57·5	1439	155·5	165·5	162	165·5
1413	51·5	61·5	58	61·5	1440	159·5	169·5	166	169·5
1414	55·5 (+0 / —1·25)	65·5	62	65·5	1441	163·5 (+0 / —2·0)	173·5	170	173·5
1415	59·5	69·5	66	69·5	1442	167·5	177·5	174	177·5
1416	63·5	73·5	70	73·5	1443	171·5	181·5	178	181·5
1417	67·5 (+0 / —1·5)	77·5	74	77·5	1444	175·5 (+0 / —2·0)	185·5	182	185·5
1418	71·5	81·5	78	81·5	1445	179·5	189·5	186	189·5
1419	75·5	85·5	82	85·5	1446	183·5	193·5	190	193·5
1420	79·5 (+0 / —1·75)	89·5	86	89·5	1447	187·5 (+0 / —2·0)	197·5	194	197·5
1421	83·5	93·5	90	93·5	1448	191·5	201·5	198	201·5
1422	87·5	97·5	94	97·5	1449	195·5	205·5	202	205·5
1423	91·5 (+0 / —2·0)	101·5	98	101·5	1450	199·5 (+0 / —2·0)	209·5	206	209·5
1424	95·5	105·5	102	105·5	1451	203·5	213·5	210	213·5
1425	99·5	109·5	106	109·5	1452	207·5	217·5	214	217·5
1426	103·5 (+0 / —2·0)	113·5	110	113·5	1453	211·5 (+0 / —2·0)	221·5	218	221·5
1427	107·5	117·5	114	117·5	1454	215·5	225·5	222	225·5

Specification :—The material for these Streamline Wires is to bę to B.S. Spec. W.3. All Streamline Wires to this drawing are to have a minimum tensile strength of 29,610 lbs. The screw threads are to be in accordance with the British Standard Fine Screw Threads as given in the British Engineering Standards Association Report No. 84, Table II.

A.G.S. No. 655.

STREAMLINE WIRES—*contd.*

In ordering, call up "A" length to nearest half-inch above calculated "A" length.

Size : $\frac{3}{4}$ inch.
Thread : $\frac{3}{4}$ B.S.F. D = 3·2 in.
Oval : T = 0·302 inch (min.) ; 0·313 inch (max.) ; R = 1·58 inches.
Area = 0·248 sq. in. (min.) ; W = 1·16 inches approx. Not to exceed 1·25 inches.

Part No. Prefix A.G.S. 655	B (With Limits)	Overall Length of Blank	For "A" Lengths between: Min.	For "A" Lengths between: Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between: Min.	For "A" Lengths between: Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1501	3·5	14	10·5	14	1528	111·5	122	118·5	122
1502	7·5 (+0 / —·25)	18	14·5	18	1529	115·5 (+0 / —2·0)	126	122·5	126
1503	11·5	22	18·5	22	1530	119·5	130	126·5	130
1504	15·5	26	22·5	26	1531	123·5	134	130·5	134
1505	19·5 (+0 / —·5)	30	26·5	30	1532	127·5 (+0 / —2·0)	138	134·5	138
1506	23·5	34	30·5	34	1533	131·5	142	138·5	142
1507	27·5	38	34·5	38	1534	135·5	146	142·5	146
1508	31·5 (+0 / —·75)	42	38·5	42	1535	139·5 (+0 / —2·0)	150	146·5	150
1509	35·5	46	42·5	46	1536	143·5	154	150·5	154
1510	39·5	50	46·5	50	1537	147·5	158	154·5	158
1511	43·5 (+0 / —1·0)	54	50·5	54	1538	151·5 (+0 / —2·0)	162	158·5	162
1512	47·5	58	54·5	58	1539	155·5	166	162·5	166
1513	51·5	62	58·5	62	1540	159·5	170	166·5	170
1514	55·5 (+0 / —1·25)	66	62·5	66	1541	163·5 (+0 / —2·0)	174	170·5	174
1515	59·5	70	66·5	70	1542	167·5	178	174·5	178
1516	63·5	74	70·5	74	1543	171·5	182	178·5	182
1517	67·5 (+0 / —1·5)	78	74·5	78	1544	175·5 (+0 / —2·0)	186	182·5	186
1518	71·5	82	78·5	82	1545	179·5	190	186·5	190
1519	75·5	86	82·5	86	1546	183·5	194	190·5	194
1520	79·5 (+0 / —1·75)	90	86·5	90	1547	187·5 (+0 / —2·0)	198	194·5	198
1521	83·5	94	90·5	94	1548	191·5	202	198·5	202
1522	87·5	98	94·5	98	1549	195·5	206	202·5	206
1523	91·5 (+0 / —2·0)	102	98·5	102	1550	199·5 (+0 / —2·0)	210	206·5	210
1524	95·5	106	102·5	106	1551	203·5	214	210·5	214
1525	99·5	110	106·5	110	1552	207·5	218	214·5	218
1526	103·5 (+0 / —2·0)	114	110·5	114	1553	211·5 (+0 / —2·0)	222	218·5	222
1527	107·5	118	114·5	118	1554	215·5	226	222·5	226

Specification :—The material for these Streamline Wires is to be to B.S. Spec. W. 3. All Streamline Wires to this drawing are to have a minimum tensile strength of 34,520 lbs.

A.G.S. No. 656.

STREAMLINE WIRES—*contd.*

In ordering, call up " A " length to nearest half-inch above calculated " A " length.

Size : $\frac{7}{8}$ inch.
Thread : $\frac{7}{8}$ B.S.F. D = 3·5 inches.
Oval : T = 0·363 inch (min.) ; 0·385 inch (max.) ; R = 1·80 inches.
Area = 0·358 sq. inch (min.) ; W = 1·27 inches approx. Not to exceed 1·50 inches.

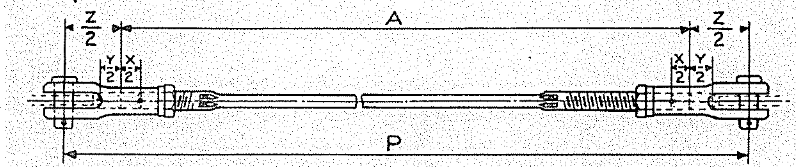
Part No.	B (With Limits)		Overall Length of Blank	For " A " Lengths between Min.	For " A " Lengths between Max.	Part No.	B (With Limits)		Overall Length of Blank	For " A " Lengths between Min.	For " A " Lengths between Max.
	Inches		Inches	Inches	Inches		Inches		Inches	Inches	Inches
1601	3·5		14·5	11	14·5	1628	111·5		122·5	119	122·5
1602	7·5	+0 −·25	18·5	15	18·5	1629	115·5	+0 −2·0	126·5	123	126·5
1603	11·5		22·5	19	22·5	1630	119·5		130·5	127	130·5
1604	15·5		26·5	23	26·5	1631	123·5		134·5	131	134·5
1605	19·5	+0 −·5	30·5	27	30·5	1632	127·5	+0 −2·0	138·5	135	138·5
1606	23·5		34·5	31	34·5	1633	131·5		142·5	139	142·5
1607	27·5		38·5	35	38·5	1634	135·5		146·5	143	146·5
1608	31·5	+0 −·75	42·5	39	42·5	1635	139·5	+0 −2·0	150·5	147	150·5
1609	35·5		46·5	43	46·5	1636	143·5		154·5	151	154·5
1610	39·5		50·5	47	50·5	1637	147·5		158·5	155	158·5
1611	43·5	+0 −1·0	54·5	51	54·5	1638	151·5	+0 −2·0	162·5	159	162·5
1612	47·5		58·5	55	58·5	1639	155·5		166·5	163	166·5
1613	51·5		62·5	59	62·5	1640	159·5		170·5	167	170·5
1614	55·5	+0 −1·25	66·5	63	66·5	1641	163·5	+0 −2·0	174·5	171	174·5
1615	59·5		70·5	67	70·5	1642	167·5		178·5	175	178·5
1616	63·5		74·5	71	74·5	1643	171·5		182·5	179	182·5
1617	67·5	+0 −1·5	78·5	75	78·5	1644	175·5	+0 −2·0	186·5	183	186·5
1618	71·5		82·5	79	82·5	1645	179·5		190·5	187	190·5
1619	75·5		86·5	83	86·5	1646	183·5		194·5	191	194·5
1620	79·5	+0 −1·75	90·5	87	90·5	1647	187·5	+0 −2·0	198·5	195	198·5
1621	83·5		94·5	91	94·5	1648	191·5		202·5	199	202·5
1622	87·5		98·5	95	98·5	1649	195·5		206·5	203	206·5
1623	91·5	+0 −2·0	102·5	99	102·5	1650	199·5	+0 −2·0	210·5	207	210·5
1624	95·5		106·5	103	106·5	1651	203·5		214·5	211	214·5
1625	99·5		110·5	107	110·5	1652	207·5		218·5	215	218·5
1626	103·5	+0 −2·0	114·5	111	114·5	1653	211·5	+0 −2·0	222·5	219	222·5
1627	107·5		118·5	115	118·5	1654	215·5		226·5	223	226·5

Specification :—The material for these Streamline Wires is to be to B.S. Spec. W.3. All Streamline Wires to this drawing to have a minimum tensile strength of 48,190 lbs. The screw threads are to be in accordance with the British Standard Fine Screw Threads as given in the British Engineering Standards Association Report No. 84, Table II.

FINISHED
TIE RODS
SCREWED

FINISHED TIE RODS (SCREWED)

NOTE.—When ordering finished tie rods, only the Specification Number, Part Number, and the required Overall Length to the nearest even half inch should be quoted. (If the calculated length "A" (see sketch) be not an even inch or half-inch, then the nearest half-inch above "A" should be quoted).



A = P-Z.
Where P = Calculated Pin Centres.
and Z = Figure shown in Table below for the respective sizes of Tie Rods.

VALUE Z.
For Plain Forks to B.S. Specification 2 SP. 3.

Size of Tie Rod	Z	Size of Tie Rod	Z
	In.		In.
4 B.A.	1·07	$\frac{11}{32}$ inch B.S.F.	2·09
2 B.A.	1·31	$\frac{3}{8}$ inch ,,	2·33
$\frac{7}{32}$ inch B.S.F.	1·58	$\frac{13}{32}$ inch ,,	2·67
$\frac{1}{4}$ inch ,,	1·55	$\frac{7}{16}$ inch ,,	2·81
$\frac{9}{32}$ inch ,,	1·85	$\frac{15}{32}$ inch ,,	3·00
$\frac{5}{16}$ inch ,,	2·04	$\frac{1}{2}$ inch ,,	3·12

The figures for the Maximum "Outward" and "Inward" adjustment (X and Y) which correspond with the above values for Z are given in the following Table :—

Type of End Fitting	Adjustment	4 B.A.	2 B.A.	$\frac{7}{32}$ in. B.S.F.	$\frac{1}{4}$ in. B.S.F.	$\frac{9}{32}$ in. B.S.F.	$\frac{5}{16}$ in. B.S.F.	$\frac{11}{32}$ in. B.S.F.	$\frac{3}{8}$ in. B.S.F.	$\frac{13}{32}$ in. B.S.F.	$\frac{7}{16}$ in. B.S.F.	$\frac{15}{32}$ in. B.S.F.	$\frac{1}{2}$ in. B.S.F.
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Plain Forks to B.S. Specification 2 SP. 3	X (=Y)	0·53	0·59	0·72	0·65	0·75	0·76	0·81	0·87	0·93	0·99	1·00	0·98

EXAMPLES :—

(1) *Suppose that for a $\frac{1}{4}$ inch tie rod the calculated length "A" = 61·1 inches.*
The finished length "A" to the nearest half-inch above is 61·5 inches and should be ordered thus :—
"B.S. Specification 5 W. 8, Part No. 1514, 'A' 61·5 in."

(2) *Suppose that for a $\frac{5}{16}$ inch tie rod A = 52·0 inches.*
As this length is not between an even inch or half-inch it may be quoted as the finished length, thus :—
"B.S. Specification 5 W. 8, Part No. 1712, 'A' 52·0 in."

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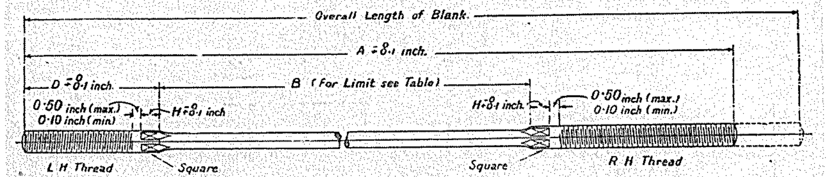
SWAGED TIE RODS

[**5 W. 8.** *January,* 1928.]
(Cancelling B.S. Specification 4 W. 8.)



SCHEDULE.

Size : 4 B.A. Ultimate Tensile Strength : 1,050 lb.
Thread : No. 4 B.A. D = 1·85 inches. H = 0·16 inch. Width across flats of Square = 0·11 ± 0·002 inch.
Diam. of Swaged Part = 0·104 $^{-0}_{+0\cdot006}$ inch. Area of Swaged Part = 0·0085 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1201	3	9·5	7	9·5	1211	42	49·5	46	49·5
1202	6 (+0 −·25)	13·5	10	13·5	1212	46	53·5	50	53·5
1203	10	17·5	14	17·5	1213	50	57·5	54	57·5
					1214	54 (+0 −·75)	61·5	58	61·5
1204	14	21·5	18	21·5	1215	58	65·5	62	65·5
1205	18	25·5	22	25·5	1216	62	69·5	66	69·5
1206	22	29·5	26	29·5	1217	66	73·5	70	73·5
					1218	70	77·5	74	77·5
1207	26 (+0 −·5)	33·5	30	33·5	1219	74	81·5	78	81·5
1208	30	37·5	34	37·5	1220	78 (+0 −1·0)	85·5	82	85·5
1209	34	41·5	38	41·5	1221	82	89·5	86	89·5
1210	38	45·5	42	45·5	1222	86	93·5	90	93·5

Size : 2 B.A. Ultimate Tensile Strength : 1,900 lb.
Thread : No. 2 B.A. D = 1·90 inches. H = 0 20 inch. Width across flats of Square = 0·14 ± 0·002 inch.
Diam. of Swaged Part = 0·128 $^{-0}_{+0\cdot006}$ inch Area of Swaged Part = 0·0129 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1301	3	9·5	7	9·5	1311	42	49·5	46	49·5
1302	6 (+0 −·25)	13·5	10	13·5	1312	46	53·5	50	53·5
1303	10	17·5	14	17·5	1313	50	57·5	54	57·5
					1314	54 (+0 −·75)	61·5	58	61·5
1304	14	21·5	18	21·5	1315	58	65·5	62	65·5
1305	18	25·5	22	25·5	1316	62	69·5	66	69·5
1306	22	29·5	26	29·5	1317	66	73·5	70	73·5
					1318	70	77·5	74	77·5
1307	26 (+0 −·5)	33·5	30	33·5	1319	74	81·5	78	81·5
1308	30	37·5	34	37·5	1320	78 (+0 −1·0)	85·5	82	85·5
1309	34	41·5	38	41·5	1321	82	89·5	86	89·5
1310	38	45·5	42	45·5	1322	86	93·5	90	93·5

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[5 W. 8. *January, 1928.*]

SWAGED TIE RODS—*contd.*

(Cancelling B.S. Specification 4 W. 8.)

Size : $\frac{7}{32}$ inch.
Ultimate Tensile Strength : 2,600 lb.
Thread : $\frac{7}{32}$ inch, B.S.F. D = 2·0 inches. H = 0·20 inch.
Width across flats of Square = 0·17 ± 0·002 inch.

Diam. of Swaged Part = $0{\cdot}149\,{}^{-0}_{+0{\cdot}006}$ inch. Area of Swaged Part = 0·0174 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1402	6 (+0)	13·5	10	13·5	1445	178	185·5	182	185·5
1403	10 (—·25)	17·5	14	17·5	1446	182	189·5	186	189·5
					1447	186 (+0 —1·75)	193·5	190	193·5
1404	14	21·5	18	21·5	1448	190	197·5	194	197·5
1405	18	25·5	22	25·5	1449	194	201·5	198	201·5
1406	22	29·5	26	29·5	1450	198	205·5	202	205·5
1407	26 (+0 —·5)	33·5	30	33·5	1451	202	209·5	206	209·5
1408	30	37·5	34	37·5	1452	206	213·5	210	213·5
1409	34	41·5	38	41·5	1453	210	217·5	214	217·5
1410	38	45·5	42	45·5	1454	214	221·5	218	221·5
1411	42	49·5	46	49·5	1455	218	225·5	222	225·5
1412	46	53·5	50	53·5	1456	222	229·5	226	229·5
1413	50	57·5	54	57·5	1457	226	233·5	230	233·5
1414	54 (+0 —·75)	61·5	58	61·5	1458	230	237·5	234	237·5
1415	58	65·5	62	65·5	1459	234	241·5	238	241·5
1416	62	69·5	66	69·5	1460	238	245·5	242	245·5
1417	66	73·5	70	73·5	1461	242	249·5	246	249·5
1418	70	77·5	74	77·5	1462	246	253·5	250	253·5
1419	74	81·5	78	81·5	1463	250	257·5	254	257·5
1420	78 (+0 —1·0)	85·5	82	85·5	1464	254	261·5	258	261·5
1421	82	89·5	86	89·5	1465	258	265·5	262	265·5
1422	86	93·5	90	93·5	1466	262	269·5	266	269·5
1423	90	97·5	94	97·5	1467	266	273·5	270	273·5
1424	94	101·5	98	101·5	1468	270	277·5	274	277·5
1425	98	105·5	102	105·5	1469	274 (+0 —2·0)	281·5	278	281·5
1426	102	109·5	106	109·5	1470	278	285·5	282	285·5
1427	106	113·5	110	113·5	1471	282	289·5	286	289·5
1428	110 (+0 —1·25)	117·5	114	117·5	1472	286	293·5	290	293·5
1429	114	121·5	118	121·5	1473	290	297·5	294	297·5
1430	118	125·5	122	125·5	1474	294	301·5	298	301·5
1431	122	129·5	126	129·5	1475	298	305·5	302	305·5
1432	126	133·5	130	133·5	1476	302	309·5	306	309·5
1433	130	137·5	134	137·5	1477	306	313·5	310	313·5
1434	134	141·5	138	141·5	1478	310	317·5	314	317·5
1435	138	145·5	142	145·5	1479	314	321·5	318	321·5
1436	142	149·5	146	149·5	1480	318	325·5	322	325·5
1437	146 (+0 —1·5)	153·5	150	153·5	1481	322	329·5	326	329·5
1438	150	157·5	154	157·5	1482	326	333·5	330	333·5
1439	154	161·5	158	161·5	1483	330	337·5	334	337·5
1440	158	165·5	162	165·5	1484	334	341·5	338	341·5
1441	162	169·5	166	169·5	1485	338	345·5	342	345·5
1442	166	173·5	170	173·5	1486	342	349·5	346	349·5
1443	170 (+0 —1·75)	177·5	174	177·5	1487	346	353·5	350	353·5
1444	174	181·5	178	181·5	1488	350	357·5	354	357·5

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SWAGED TIE RODS—*contd.*

[5 W. 8. *January, 1928.*]

(Cancelling B.S. Specification 4 W. 8.)

Size : $\frac{1}{4}$ inch.
Ultimate Tensile Strength : 3,450 lb.
Thread : $\frac{1}{4}$ inch, B.S.F. D = 2·10 inches. H = 0·20 inch.
Width across flats of Square = 0·19 ± 0·002 inch.

Diam. of Swaged Part = $0{\cdot}171\,{}^{-0}_{+0{\cdot}007}$ inch. Area of Swaged Part = 0·0230 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1502	6 (+0)	14	10·5	14	1545	178	186	182·5	186
1503	10 (—·25)	18	14·5	18	1546	182	190	186·5	190
					1547	186 (+0 —1·75)	194	190·5	194
1504	14	22	18·5	22	1548	190	198	194·5	198
1505	18	26	22·5	26	1549	194	202	198·5	202
1506	22	30	26·5	30	1550	198	206	202·5	206
1507	26 (+0 —·5)	34	30·5	34	1551	202	210	206·5	210
1508	30	38	34·5	38	1552	206	214	210·5	214
1509	34	42	38·5	42	1553	210	218	214·5	218
1510	38	46	42·5	46	1554	214	222	218·5	222
1511	42	50	46·5	50	1555	218	226	222·5	226
1512	46	54	50·5	54	1556	222	230	226·5	230
1513	50	58	54·5	58	1557	226	234	230·5	234
1514	54 (+0 —·75)	62	58·5	62	1558	230	238	234·5	238
1515	58	66	62·5	66	1559	234	242	238·5	242
1516	62	70	66·5	70	1560	238	246	242·5	246
1517	66	74	70·5	74	1561	242	250	246·5	250
1518	70	78	74·5	78	1562	246	254	250·5	254
1519	74	82	78·5	82	1563	250	258	254·5	258
1520	78	86	82·5	86	1564	254	262	258·5	262
1521	82 (+0 —1·0)	90	86·5	90	1565	258	266	262·5	266
1522	86	94	90·5	94	1566	262	270	266·5	270
1523	90	98	94·5	98	1567	266	274	270·5	274
1524	94	102	98·5	102	1568	270	278	274·5	278
1525	98	106	102·5	106	1569	274 (+0 —2·0)	282	278·5	282
1526	102	110	106·5	110	1570	278	286	282·5	286
1527	106	114	110·5	114	1571	282	290	286·5	290
1528	110 (+0 —1·25)	118	114·5	118	1572	286	294	290·5	294
1529	114	122	118·5	122	1573	290	298	294·5	298
1530	118	126	122·5	126	1574	294	302	298·5	302
1531	122	130	126·5	130	1575	298	306	302·5	306
1532	126	134	130·5	134	1576	302	310	306·5	310
1533	130	138	134·5	138	1577	306	314	310·5	314
1534	134	142	138·5	142	1578	310	318	314·5	318
1535	138	146	142·5	146	1579	314	322	318·5	322
1536	142	150	146·5	150	1580	318	326	322·5	326
1537	146 (+0 —1·5)	154	150·5	154	1581	322	330	326·5	330
1538	150	158	154·5	158	1582	326	334	330·5	334
1539	154	162	158·5	162	1583	330	338	334·5	338
1540	158	166	162·5	166	1584	334	342	338·5	342
1541	162	170	166·5	170	1585	338	346	342·5	346
1542	166	174	170·5	174	1586	342	350	346·5	350
1543	170 (+0 —1·75)	178	174·5	178	1587	346	354	350·5	354
1544	174	182	178·5	182	1588	350	358	354·5	358

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[5 W. 8. *January*, 1928.] SWAGED TIE RODS—*contd.*

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{9}{32}$ inch.
Ultimate Tensile Strength : 4,650 lb.
Thread : $\frac{9}{32}$ inch, B.S.F. D = 2·25 inches. H = 0·26 inch.
Width across flats of Square = 0·22 ± 0·002 inch.

Diam. of Swaged Part = $0{\cdot}207\,^{-0}_{+0{\cdot}008}$ inch. Area of Swaged Part = 0·0337 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1602	6 +0 —·25	14	10·5	14	1645	178	186	182·5	186
1603	10	18	14·5	18	1646	182	190	186·5	190
					1647	186 +0 —1·75	194	190·5	194
1604	14	22	18·5	22	1648	190	198	194·5	198
1605	18	26	22·5	26	1649	194	202	198·5	202
1606	22	30	26·5	30	1650	198	206	202·5	206
1607	26 +0 —·5	34	30·5	34	1651	202	210	206·5	210
1608	30	38	34·5	38	1652	206	214	210·5	214
1609	34	42	38·5	42	1653	210	218	214·5	218
1610	38	46	42·5	46	1654	214	222	218·5	222
1611	42	50	46·5	50	1655	218	226	222·5	226
1612	46	54	50·5	54	1656	222	230	226·5	230
1613	50	58	54·5	58	1657	226	234	230·5	234
1614	54 +0 —·75	62	58·5	62	1658	230	238	234·5	238
1615	58	66	62·5	66	1659	234	242	238·5	242
1616	62	70	66·5	70	1660	238	246	242·5	246
1617	66	74	70·5	74	1661	242	250	246·5	250
1618	70	78	74·5	78	1662	246	254	250·5	254
1619	74	82	78·5	82	1663	250	258	254·5	258
1620	78 +0 —1·0	86	82·5	86	1664	254	262	258·5	262
1621	82	90	86·5	90	1665	258	266	262·5	266
1622	86	94	90·5	94	1666	262	270	266·5	270
1623	90	98	94·5	98	1667	266	274	270·5	274
1624	94	102	98·5	102	1668	270	278	274·5	278
1625	98	106	102·5	106	1669	274 +0 —2·0	282	278·5	282
1626	102	110	106·5	110	1670	278	286	282·5	286
1627	106	114	110·5	114	1671	282	290	286·5	290
1628	110 +0 —1·25	118	114·5	118	1672	286	294	290·5	294
1629	114	122	118·5	122	1673	290	298	294·5	298
1630	118	126	122·5	126	1674	294	302	298·5	302
1631	122	130	126·5	130	1675	298	306	302·5	306
1632	126	134	130·5	134	1676	302	310	306·5	310
1633	130	138	134·5	138	1677	306	314	310·5	314
1634	134	142	138·5	142	1678	310	318	314·5	318
1635	138	146	142·5	146	1679	314	322	318·5	322
1636	142 +0 —1·5	150	146·5	150	1680	318	326	322·5	326
1637	146	154	150·5	154	1681	322	330	326·5	330
1638	150	158	154·5	158	1682	326	334	330·5	334
1639	154	162	158·5	162	1683	330	338	334·5	338
1640	158	166	162·5	166	1684	334	342	338·5	342
1641	162	170	166·5	170	1685	338	346	342·5	346
1642	166 +0 —1·75	174	170·5	174	1686	342	350	346·5	350
1643	170	178	174·5	178	1687	346	354	350·5	354
1644	174	182	178·5	182	1688	350	358	354·5	358

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SWAGED TIE RODS—*contd.* [5 W. 8. *January*, 1928.]

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{5}{16}$ inch.
Ultimate Tensile Strength : 5,700 lb.
Thread : $\frac{5}{16}$ inch, B.S.F. D = 2·35 inches. H = 0·26 inch.
Width across flats of Square = 0·25 ± 0·002 inch.

Diam. of Swaged Part = $0{\cdot}223\,^{-0{\cdot}}_{+0{\cdot}009}$ inch. Area of Swaged Part = 0·0391 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1703	10 +0 —·25	18·5	15	18·5	1745	178	186·5	183	186·5
					1746	182	190·5	187	190·5
1704	14	22·5	19	22·5	1747	186 +0 —1·75	194·5	191	194·5
1705	18	26·5	23	26·5	1748	190	198·5	195	198·5
1706	22	30·5	27	30·5	1749	194	202·5	199	202·5
1707	26 +0 —·5	34·5	31	34·5	1750	198	206·5	203	206·5
1708	30	38·5	35	38·5	1751	202	210·5	207	210·5
1709	34	42·5	39	42·5	1752	206	214·5	211	214·5
1710	38	46·5	43	46·5	1753	210	218·5	215	218·5
1711	42	50·5	47	50·5	1754	214	222·5	219	222·5
1712	46	54·5	51	54·5	1755	218	226·5	223	226·5
1713	50	58·5	55	58·5	1756	222	230·5	227	230·5
1714	54 +0 —·75	62·5	59	62·5	1757	226	234·5	231	234·5
1715	58	66·5	63	66·5	1758	230	238·5	235	238·5
1716	62	70·5	67	70·5	1759	234	242·5	239	242·5
1717	66	74·5	71	74·5	1760	238	246·5	243	246·5
1718	70	78·5	75	78·5	1761	242	250·5	247	250·5
1719	74	82·5	79	82·5	1762	246	254·5	251	254·5
1720	78 +0 —1·0	86·5	83	86·5	1763	250	258·5	255	258·5
1721	82	90·5	87	90·5	1764	254	262·5	259	262·5
1722	86	94·5	91	94·5	1765	258	266·5	263	266·5
1723	90	98·5	95	98·5	1766	262	270·5	267	270·5
1724	94	102·5	99	102·5	1767	266	274·5	271	274·5
1725	98	106·5	103	106·5	1768	270	278·5	275	278·5
1726	102	110·5	107	110·5	1769	274 +0 —2·0	282·5	279	282·5
1727	106	114·5	111	114·5	1770	278	286·5	283	286·5
1728	110 +0 —1·25	118·5	115	118·5	1771	282	290·5	287	290·5
1729	114	122·5	119	122·5	1772	286	294·5	291	294·5
1730	118	126·5	123	126·5	1773	290	298·5	295	298·5
1731	122	130·5	127	130·5	1774	294	302·5	299	302·5
1732	126	134·5	131	134·5	1775	298	306·5	303	306·5
1733	130	138·5	135	138·5	1776	302	310·5	307	310·5
1734	134	142·5	139	142·5	1777	306	314·5	311	314·5
1735	138	146·5	143	146·5	1778	310	318·5	315	318·5
1736	142 +0 —1·5	150·5	147	150·5	1779	314	322·5	319	322·5
1737	146	154·5	151	154·5	1780	318	326·5	323	326·5
1738	150	158·5	155	158·5	1781	322	330·5	327	330·5
1739	154	162·5	159	162·5	1782	326	334·5	331	334·5
1740	158	166·5	163	166·5	1783	330	338·5	335	338·5
1741	162	170·5	167	170·5	1784	334	342·5	339	342·5
1742	166 +0 —1·75	174·5	171	174·5	1785	338	346·5	343	346·5
1743	170	178·5	175	178·5	1786	342	350·5	347	350·5
1744	174	182·5	179	182·5	1787	346	354·5	351	354·5
					1788	350	358·5	355	358·5

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[5 W. 8. *January*, 1928.]   SWAGED TIE RODS—*contd.*

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{11}{32}$ inch.
Ultimate Tensile Strength : 7,150 lb.
Thread : $\frac{11}{32}$ inch, B.S.F.   D = 2·40 inches.   H = 0·32 inch.
Width across flats of Square = 0·28 ± 0·002 inch.
Diam. of Swaged Part = 0·251 $^{-0}_{+0·009}$ inch.   Area of Swaged Part = 0·0495 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1803	10 +0 −·25	18·5	15	18·5	1845	178	186·5	183	186·5
1804	14	22·5	19	22·5	1846	182	190·5	187	190·5
1805	18	26·5	23	26·5	1847	186 +0	194·5	191	194·5
1806	22	30·5	27	30·5	1848	190 −1·75	198·5	195	198·5
1807	26 +0	34·5	31	34·5	1849	194	202·5	199	202·5
1808	30 −·5	38·5	35	38·5	1850	198	206·5	203	206·5
1809	34	42·5	39	42·5	1851	202	210·5	207	210·5
1810	38	46·5	43	46·5	1852	206	214·5	211	214·5
1811	42	50·5	47	50·5	1853	210	218·5	215	218·5
1812	46	54·5	51	54·5	1854	214	222·5	219	222·5
1813	50	58·5	55	58·5	1855	218	226·5	223	226·5
1814	54 +0	62·5	59	62·5	1856	222	230·5	227	230·5
1815	58 −·75	66·5	63	66·5	1857	226	234·5	231	234·5
1816	62	70·5	67	70·5	1858	230	238·5	235	238·5
1817	66	74·5	71	74·5	1859	234	242·5	239	242·5
1818	70	78·5	75	78·5	1860	238	246·5	243	246·5
1819	74	82·5	79	82·5	1861	242	250·5	247	250·5
1820	78 +0	86·5	83	86·5	1862	246	254·5	251	254·5
1821	82 −1·0	90·5	87	90·5	1863	250	258·5	255	258·5
1822	86	94·5	91	94·5	1864	254	262·5	259	262·5
1823	90	98·5	95	98·5	1865	258	266·5	263	266·5
1824	94	102·5	99	102·5	1866	262	270·5	267	270·5
1825	98	106·5	103	106·5	1867	266	274·5	271	274·5
1826	102	110·5	107	110·5	1868	270	278·5	275	278·5
1827	106	114·5	111	114·5	1869	274 +0	282·5	279	282·5
1828	110 +0	118·5	115	118·5	1870	278 −2·0	286·5	283	286·5
1829	114 −1·25	122·5	119	122·5	1871	282	290·5	287	290·5
1830	118	126·5	123	126·5	1872	286	294·5	291	294·5
1831	122	130·5	127	130·5	1873	290	298·5	295	298·5
1832	126	134·5	131	134·5	1874	294	302·5	299	302·5
1833	130	138·5	135	138·5	1875	298	306·5	303	306·5
1834	134	142·5	139	142·5	1876	302	310·5	307	310·5
1835	138	146·5	143	146·5	1877	306	314·5	311	314·5
1836	142 +0	150·5	147	150·5	1878	310	318·5	315	318·5
1837	146 −1·5	154·5	151	154·5	1879	314	322·5	319	322·5
1838	150	158·5	155	158·5	1880	318	326·5	323	326·5
1839	154	162·5	159	162·5	1881	322	330·5	327	330·5
1840	158	166·5	163	166·5	1882	326	334·5	331	334·5
1841	162	170·5	167	170·5	1883	330	338·5	335	338·5
1842	166 +0	174·5	171	174·5	1884	334	342·5	339	342·5
1843	170 −1·75	178·5	175	178·5	1885	338	346·5	343	346·5
1844	174	182·5	179	182·5	1886	342	350·5	347	350·5
					1887	346	354·5	351	354·5
					1888	350	358·5	355	358·5

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SWAGED TIE RODS—*contd.*   [5 W. 8. *January*, 1928.]

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{3}{8}$ inch.
Ultimate Tensile Strength : 8,500 lb.
Thread : $\frac{3}{8}$ inch, B.S.F.   D = 2·50 inches.   H = 0·32 inch.
Width across flats of Square = 0·30 ± 0·002 inch.
Diam. of Swaged Part = 0·274 $^{-0}_{+0·010}$ inch.   Area of Swaged Part = 0·0590 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
1903	10 +0 −·25	18·5	15	18·5	1945	178	186·5	183	186·5
1904	14	22·5	19	22·5	1946	182	190·5	187	190·5
1905	18	26·5	23	26·5	1947	186 +0	194·5	191	194·5
1906	22	30·5	27	30·5	1948	190 −1·75	198·5	195	198·5
1907	26 +0	34·5	31	34·5	1949	194	202·5	199	202·5
1908	30 −·5	38·5	35	38·5	1950	198	206·5	203	206·5
1909	34	42·5	39	42·5	1951	202	210·5	207	210·5
1910	38	46·5	43	46·5	1952	206	214·5	211	214·5
1911	42	50·5	47	50·5	1953	210	218·5	215	218·5
1912	46	54·5	51	54·5	1954	214	222·5	219	222·5
1913	50	58·5	55	58·5	1955	218	226·5	223	226·5
1914	54 +0	62·5	59	62·5	1956	222	230·5	227	230·5
1915	58 −·75	66·5	63	66·5	1957	226	234·5	231	234·5
1916	62	70·5	67	70·5	1958	230	238·5	235	238·5
1917	66	74·5	71	74·5	1959	234	242·5	239	242·5
1918	70	78·5	75	78·5	1960	238	246·5	243	246·5
1919	74	82·5	79	82·5	1961	242	250·5	247	250·5
1920	78 +0	86·5	83	86·5	1962	246	254·5	251	254·5
1921	82 −1·0	90·5	87	90·5	1963	250	258·5	255	258·5
1922	86	94·5	91	94·5	1964	254	262·5	259	262·5
1923	90	98·5	95	98·5	1965	258	266·5	263	266·5
1924	94	102·5	99	102·5	1966	262	270·5	267	270·5
1925	98	106·5	103	106·5	1967	266	274·5	271	274·5
1926	102	110·5	107	110·5	1968	270	278·5	275	278·5
1927	106	114·5	111	114·5	1969	274 +0	282·5	279	282·5
1928	110 +0	118·5	115	118·5	1970	278 −2·0	286·5	283	286·5
1929	114 −1·25	122·5	119	122·5	1971	282	290·5	287	290·5
1930	118	126·5	123	126·5	1972	286	294·5	291	294·5
1931	122	130·5	127	130·5	1973	290	298·5	295	298·5
1932	126	134·5	131	134·5	1974	294	302·5	299	302·5
1933	130	138·5	135	138·5	1975	298	306·5	303	306·5
1934	134	142·5	139	142·5	1976	302	310·5	307	310·5
1935	138	146·5	143	146·5	1977	306	314·5	311	314·5
1936	142 +0	150·5	147	150·5	1978	310	318·5	315	318·5
1937	146 −1·5	154·5	151	154·5	1979	314	322·5	319	322·5
1938	150	158·5	155	158·5	1980	318	326·5	323	326·5
1939	154	162·5	159	162·5	1981	322	330·5	327	330·5
1940	158	166·5	163	166·5	1982	326	334·5	331	334·5
1941	162	170·5	167	170·5	1983	330	338·5	335	338·5
1942	166 +0	174·5	171	174·5	1984	334	342·5	339	342·5
1943	170 −1·75	178·5	175	178·5	1985	338	346·5	343	346·5
1944	174	182·5	179	182·5	1986	342	350·5	347	350·5
					1987	346	354·5	351	354·5
					1988	350	358·5	355	358·5

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[5 W. 8. *January*, 1928.] SWAGED TIE RODS—*contd.*

(Cancelling B.S. Specification 4 W. 8.)

Size : 13/32 inch.
Ultimate Tensile Strength : 10,250 lb.
Thread : 13/32 inch, B.S.F. D = 2·55 inches. H = 0·38 inch.
Width across flats of Square = 0·33 ± 0·002 inch.
Diam. of Swaged Part = 0·303 $\begin{smallmatrix}-0\\+0·011\end{smallmatrix}$ inch. Area of Swaged Part = 0·0721 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
2003	10 +0 −·25	18·5	15	18·5	2045	178	186·5	183	186·5
					2046	182	190·5	187	190·5
2004	14	22·5	19	22·5	2047	186 } +0 −1·75	194·5	191	194·5
2005	18	26·5	23	26·5	2048	190	198·5	195	198·5
2006	22	30·5	27	30·5	2049	194	202·5	199	202·5
2007	26 } +0 −·5	34·5	31	34·5	2050	198	206·5	203	206·5
2008	30	38·5	35	38·5	2051	202	210·5	207	210·5
2009	34	42·5	39	42·5	2052	206	214·5	211	214·5
2010	38	46·5	43	46·5	2053	210	218·5	215	218·5
2011	42	50·5	47	50·5	2054	214	222·5	219	222·5
2012	46	54·5	51	54·5	2055	218	226·5	223	226·5
2013	50	58·5	55	58·5	2056	222	230·5	227	230·5
2014	54 } +0 −·75	62·5	59	62·5	2057	226	234·5	231	234·5
2015	58	66·5	63	66·5	2058	230	238·5	235	238·5
2016	62	70·5	67	70·5	2059	234	242·5	239	242·5
2017	66	74·5	71	74·5	2060	238	246·5	243	246·5
2018	70	78·5	75	78·5	2061	242	250·5	247	250·5
2019	74	82·5	79	82·5	2062	246	254·5	251	254·5
2020	78	86·5	83	86·5	2063	250	258·5	255	258·5
2021	82 } +0 −1·0	90·5	87	90·5	2064	254	262·5	259	262·5
2022	86	94·5	91	94·5	2065	258	266·5	263	266·5
2023	90	98·5	95	98·5	2066	262	270·5	267	270·5
2024	94	102·5	99	102·5	2067	266	274·5	271	274·5
2025	98	106·5	103	106·5	2068	270	278·5	275	278·5
2026	102	110·5	107	110·5	2069	274 } +0 −2·0	282·5	279	282·5
2027	106	114·5	111	114·5	2070	278	286·5	283	286·5
2028	110 } +0 −1·25	118·5	115	118·5	2071	282	290·5	287	290·5
2029	114	122·5	119	122·5	2072	286	294·5	291	294·5
2030	118	126·5	123	126·5	2073	290	298·5	295	298·5
2031	122	130·5	127	130·5	2074	294	302·5	299	302·5
2032	126	134·5	131	134·5	2075	298	306·5	303	306·5
2033	130	138·5	135	138·5	2076	302	310·5	307	310·5
2034	134	142·5	139	142·5	2077	306	314·5	311	314·5
2035	138	146·5	143	146·5	2078	310	318·5	315	318·5
2036	142	150·5	147	150·5	2079	314	322·5	319	322·5
2037	146 } +0 −1·5	154·5	151	154·5	2080	318	326·5	323	326·5
2038	150	158·5	155	158·5	2081	322	330·5	327	330·5
2039	154	162·5	159	162·5	2082	326	334·5	331	334·5
2040	158	166·5	163	166·5	2083	330	338·5	335	338·5
2041	162	170·5	167	170·5	2084	334	342·5	339	342·5
2042	166	174·5	171	174·5	2085	338	346·5	343	346·5
2043	170 } +0 −1·75	178·5	175	178·5	2086	342	350·5	347	350·5
2044	174	182·5	179	182·5	2087	346	354·5	351	354·5
					2088	350	358·5	355	358·5

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SWAGED TIE RODS—*contd.* [5 W. 8. *January*, 1928.

(Cancelling B.S. Specification 4 W. 8.)

Size : 7/16 inch.
Ultimate Tensile Strength : 11,800 lb.
Thread : 7/16 inch, B.S.F. D = 2.65 inches. H = 0·38 inch.
Width across flats of Square = 0·36 ± 0·002 inch.
Diam. of Swaged Part = 0·326 $\begin{smallmatrix}-0\\+0·012\end{smallmatrix}$ inch. Area of Swaged Part = 0·0835 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between		Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between	
			Min.	Max.				Min.	Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
2103	10 +0 −·25	19	15·5	19	2145	178	187	183·5	187
					2146	182	191	187·5	191
2104	14	23	19·5	23	2147	186 } +0 −1·75	195	191·5	195
2105	18	27	23·5	27	2148	190	199	195·5	199
2106	22	31	27·5	31	2149	194	203	199·5	203
2107	26 } +0 −·5	35	31·5	35	2150	198	207	203·5	207
2108	30	39	35·5	39	2151	202	211	207·5	211
2109	34	43	39·5	43	2152	206	215	211·5	215
2110	38	47	43·5	47	2153	210	219	215·5	219
2111	42	51	47·5	51	2154	214	223	219·5	223
2112	46	55	51·5	55	2155	218	227	223·5	227
2113	50	59	55·5	59	2156	222	231	227·5	231
2114	54 } +0 −·75	63	59·5	63	2157	226	235	231·5	235
2115	58	67	63·5	67	2158	230	239	235·5	239
2116	62	71	67·5	71	2159	234	243	239·5	243
2117	66	75	71·5	75	2160	238	247	243·5	247
2118	70	79	75·5	79	2161	242	251	247·5	251
2119	74	83	79·5	83	2162	246	255	251·5	255
2120	78	87	83·5	87	2163	250	259	255·5	259
2121	82 } +0 −1·0	91	87·5	91	2164	254	263	259·5	263
2122	86	95	91·5	95	2165	258	267	263·5	267
2123	90	99	95·5	99	2166	262	271	267·5	271
2124	94	103	99·5	103	2167	266	275	271·5	275
2125	98	107	103·5	107	2168	270	279	275·5	279
2126	102	111	107·5	111	2169	274 } +0 −2·0	283	279·5	283
2127	106	115	111·5	115	2170	278	287	283·5	287
2128	110 } +0 −1·25	119	115·5	119	2171	282	291	287·5	291
2129	114	123	119·5	123	2172	286	295	291·5	295
2130	118	127	123·5	127	2173	290	299	295·5	299
2131	122	131	127·5	131	2174	294	303	299·5	303
2132	126	135	131·5	135	2175	298	307	303·5	307
2133	130	139	135·5	139	2176	302	311	307·5	311
2134	134	143	139·5	143	2177	306	315	311·5	315
2135	138	147	143·5	147	2178	310	319	315·5	319
2136	142	151	147·5	151	2179	314	323	319·5	323
2137	146 } +0 −1·5	155	151·5	155	2180	318	327	323·5	327
2138	150	159	155·5	159	2181	322	331	327·5	331
2139	154	163	159·5	163	2182	326	335	331·5	335
2140	158	167	163·5	167	2183	330	339	335·5	339
2141	162	171	167·5	171	2184	334	343	339·5	343
2142	166	175	171·5	175	2185	338	347	343·5	347
2143	170 } +0 −1·75	179	175·5	179	2186	342	351	347·5	351
2144	174	183	179·5	183	2187	346	355	351·5	355
					2188	350	359	355·5	359

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VICKERS AVIATION LIMITED

[5 W. 8. *January*, 1928.]

SWAGED TIE RODS—*contd.*

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{15}{32}$ inch.
Ultimate Tensile Strength : 13,800 lb.
Thread : $\frac{15}{32}$ inch, B.S.F. D = 2·85 inches. H = 0·45 inch.
Width across flats of Square = 0·39 ± 0·002 inch.
Diam. of Swaged Part = $0{\cdot}355 \begin{smallmatrix} -0 \\ +0{\cdot}013 \end{smallmatrix}$ inch. Area of Swaged Part = ·0989 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
2203	10 +0 −·25	19·5	16	19·5	2245	178	187·5	184	187·5
2204	14	23·5	20	23·5	2246	182	191·5	188	191·5
2205	18	27·5	24	27·5	2247	186 +0 −1·75	195·5	192	195·5
2206	22	31·5	28	31·5	2248	190	199·5	196	199·5
2207	26 +0 −·5	35·5	32	35·5	2249	194	203·5	200	203·5
2208	30	39·5	36	39·5	2250	198	207·5	204	207·5
2209	34	43·5	40	43·5	2251	202	211·5	208	211·5
2210	38	47·5	44	47·5	2252	206	215·5	212	215·5
2211	42	51·5	48	51·5	2253	210	219·5	216	219·5
2212	46	55·5	52	55·5	2254	214	223·5	220	223·5
2213	50	59·5	56	59·5	2255	218	227·5	224	227·5
2214	54 +0 −·75	63·5	60	63·5	2256	222	231·5	228	231·5
2215	58	67·5	64	67·5	2257	226	235·5	232	235·5
2216	62	71·5	68	71·5	2258	230	239·5	236	239·5
2217	66	75·5	72	75·5	2259	234	243·5	240	243·5
2218	70	79·5	76	79·5	2260	238	247·5	244	247·5
2219	74	83·5	80	83·5	2261	242	251·5	248	251·5
2220	78 +0 −1·0	87·5	84	87·5	2262	246	255·5	252	255·5
2221	82	91·5	88	91·5	2263	250	259·5	256	259·5
2222	86	95·5	92	95·5	2264	254	263·5	260	263·5
2223	90	99·5	96	99·5	2265	258	267·5	264	267·5
2224	94	103·5	100	103·5	2266	262	271·5	268	271·5
2225	98	107·5	104	107·5	2267	266	275·5	272	275·5
2226	102	111·5	108	111·5	2268	270	279·5	276	279·5
2227	106	115·5	112	115·5	2269	274 +0 −2·0	283·5	280	283·5
2228	110 +0 −1·25	119·5	116	119·5	2270	278	287·5	284	287·5
2229	114	123·5	120	123·5	2271	282	291·5	288	291·5
2230	118	127·5	124	127·5	2272	286	295·5	292	295·5
2231	122	131·5	128	131·5	2273	290	299·5	296	299·5
2232	126	135·5	132	135·5	2274	294	303·5	300	303·5
2233	130	139·5	136	139·5	2275	298	307·5	304	307·5
2234	134	143·5	140	143·5	2276	302	311·5	308	311·5
2235	138	147·5	144	147·5	2277	306	315·5	312	315·5
2236	142	151·5	148	151·5	2278	310	319·5	316	319·5
2237	146 +0 −1·5	155·5	152	155·5	2279	314	323·5	320	323·5
2238	150	159·5	156	159·5	2280	318	327·5	324	327·5
2239	154	163·5	160	163·5	2281	322	331·5	328	331·5
2240	158	167·5	164	167·5	2282	326	335·5	332	335·5
2241	162	171·5	168	171·5	2283	330	339·5	336	339·5
2242	166	175·5	172	175·5	2284	334	343·5	340	343·5
2243	170 +0 −1·75	179·5	176	179·5	2285	338	347·5	344	347·5
2244	174	183·5	180	183·5	2286	342	351·5	348	351·5
					2287	346	355·5	352	355·5
					2288	350	359·5	356	359·5

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VICKERS AVIATION LIMITED

SWAGED TIE RODS—*contd.*

[5 W. 8. *January*, 1928.]

(*Cancelling B.S. Specification* 4 W. 8.)

Size : $\frac{1}{2}$ inch.
Ultimate Tensile Strength : 15,500 lb.
Thread : $\frac{1}{2}$ inch, B.S.F. D = 2·95 inches. H = 0·45 inch.
Width across flats of Square = 0·41 ± 0·002 inch.
Diam. of Swaged Part = $0{\cdot}377 \begin{smallmatrix} -0 \\ +0{\cdot}014 \end{smallmatrix}$ inch. Area of Swaged Part = 0·1116 sq. inch.

Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.	Part No.	B (With Limits)	Overall Length of Blank	For "A" Lengths between Min.	For "A" Lengths between Max.
	Inches	Inches	Inches	Inches		Inches	Inches	Inches	Inches
2303	10 +0 −·25	19·5	16	19·5	2345	178	187·5	184	187·5
2304	14	23·5	20	23·5	2346	182	191·5	188	191·5
2305	18	27·5	24	27·5	2347	186 +0 −1·75	195·5	192	195·5
2306	22	31·5	28	31·5	2348	190	199·5	196	199·5
2307	26 +0 −·5	35·5	32	35·5	2349	194	203·5	200	203·5
2308	30	39·5	36	39·5	2350	198	207·5	204	207·5
2309	34	43·5	40	43·5	2351	202	211·5	208	211·5
2310	38	47·5	44	47·5	2352	206	215·5	212	215·5
2311	42	51·5	48	51·5	2353	210	219·5	216	219·5
2312	46	55·5	52	55·5	2354	214	223·5	220	223·5
2313	50	59·5	56	59·5	2355	218	227·5	224	227·5
2314	54 +0 −·75	63·5	60	63·5	2356	222	231·5	228	231·5
2315	58	67·5	64	67·5	2357	226	235·5	232	235·5
2316	62	71·5	68	71·5	2358	230	239·5	236	239·5
2317	66	75·5	72	75·5	2359	234	243·5	240	243·5
2318	70	79·5	76	79·5	2360	238	247·5	244	247·5
2319	74	83·5	80	83·5	2361	242	251·5	248	251·5
2320	78 +0 −1·0	87·5	84	87·5	2362	246	255·5	252	255·5
2321	82	91·5	88	91·5	2363	250	259·5	256	259·5
2322	86	95·5	92	95·5	2364	254	263·5	260	263·5
2323	90	99·5	96	99·5	2365	258	267·5	264	267·5
2324	94	103·5	100	103·5	2366	262	271·5	268	271·5
2325	98	107·5	104	107·5	2367	266	275·5	272	275·5
2326	102	111·5	108	111·5	2368	270	279·5	276	279·5
2327	106	115·5	112	115·5	2369	274 +0 −2·0	283·5	280	283·5
2328	110 +0 −1·25	119·5	116	119·5	2370	278	287·5	284	287·5
2329	114	123·5	120	123·5	2371	282	291·5	288	291·5
2330	118	127·5	124	127·5	2372	286	295·5	292	295·5
2331	122	131·5	128	131·5	2373	290	299·5	296	299·5
2332	126	135·5	132	135·5	2374	294	303·5	300	303·5
2333	130	139·5	136	139·5	2375	298	307·5	304	307·5
2334	134	143·5	140	143·5	2376	302	311·5	308	311·5
2335	138	147·5	144	147·5	2377	306	315·5	312	315·5
2336	142	151·5	148	151·5	2378	310	319·5	316	319·5
2337	146 +0 −1·5	155·5	152	155·5	2379	314	323·5	320	323·5
2338	150	159·5	156	159·5	2380	318	327·5	324	327·5
2339	154	163·5	160	163·5	2381	322	331·5	328	331·5
2340	158	167·5	164	167·5	2382	326	335·5	332	335·5
2341	162	171·5	168	171·5	2383	330	339·5	336	339·5
2342	166	175·5	172	175·5	2384	334	343·5	340	343·5
2343	170 +0 −1·75	179·5	176	179·5	2385	338	347·5	344	347·5
2344	174	183·5	180	183·5	2386	342	351·5	348	351·5
					2387	346	355·5	352	355·5
					2388	350	359·5	356	359·5

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VICKERS AVIATION LIMITED

FORK JOINTS (Table I)

LOW TENSILE TYPE

2 S.P.3

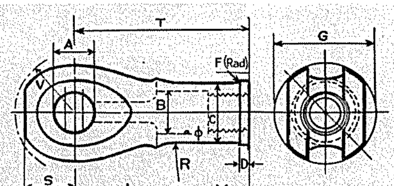
Design and Dimensions.—All Fork Joints (those in S.1. steel after coating) shall be in accordance with the dimensions and limits given in Table I, with the exception that those made in stainless steel shall have the collar D omitted. They may be tapped either right-hand or left-hand as may be necessary, and when ordering the hand shall be definitely specified.

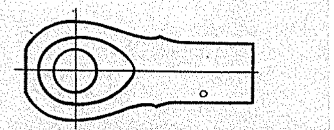
Material.—All Fork Joints shall be made from steel bars which have been inspected and passed by the Inspector as complying with the latest issue of B.S. Specification S.1. or B.S. Specification S.62 or S.80 where stainless steel is specified.

Manufacture.—(a) The Fork Joints shall be machined bright all over. (b) The screw threads of coated Fork Joints in S.1. steel and those of Fork Joints in stainless steel shall not be smaller than the maximum full, effective and core diameters specified for the bolts in Table II of B.S. Specification No. 93 for British Association Threads, or Table II of B.S. Specification No. 84 for British Standard Fine Threads. The screw threads of all Fork Joints (those in S.1. steel after being coated) shall be required to pass approved gauges.

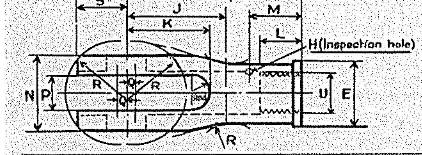
Anti-Corrosion Coating.—The finished Fork Joints in S.1. Steel shall be uniformly coated with zinc or cadmium by an approved process. The thickness of the coating shall be not less than 0·0003 inch. If the coating is electro-deposited the forks shall be heated to a suitable temperature between 100° C. and 200° C. for at least 30 minutes after coating.

Marking.—Each Fork Joint shall have the appropriate Part Number applied on the shank near the tapped end by rolling and shall also bear the identification mark of the Inspector. Each Fork Joint made in stainless steel shall in addition be marked with two " SS " adjacent to the Part Number.





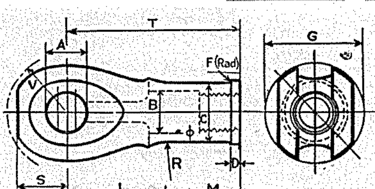
Sketch showing fork Joint with collar D omitted as a manufacturing mark for fork Joints made in stainless steel.

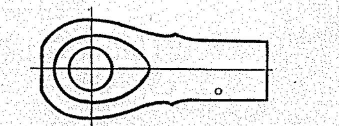


FORK JOINTS (Table I)—*continued*

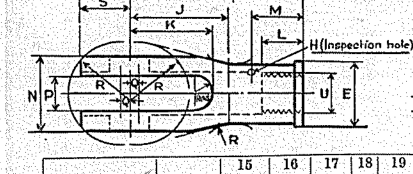
1		2	3	4	5	6	7	8	9	10	11	12	13	14	
Part No. (See Footnote) R.H. Thread	L.H. Thread	Size of Fork Joint	A +·001 +·005	B −0 +·01	C −0 +·01	D −0 +·015	E −0 +·015	F	G	H	J −0 +·04	K −0 +·015	L −0 +·04	M −0 +·04	Part No. of Standard Pin See Spec. 2 S.P. 4
			in.	in.	in.	in.	in.	in.	in. in.	in.	in.	in.	in.	in.	
412	412L	4 B.A.	5/32	5/32	·23	·07	·28	·05	·36 −0 +·015	1/16	·40	·35	·20	·30	338/2
413	413L	2 ,,	3/16	3/16	·28	·08	·32	·05	·48 −0 +·015	1/16	·50	·40	·25	·35	383/19
411	411L	7/32 B.S.F.	7/32	15/64	·34	·10	·40	·05	·56 −0 +·015	1/16	·53	·48	·25	·35	383/37
414	414L	1/4 ,,	1/4	17/64	·385	·11	·48	·05	·62 −·010 +·005	1/16	·60	·50	·30	·40	383/54
415	415L	9/32 ,,	9/32	19/64	·44	·12	·50	·05	·72 −0 +·015	1/16	·78	·60	·30	·40	383/72
416	416L	5/16 ,,	11/32	21/64	·49	·12	·56	·05	·86 −0 +·015	1/16	·78	·70	·35	·45	383/106
417	417L	11/32 ,,	11/32	23/64	·54	·15	·62	·05	·90 −0 +·015	1/16	·78	·70	·35	·45	383/107
418	418L	3/8 ,,	13/32	25/64	·58	·15	·66	·05	1·00 −·010 +·005	1/16	·90	·80	·40	·50	383/140
419	419L	13/32 ,,	7/16	27/64	·63	·15	·71	·05	1·06 −·010 +·005	1/16	1·05	·95	·45	·55	383/156
420	420L	7/16 ,,	15/32	29/64	·68	·15	·76	·05	1·14 −0 +·015	1/16	1·1	1·0	·45	·55	383/173
421	421L	15/32 ,,	1/2	31/64	·73	·15	·81	·05	1·20 −0 +·015	1/16	1·25	1·1	·50	·60	383/191
422	422L	1/2 ,,	17/32	33/64	·77	·15	·85	·05	1·26 −·020 +0	1/16	1·3	1·17	·55	·65	383/208

NOTE.—Where Fork Joints are required to be in stainless steel (S.62 or S.80) the Part Numbers in the blue print schedules must bear the Suffix Letters S.S. e.g. 412 S.S., 413 L.S.S.





Sketch showing fork Joint with collar D omitted as a manufacturing mark for fork Joints made in stainless steel.

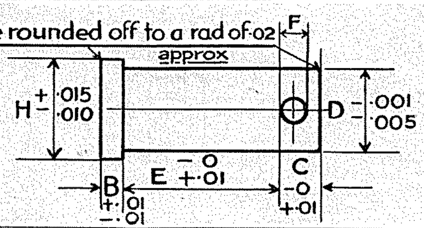


FORK JOINTS (Table I)—*continued*

			15	16	17	18	19	20	21	22	23	24	25
Part No. (See Footnote) R.H. Thread	L.H. Thread	Size of Fork Joint	N −0 +·015	P −0 +·01	Q −0 +·01	R	S −0 +·01	T −0 +·04	U R.H. or L.H. Thread	V Pin Drill Rod	Minimum Ultimate Tensile Strength	Approx. Weight	Part No. of Standard Pin See Spec. 2 S.P. 4
			in.	in.	in.	in.	in.	in.		in.	lb.	lb.	
412	412L	4 B.A.	·26	·10	·04	·18	·19	1·1	4 B.A.	·23	1155	·010	383/2
413	413L	2 ,,	·33	·15	·06	·24	·24	1·3	2 ,,	·31	2090	·016	383/19
411	411L	7/32 B.S.F.	·42	·20	·05	·28	·27	1·5	7/32 B.S.F.	·34	2860	·030	383/37
414	414L	1/4 ,,	·48	·20	·08	·31	·30	1·5	1/4 ,,	·39	3795	·046	383/54
415	415L	9/32 ,,	·58	·20	·08	·36	·34	1·7	9/32 ,,	·45	5115	·076	383/72
416	416L	5/16 ,,	·68	·25	·05	·43	·37	1·85	5/16 ,,	·50	6270	·104	383/106
417	417L	11/32 ,,	·73	·25	·09	·45	·39	1·90	11/32 ,,	·55	7865	·135	383/107
418	418L	3/8 ,,	·78	·30	·12	·50	·44	2·1	3/8 ,,	·62	9350	·168	383/140
419	419L	13/32 ,,	·78	·34	·13	·53	·54	2·35	13/32 ,,	·67	11275	·208	383/156
420	420L	7/16 ,,	·83	·36	·18	·57	·58	2·45	7/16 ,,	·74	12980	·250	383/173
421	421L	15/32 ,,	·93	·38	·13	·60	·62	2·6	15/32 ,,	·74	15180	·293	383/191
422	422L	1/2 ,,	·98	·40	·18	·63	·64	2·7	1/2 ,,	·81	17050	·334	383/208

NOTE.—Where Fork Joints are required to be in stainless steel (S.62 or S.80) the Part Numbers in the blue print schedules must bear the Suffix Letters S.S. e.g. 412 S.S., 413 L.S.S.

PINS (2.S.P.4.)



Dia. of Pin D	H	B	C	F Standard Drill Size		Lengths E (inches)															
ins.	ins.	ins.	ins.	ins.		·25	·30	·35	·40	·45	·50	·55	·60	·65	·70	·75	·80	·85	·90	·95	1·00
5/32	1/4	·05	·12	·070		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/16	5/16	·06	·12	·070		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
7/32	5/16	·07	·12	·070		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1/4	3/8	·08	·12	·070		49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
9/32	3/8	·09	·18	·104		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
5/16	7/16	·10	·18	·104		81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
11/32	7/16	·11	·18	·104		97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
3/8	1/2	·12	·18	·104		113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
13/32	1/2	·13	·25	·136		129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
7/16	9/16	·14	·25	·136	Part No. 383	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
15/32	9/16	·15	·25	·136		161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
1/2	5/8	·16	·25	·136		177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
17/32	5/8	·17	·25	·136		193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
9/16	11/16	·17	·31	·166							214	215	216	217	218	219	220	221	222	223	224
19/32	23/32	·17	·31	·166													225	226	227	228	229
5/8	3/4	·17	·31	·166							230	231	232	233	234	235	236	237	238	239	240
21/32	13/16	·17	·31	·166							246	247	248	249	250	251	252	253	254	255	256
11/16	7/8	·17	·31	·166							262	263	264	265	266	267	268	269	270	271	272
3/4	15/16	·17	·31	·166																	
13/16	1·0	·17	·37	·199																	
7/8	1 1/16	·17	·37	·199																	
15/16	1 1/8	·17	·37	·199																	
1·0	1 3/16	·17	·37	·199																	
1 1/16	1 1/4	·17	·43	·261																	

PINS (2.S.P.4.)—*continued*

Dia. of Pin D	H	B	C	F Standard Drill Size		Lengths E (inches)																			
ins.	ins.	ins.	ins.	ins.		1·10	1·20	1·30	1·40	1·50	1·60	1·70	1·80	1·90	2·00	2·20	2·40	2·60	2·80	3·00	3·20	3·40
5/32	1/4	·05	·12	·070																		
3/16	5/16	·06	·12	·070		1	2	3	4	5	6	7	8	9	10							
7/32	5/16	·07	·12	·070		21	22	23	24	25	26	27	28	29	30							
1/4	3/8	·08	·12	·070		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
9/32	3/8	·09	·18	·104		71	72	73	74	75	76	77	78	79	80	81	82	83	84	85		
5/16	7/16	·10	·18	·104		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115		
11/32	7/16	·11	·18	·104		131	132	133	134	135	136	137	138	139	140	141	142	143	144	145		
3/8	1/2	·12	·18	·104		161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177
13/32	1/2	·13	·25	·136		191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
7/16	9/16	·14	·25	·136		221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237
15/32	9/16	·15	·25	·136	Part No. 384	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267
1/2	5/8	·16	·25	·136		281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297
17/32	5/8	·17	·25	·136		311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327
9/16	11/16	·17	·31	·166		341	342	343	344	345	346	347	348	349	350	351	352	253	354	355	356	357
19/32	23/32	·17	·31	·166		358	359	360	361	362	363	364	365	366	367	368	369	370				
5/8	3/4	·17	·31	·166		371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387
21/32	13/16	·17	·31	·166		388	389	390	391	392	393	394	395	396	397	398	399	400				
11/16	7/8	·17	·31	·166		401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417
3/4	15/16	·17	·31	·166		431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447
13/16	1·0	·17	·37	·199		461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477
7/8	1 1/16	·17	·37	·199		491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507
15/16	1 1/8	·17	·37	·199		521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537
1·0	1 3/16	·17	·37	·199		551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567
1 1/16	1 1/4	·17	·43	·261					584	585	586	587	588	589	590	591	592	593	594	595	596	597

PINS (2.S.P.4.)—*continued*

NOTE.—Pins to the Part Numbers in the table below are used on the Standard Plain Forks for Streamline Wires and Tie Rods.

A.G.S. No.	383/2	383/19	383/37	383/54	383/72	383/106	383/107	383/140	383/156	383/173
Size of Fork	4 BA	2 BA	$\frac{7}{32}$ in. B.S.F.	$\frac{1}{4}$ in. B.S.F.	$\frac{9}{32}$ in. B.S.F.	$\frac{5}{16}$ in. B.S.F.	$\frac{11}{32}$ in. B.S.F.	$\frac{3}{8}$ in. B.S.F.	$\frac{13}{32}$ in. B.S.F.	$\frac{7}{16}$ in. B.S.F.

A.G.S. No.	383/191	383/208	383/221	383/228	384/371	384/401	384/433	384/464	384/526	384/588
Size of Fork	$\frac{15}{32}$ in. B.S.F.	$\frac{1}{2}$ in. B.S.F.	$\frac{9}{16}$ in. B.S.F.	$\frac{5}{8}$ in. B.S.F.	$\frac{11}{16}$ in. B.S.F.	$\frac{3}{4}$ in. B.S.F.	$\frac{7}{8}$ in. B.S.F.	1 in. B.S.F.	$1\frac{1}{8}$ in. B.S.F.	$1\frac{1}{4}$ in. B.S.F.
			A.G.S. Fork Joints							

PINS (Non-Corrosive Steel)

(*See* Diagram on page 126.)

Dia. of Pin D ins.	H ins.	B ins.	C ins.	F Standard Drill Size ins.		Lengths E (inches)															
						·25	·30	·35	·40	·45	·50	·55	·60	·65	·70	·75	·80	·85	·90	·95	1·00
5/32	1/4	·05	·12	·070		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/16	5/16	·06	·12	·070		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
7/32	5/16	·07	·12	·070		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1/4	3/8	·08	·12	·070		49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
9/32	3/8	·09	·18	·104		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
5/16	7/16	·10	·18	·104		81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
11/32	7/16	·11	·18	·104		97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
3/8	1/2	·12	·18	·104		113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
13/32	1/2	·13	·25	·136		129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
7/16	9/16	·14	·25	·136		145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
15/32	9/16	·15	·25	·136	V.G.S. 783	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
1/2	5/8	·16	·25	·136		177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
17/32	5/8	·17	·25	·136		193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
9/16	11/16	·17	·31	·166							214	215	216	217	218	219	220	221	222	223	224
19/32	23/32	·17	·31	·166													225	226	227	228	229
5/8	3/4	·17	·31	·166							230	231	232	233	234	235	236	237	238	239	240
21/32	13/16	·17	·31	·166							246	247	248	249	250	251	252	253	254	255	256
11/16	7/8	·17	·31	·166							262	263	264	265	266	267	268	269	270	271	272
3/4	15/16	·17	·31	·166																	
13/16	1·0	·17	·37	·199																	
7/8	1 1/16	·17	·37	·199																	
15/16	1 1/8	·17	·37	·199																	
1·0	1 3/16	·17	·37	·199																	
1 1/16	1 1/4	·17	·43	·261																	

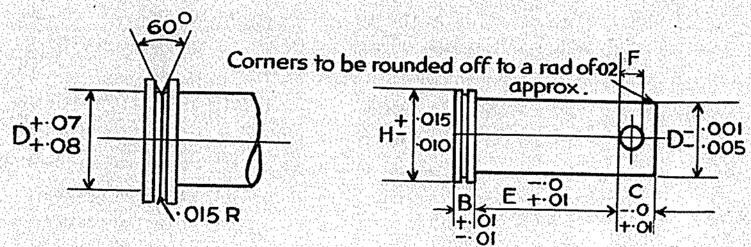
PINS (Non-Corrosive Steel)—*continued*

Dia. of Pin D ins.	H ins.	B ins.	C ins.	F Standard Drill Size ins.		Lengths E (inches)																
						1·10	1·20	1·30	1·40	1·50	1·60	1·70	1·80	1·90	2·00	2·20	2·40	2·60	2·80	3·00	3·20	3·40
5/32	1/4	·05	·12	·070																		
3/16	5/16	·06	·12	·070		1	2	3	4	5	6	7	8	9	10							
7/32	5/16	·07	·12	·070		21	22	23	24	25	26	27	28	29	30							
1/4	3/8	·08	·12	·070		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
9/32	3/8	·09	·18	·104		71	72	73	74	75	76	77	78	79	80	81	82	83	84	85		
5/16	7/16	·10	·18	·104		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115		
11/32	7/16	·11	·18	·104		131	132	133	134	135	136	137	138	139	140	141	142	143	144	145		
3/8	1/2	·12	·18	·104		161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177
13/32	1/2	·13	·25	·136		191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
7/16	9/16	·14	·25	·136	V.G.S. 784	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237
15/32	9/16	·15	·25	·136		251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267
1/2	5/8	·16	·25	·136		281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297
17/32	5/8	·17	·25	·136		311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327
9/16	11/16	·17	·31	·166		341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357
19/32	23/32	·17	·31	·166		358	359	360	361	362	363	364	365	366	367	368	369	370				
5/8	3/4	·17	·31	·166		371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387
21/32	13/16	·17	·31	·166		388	389	390	391	392	393	394	395	396	397	398	399	400				
11/16	7/8	·17	·31	·166		401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417
3/4	15/16	·17	·31	·166		431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447
13/16	1·0	·17	·37	·199		461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477
7/8	1 1/16	·17	·37	·199		491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507
15/16	1 1/8	·17	·37	·199		521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537
1·0	1 3/16	·17	·37	·199		551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567
1 1/16	1 1/4	·17	·43	·261					584	585	586	587	588	589	590	591	592	593	594	595	596	597

PINS (Non-Corrosive Steel)—*continued*

NOTE.—Pins to the Part Numbers in the table below are used on the Standard Plain Forks for Streamline Wires and Tie Rods.

V.G.S. No.	783/2	783/19	783/37	783/54	783/72	783/106	783/107	783/140	783/156	783/173
Size of Fork	4 BA	2 BA	$\frac{7}{32}$ in. B.S.F.	$\frac{1}{4}$ in. B.S.F.	$\frac{9}{32}$ in. B.S.F.	$\frac{5}{16}$ in. B.S.F.	$\frac{11}{32}$ in. B.S.F.	$\frac{3}{8}$ in. B.S.F.	$\frac{13}{32}$ in. B.S.F.	$\frac{7}{16}$ in. B.S.F.
V.G.S. No.	783/191	783/208	783/221	783/228	784/371	784/401	784/433	784/464	784/526	784/588
Size of Fork	$\frac{15}{32}$ in. B.S.F.	$\frac{1}{2}$ in. B.S.F.	$\frac{9}{16}$ in. B.S.F.	$\frac{5}{8}$ in. B.S.F.	$\frac{11}{16}$ in. B.S.F.	$\frac{3}{4}$ in. B.S.F.	$\frac{7}{8}$ in. B.S.F.	1 in. B.S.F.	$1\frac{1}{8}$ in. B.S.F.	$1\frac{1}{4}$ in. B.S.F.
			A.G.S. Fork Joints							



USEFUL TABLES

The following pages are inserted in the belief that they will be of value to members of the technical staffs of aircraft manufacturers.

	PAGE
Bolts	128 to 132, 137, 138
Nuts	133 to 136, 139
Colour Scheme for Metals, Standard	140 to 144
Gauges, Equivalents (English and Metric)	145
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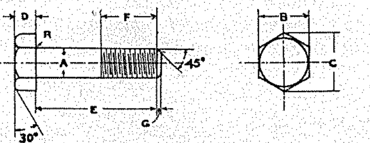
[4 A 1. *June, 1931.*]

(Cancelling B.S. Specification 3 A 1.)

TABLE I.

BRITISH ASSOCIATION AND BRITISH STANDARD FINE BOLTS.



For Length of Shank (E) and Length of Screwing (F), see Table II.

1	2		3	4	5	6	7	8	9	10	11	12	13
	Bolt.										Split Pin.		
Diameter of Bolt A.	Tolerance on Diameter of Shank.		Width across Flats B.		Width across Corners C.	Thickness D.		Radius under Bolt Head R.	Depth of Chamfer G.		Dia. of Pin.	Over-all Lgth. of Pin.	Size of Drill for Pin Hole.
			Min.	Max.	Approx. Max.	Min.	Max.		Min.	Max.			
	in. +	in. —	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
6 B.A. (2·8 mm.)	0	·0030	0·190	0·193	0·22	0·078	0·083	0·02	0·015	0·020	—	—	—
4 B.A. (3·6 „)	0	·0030	0·245	0·248	0·29	0·100	0·106	0·02	0·020	0·030	—	—	—
2 B.A. (4·7 „)	0	·0030	0·321	0·324	0·37	0·132	0·139	0·02	0·030	0·040	1/16	1	0·070
inch	+	—											
7/32 B.S.F. (0·2188)	0	·0035	0·410	0·413	0·48	0·15	0·16	0·03	0·030	0·040	1/16	1	0·070
1/4 „ (0·25)	0	·0035	0·440	0·445	0·51	0·18	0·19	0·03	0·030	0·040	1/16	1	0·070
9/32 „ (0·2813)	0	·0035	0·520	0·525	0·61	0·21	0·22	0·03	0·030	0·040	1/16	1	0·070
5/16 „ (0·3125)	0	·0035	0·520	0·525	0·61	0·21	0·22	0·03	0·030	0·040	1/16	1	0·070
3/8 „ (0·375)	0	·0035	0·595	0·600	0·69	0·26	0·27	0·03	0·030	0·040	1/16	1	0·070
7/16 „ (0·4375)	0	·0040	0·705	0·710	0·82	0·32	0·33	0·03	0·040	0·050	3/32	1¼	0·104
1/2 „ (0·5)	0	·0040	0·815	0·820	0·95	0·37	0·38	0·03	0·040	0·050	3/32	1¼	0·104
9/16 „ (0·5625)	0	·0040	0·915	0·920	1·06	0·43	0·44	0·03	0·040	0·050	1/8	1¼	0·136
5/8 „ (0·625)	0	·0060	1·002	1·010	1·17	0·48	0·49	0·03	0·050	0·060	1/8	1½	0·136
11/16 „ (0·6875)	0	·0060	1·092	1·100	1·27	0·54	0·55	0·03	0·050	0·060	1/8	1¾	0·136
3/4 „ (0·75)	0	·0060	1·192	1·200	1·39	0·59	0·60	0·03	0·065	0·075	5/32	1¾	0·166
13/16 „ (0·8125)	0	·0060	1·192	1·200	1·39	0·62	0·63	0·03	0·065	0·075	5/32	1¾	0·166
7/8 „ (0·875)	0	·0080	1·292	1·300	1·50	0·65	0·66	0·03	0·065	0·075	5/32	2	0·166
15/16 „ (0·9375)	0	·0080	1·382	1·390	1·61	0·70	0·71	0·03	0·065	0·075	5/32	2	0·166
1 „ (1·0)	0	·0080	1·468	1·480	1·71	0·76	0·77	0·03	0·065	0·075	3/16	2¼	0·199

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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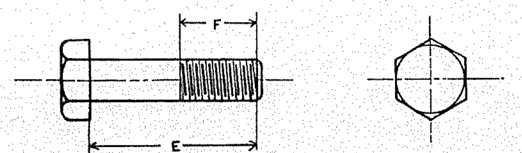
[4 A 1. *June, 1931.*]

(Cancelling B.S. Specification 3 A. 1.)

TABLE II.

LENGTH OF SHANK AND LENGTH OF SCREWING FOR BRIGHT STEEL BOLTS.



For Dimensions of Heads, see Table I.

6 B.A.			4 B.A.			2 B.A.		
Part No.	E + ·04 in. —0	F + ·04 in. —0	Part No.	E + ·04 in. —0	F + ·04 in. —0	Part No.	E + ·04 in. —0	F + ·04 in. —0
	in.	in.		in.	in.		in.	in.
A 4	0·4	0·35	B 4	0·4	0·35	C 4	0·4	0·35
A 6	0·6	0·45	B 6	0·6	0·45	C 6	0·6	0·50
A 8	0·8	0·45	B 8	0·8	0·45	C 8	0·8	0·50
A 10	1·0	0·45	B 10	1·0	0·45	C 10	1·0	0·50
A 14	1·4	0·65	B 14	1·4	0·65	C 14	1·4	0·70
A 18	1·8	0·65	B 18	1·8	0·65	C 18	1·8	0·70
A 22	2·2	0·65	B 22	2·2	0·65	C 22	2·2	0·70
A 26	2·6	0·65	B 26	2·6	0·65	C 26	2·6	0·70
A 30	3·0	0·65	B 30	3·0	0·65	C 30	3·0	0·70
A 35	3·5	0·70	B 35	3·5	0·70	C 35	3·5	0·80
A 40	4·0	0·70	B 40	4·0	0·70	C 40	4·0	0·80
A 45	4·5	0·70	B 45	4·5	0·70	C 45	4·5	0·80
A 50	5·0	0·70	B 50	5·0	0·70	C 50	5·0	0·80
A 55	5·5	1·00	B 55	5·5	1·00	C 55	5·5	1·00
A 60	6·0	1·00	B 60	6·0	1·00	C 60	6·0	1·00

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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(Cancelling B.S. Specification 3 A 1.)

TABLE II.—*continued.*

LENGTH OF SHANK AND LENGTH OF SCREWING FOR BRIGHT STEEL BOLTS.

For Dimensions of Heads, see Table I.

7/32 in. B.S.F.			1/4 in. B.S.F.			9/32 in. B.S.F.		
Part No.	E + ·04 in. —0	F + ·04 in. —0	Part No.	E + ·04 in. —0	F + ·04 in. —0	Part No.	E + ·04 in. —0	F + ·04 in. —0
	in.	in.		in.	in.		in.	in.
D 4	0·4	0·35	E 4	0·4	0·35	F 4	0·4	0·35
D 6	0·6	0·55	E 6	0·6	0·55	F 6	0·6	0·60
D 8	0·8	0·55	E 8	0·8	0·55	F 8	0·8	0·60
D 10	1·0	0·55	E 10	1·0	0·55	F 10	1·0	0·60
D 14	1·4	0·75	E 14	1·4	0·75	F 14	1·4	0·80
D 18	1·8	0·75	E 18	1·8	0·75	F 18	1·8	0·80
D 22	2·2	0·75	E 22	2·2	0·75	F 22	2·2	0·80
D 26	2·6	0·75	E 26	2·6	0·75	F 26	2·6	0·80
D 30	3·0	0·75	E 30	3·0	0·75	F 30	3·0	0·80
D 35	3·5	0·80	E 35	3·5	0·80	F 35	3·5	0·90
D 40	4·0	0·80	E 40	4·0	0·80	F 40	4·0	0·90
D 45	4·5	0·80	E 45	4·5	0·80	F 45	4·5	0·90
D 50	5·0	0·80	E 50	5·0	0·80	F 50	5·0	0·90
D 55	5·5	1·00	E 55	5·5	1·00	F 55	5·5	1·00
D 60	6·0	1·00	E 60	6·0	1·00	F 60	6·0	1·00

5/16 in. B.S.F.			3/8 in. B.S.F.			7/16 in. B.S.F.		
Part No.	E + ·04 in. —0	F + ·04 in. —0	Part No.	E + ·04 in. —0	F + ·08 in. —0	Part No.	E + ·04 in. —0	F + ·08 in. —0
	in.	in.		in.	in.		in.	in.
G 4	0·4	0·35						
G 6	0·6	0·60	J 6	0·6	0·55			
G 8	0·8	0·60	J 8	0·8	0·65	L 8	0·8	0·70
G 10	1·0	0·60	J 10	1·0	0·65	L 10	1·0	0·70
G 14	1·4	0·80	J 14	1·4	0·85	L 14	1·4	0·90
G 18	1·8	0·80	J 18	1·8	0·85	L 18	1·8	0·90
G 22	2·2	0·80	J 22	2·2	0·85	L 22	2·2	0·90
G 26	2·6	0·80	J 26	2·6	0·85	L 26	2·6	0·90
G 30	3·0	0·80	J 30	3·0	0·85	L 30	3·0	0·90
G 35	3·5	0·90	J 35	3·5	0·95	L 35	3·5	1·05
G 40	4·0	0·90	J 40	4·0	0·95	L 40	4·0	1·05
G 45	4·5	0·90	J 45	4·5	0·95	L 45	4·5	1·05
G 50	5·0	0·90	J 50	5·0	0·95	L 50	5·0	1·05
G 55	5·5	1·00	J 55	5·5	1·00	L 55	5·5	1·05
G 60	6·0	1·00	J 60	6·0	1·00	L 60	6·0	1·05

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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[4 A 1. June, 1931.]

(Cancelling B.S. Specification 3 A. 1.)

TABLE II.—*continued.*

1/2 in. B.S.F.			9/16 in. B.S.F.			5/8 in. B.S.F.		
Part No.	E + ·04 in. —0	F + ·08 in. —0	Part No.	E + ·04 in. —0	F + ·08 in. —0	Part No.	E + ·04 in. —0	F +0·1 in. —0
	in.	in.		in.	in.		in.	in.
N 8	0·8	0·75						
N 10	1·0	0·75	P 10	1·0	0·90	Q 10	1·0	0·90
N 14	1·4	1·00	P 14	1·4	1·00	Q 14	1·4	1·00
N 18	1·8	1·00	P 18	1·8	1·00	Q 18	1·8	1·00
N 22	2·2	1·00	P 22	2·2	1·00	Q 22	2·2	1·00
N 26	2·6	1·00	P 26	2·6	1·00	Q 26	2·6	1·00
N 30	3·0	1·00	P 30	3·0	1·00	Q 30	3·0	1·00
N 35	3·5	1·10	P 35	3·5	1·10	Q 35	3·5	1·10
N 40	4·0	1·10	P 40	4·0	1·10	Q 40	4·0	1·10
N 45	4·5	1·10	P 45	4·5	1·10	Q 45	4·5	1·10
N 50	5·0	1·10	P 50	5·0	1·10	Q 50	5·0	1·10
N 55	5·5	1·10	P 55	5·5	1·10	Q 55	5·5	1·10
N 60	6·0	1·10	P 60	6·0	1·10	Q 60	6·0	1·10

11/16 in. B.S.F.			3/4 in. B.S.F.			13/16 in. B.S.F.		
Part No.	E + ·04 in. —0	F +0·1 in. —0	Part No.	E + ·04 in. —0	F +0·1 in. —0	Part No.	E + ·04 in. —0	F +0·1 in. —0
	in.	in.		in.	in.		in.	in.
R 10	1·0	0·90	S 10	1·0	0·90	T 10	1·0	0·90
R 14	1·4	1·00	S 14	1·4	1·10	T 14	1·4	1·10
R 18	1·8	1·00	S 18	1·8	1·10	T 18	1·8	1·10
R 22	2·2	1·00	S 22	2·2	1·10	T 22	2·2	1·10
R 26	2·6	1·00	S 26	2·6	1·10	T 26	2·6	1·10
R 30	3·0	1·00	S 30	3·0	1·10	T 30	3·0	1·10
R 35	3·5	1·10	S 35	3·5	1·20	T 35	3·5	1·20
R 40	4·0	1·10	S 40	4·0	1·20	T 40	4·0	1·20
R 45	4·5	1·10	S 45	4·5	1·20	T 45	4·5	1·20
R 50	5·0	1·10	S 50	5·0	1·20	T 50	5·0	1·20
R 55	5·5	1·10	S 55	5·5	1·20	T 55	5·5	1·20
R 60	6·0	1·10	S 60	6·0	1·20	T 60	6·0	1·20

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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[**4 A 1.** *June,* 1931.]
Cancelling B.S. Specification 3 A. 1.)

TABLE II.—*continued.*

7/8 in. B.S.F.			15/16 in. B.S.F.			1 in. B.S.F.		
Part No.	E + ·06 in. —0	F +0·1 in. —0	Part No.	E + ·06 in. —0	F +0·1 in. —0	Part No.	E + ·06 in. —0	F +0·1 in. —0
	in.	in.		in.	in.		in.	in.
U 14	1·4	1·20	V 14	1·4	1·20	W 14	1·4	1·20
U 18	1·8	1·30	V 18	1·8	1·30	W 18	1·8	1·30
U 22	2·2	1·30	V 22	2·2	1·30	W 22	2·2	1·30
U 26	2·6	1·30	V 26	2·6	1·30	W 26	2·6	1·30
U 30	3·0	1·30	V 30	3·0	1·30	W 30	3·0	1·30
U 35	3·5	1·40	V 35	3·5	1·40	W 35	3·5	1·40
U 40	4·0	1·40	V 40	4·0	1·40	W 40	4·0	1·40
U 45	4·5	1·40	V 45	4·5	1·40	W 45	4·5	1·40
U 50	5·0	1·40	V 50	5·0	1·40	W 50	5·0	1·40
U 55	5·5	1·40	V 55	5·5	1·40	W 55	5·5	1·40
U 60	6·0	1·40	V 60	6·0	1·40	W 60	6·0	1·40

Specification: Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

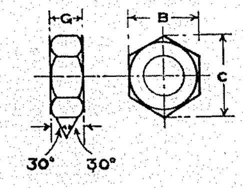
Note.

When intermediate lengths of bolts are required the length of the screwed portion (F) shall be equal to that of the next longer Standard size bolt in Table II. Such intermediate lengths of bolts should be ordered under the same system of Part Numbering, *e.g.* C 325 denotes a 2 B.A. bolt having an E length of 3·25 inches and an F length of 0·80 inch.

[**4 A 1.** *June,* 1931.]
(*Cancelling B.S. Specification* 3 A. 1.)

TABLE III.

NUTS (ORDINARY)



1	2		3	4	5	6	7
Nominal Size.	Part No.		Width across Flats B.		Width across Corners C.	Thickness G.	
	Rt. Hd. Thd.	Lt. Hd. Thd.	Min.	Max.	Approx. Max.	Min.	Max.
			in.	in.	in.	in.	in.
6 B.A.	AP	APL	0·190	0·193	0·22	0·100	0·110
4 B.A.	BP	BPL	0·245	0·248	0·29	0·132	0·142
2 B.A.	CP	CPL	0·321	0·324	0·37	0·175	0·185
7/32 in. B.S.F.	DP	DPL	0·410	0·413	0·48	0·161	0·171
1/4 ,,	EP	EPL	0·440	0·445	0·51	0·190	0·200
9/32 ,,	FP	FPL	0·520	0·525	0·61	0·215	0·225
5/16 ,,	GP	GPL	0·520	0·525	0·61	0·240	0·250
3/8 ,,	JP	JPL	0·595	0·600	0·69	0·302	0·312
7/16 ,,	LP	LPL	0·705	0·710	0·82	0·365	0·375
1/2 ,,	NP	NPL	0·815	0·820	0·95	0·427	0·437
9/16 ,,	PP	PPL	0·915	0·920	1·06	0·490	0·500
5/8 ,,	QP	QPL	1·002	1·010	1·17	0·552	0·562
11/16 ,,	RP	RPL	1·092	1·100	1·27	0·615	0·625
3/4 ,,	SP	SPL	1·192	1·200	1·39	0·677	0·687
13/16 ,,	TP	TPL	1·192	1·200	1·39	0·708	0·718
7/8 ,,	UP	UPL	1·292	1·300	1·50	0·740	0·750
15/16 ,,	VP	VPL	1·382	1·390	1·61	0·802	0·812
1 ,,	WP	WPL	1·468	1·480	1·71	0·865	0·875

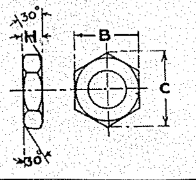
Specification: Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

[4 A 1. *June, 1931.*]

(Cancelling B.S. Specification 3 A. 1.)

TABLE IV.

LOCK NUTS.



1	2		3	4	5	6	7
Nominal Size.	Part No.		Width across Flats B.		Width across Corners C.	Thickness H.	
	Rt. Hd. Thd.	Lt. Hd. Thd.	Min.	Max.	Approx. Max.	Min.	Max.
			in.	in.	in.	in.	in.
6 B.A.	AT	ATL	0·190	0·193	0·22	0·063	0·073
4 B.A.	BT	BTL	0·245	0·248	0·29	0·085	0·095
2 B.A.	CT	CTL	0·321	0·324	0·37	0·113	0·123
7/32 in. B.S.F.	DT	DTL	0·410	0·413	0·48	0·104	0·114
1/4 "	ET	ETL	0·440	0·445	0·51	0·123	0·133
9/32 "	FT	FTL	0·520	0·525	0·61	0·140	0·150
5/16 "	GT	GTL	0·520	0·525	0·61	0·156	0·166
11/32 "	HT	HTL	0·560	0·565	0·65	0·176	0·186
3/8 "	JT	JTL	0·595	0·600	0·69	0·198	0·208
13/32 "	KT	KTL	0·650	0·655	0·76	0·220	0·230
7/16 "	LT	LTL	0·705	0·710	0·82	0·240	0·250
15/32 "	MT	MTL	0·760	0·765	0·88	0·260	0·270
1/2 "	NT	NTL	0·815	0·820	0·95	0·281	0·291
9/16 "	PT	PTL	0·915	0·920	1·06	0·323	0·333
5/8 "	QT	QTL	1·002	1·010	1·17	0·365	0·375
11/16 "	RT	RTL	1·092	1·100	1·27	0·406	0·416
3/4 "	ST	STL	1·192	1·200	1·39	0·448	0·458
13/16 "	TT	TTL	1·192	1·200	1·39	0·470	0·480
7/8 "	UT	UTL	1·292	1·300	1·50	0·490	0·500
15/16 "	VT	VTL	1·382	1·390	1·61	0·530	0·540
1 "	WT	WTL	1·468	1·480	1·71	0·573	0·583
1 1/8 "	XT	XTL	1·658	1·670	1·93	0·656	0·666
1 1/4 "	YT	YTL	1·845	1·860	2·15	0·730	0·750

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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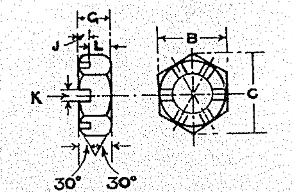
[4 A 1. *June, 1931.*]

(Cancelling B.S. Specification 3 A. 1).

TABLE V.

SLOTTED NUTS.



For Width across Flats and Corners (dimensions B & C) see Table III.

1	2		3	4	5	6	7	8
Nominal Size.	Part No.		Thickness G.		Slot		Face of Nut to Bottom of Slot L.	
	Rt. Hd. Thd.	Lt. Hd. Thd.	Min.	Max.	J.	K.	Min.	Max.
			in.	in.	in.	in.	in.	in.
2 B.A.	CS		0·240	0·250	0·090	0·080	0·150	0·160
7/32 in. B.S.F.	DS		0·240	0·250	0·090	0·090	0·150	0·160
1/4 "	ES		0·250	0·260	0·090	0·090	0·160	0·170
9/32 "	FS		0·260	0·270	0·090	0·090	0·170	0·180
5/16 "	GS		0·270	0·280	0·090	0·090	0·180	0·190
3/8 "	JS		0·302	0·312	0·090	0·090	0·212	0·222
7/16 "	LS		0·365	0·375	0·140	0·125	0·225	0·235
1/2 "	NS		0·427	0·437	0·140	0·125	0·287	0·297
9/16 "	PS		0·490	0·500	0·187	0·165	0·303	0·313
5/8 "	QS		0·552	0·562	0·187	0·165	0·365	0·375
11/16 "	RS		0·615	0·625	0·187	0·165	0·428	0·438
3/4 "	SS		0·677	0·687	0·234	0·208	0·443	0·453
13/16 "	TS		0·708	0·718	0·234	0·208	0·474	0·484
7/8 "	US		0·740	0·750	0·234	0·208	0·506	0·516
15/16 "	VS		0·802	0·812	0·240	0·208	0·562	0·572
1 "	WS		0·865	0·875	0·280	0·250	0·585	0·595

Specification : Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

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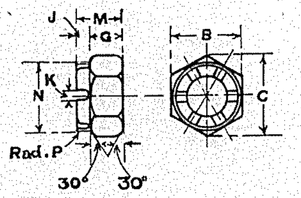
[**4 A 1.** *June*, 1931.]
(*Cancelling B.S. Specification* 3 A. 1.)

TABLE VI.

CASTLE NUTS.



For Width across Flats and Corners (dimensions B & C) see Table III.

Note.—The slots may be made rectangular as in the key plan to Table V, or rounded as in the key plan Table VI at the option of the manufacturer.

1	2	3	4	5	6	7	8	9	10	11
Nominal Size.	Part No.	Total Thickness M.		Thickness of Hexagon G.		Diameter N.		Radius of Edge.	Slot	
		Min.	Max.	Min.	Max.	Min.	Max.	P	J	K
		in.	in.	in.	in.	in.	in.	in.	in.	in.
7/32 in. B.S.F.	DC	0·251	0·261	0·161	0·171	0·395	0·400	0·04	0·090	0·090
1/4 ,,	EC	0·280	0·290	0·190	0·200	0·425	0·430	0·04	0·090	0·090
9/32 ,,	FC	0·305	0·315	0·215	0·225	0·500	0·510	0·05	0·090	0·090
5/16 ,,	GC	0·330	0·340	0·240	0·250	0·500	0·510	0·05	0·090	0·090
3/8 ,,	JC	0·392	0·402	0·302	0·312	0·575	0·585	0·05	0·090	0·090
7/16 ,,	LC	0·505	0·515	0·365	0·375	0·685	0·695	0·06	0·140	0·125
1/2 ,,	NC	0·567	0·577	0·427	0·437	0·795	0·805	0·06	0·140	0·125
9/16 ,,	PC	0·677	0·687	0·490	0·500	0·895	0·905	0·06	0·187	0·165
5/8 ,,	QC	0·739	0·749	0·552	0·562	0·985	0·995	0·07	0·187	0·165
11/16 ,,	RC	0·802	0·812	0·615	0·625	1·065	1·085	0·07	0·187	0·165
3/4 ,,	SC	0·911	0·921	0·677	0·687	1·165	1·185	0·08	0·234	0·208
13/16 ,,	TC	0·942	0·952	0·708	0·718	1·165	1·185	0·08	0·234	0·208
7/8 ,,	UC	0·974	0·984	0·740	0·750	1·265	1·285	0·08	0·234	0·208
15/16 ,,	VC	1·042	1·052	0·802	0·812	1·355	1·375	0·08	0·240	0·208
1 ,,	WC	1·145	1·155	0·865	0·875	1·445	1·465	0·09	0·280	0·250

Specification: Material to be steel to the latest issue of B.S. Specification S.1 or S.61 as may be specified.

[**4 A 1.** *June*, 1931.]
(*Cancelling B.S. Specification* 3 A. 1.)

APPENDIX

Tables showing the Relation between the Part Numbers in B.S. Specification 2 A 1 and those for the corresponding sizes in B.S. Specification 4 A 1.

TABLE 1.

BOLTS.

4 B.A.		2 B.A.		1/4 in. B.S.F.		5/16 in. B.S.F.		3/8 in. B.S.F.	
Part No.		Part No.		Part No.		Part No.		Part No.	
2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1
102 B	B 4	103 B	C 4	105 B	E 4	107 B	G 4	—	—
102 C	B 6	103 C	C 6	105 C	E 6	107 C	G 6	109 C	J 6
102 D	B 8	103 D	C 8	105 D	E 8	107 D	G 8	109 D	J 8
102 E	B 10	103 E	C 10	105 E	E 10	107 E	G 10	109 E	J 10
102 G	B 14	103 G	C 14	105 G	E 14	107 G	G 14	109 G	J 14
102 I	B 18	103 I	C 18	105 I	E 18	107 I	G 18	109 I	J 18
102 K	B 22	103 K	C 22	105 K	E 22	107 K	G 22	109 K	J 22
102 M	B 26	103 M	C 26	105 M	E 26	107 M	G 26	109 M	J 26
102 O	B 30	103 O	C 30	105 O	E 30	107 O	G 30	109 O	J 30
102 Q	B 35	103 Q	C 35	105 Q	E 35	107 Q	G 35	109 Q	J 35
102 S	B 40	103 S	C 40	105 S	E 40	107 S	G 40	109 S	J 40
102 U	B 45	103 U	C 45	105 U	E 45	107 U	G 45	109 U	J 45
102 W	B 50	103 W	C 50	105 W	E 50	107 W	G 50	109 W	J 50
102 X	B 55	103 X	C 55	105 X	E 55	107 X	G 55	109 X	J 55
102 Y	B 60	103 Y	C 60	105 Y	E 60	107 Y	G 60	109 Y	J 60

7/16 in. B.S.F.		1/2 in. B.S.F.		9/16 in. B.S.F.		5/8 in. B.S.F.		11/16 in. B.S.F.	
Part No.		Part No.		Part No.		Part No.		Part No.	
2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1
111 D	L 8	112 D	N 8	—	—	—	—	—	—
111 E	L 10	112 E	N 10	1001 E	P 10	1002 E	Q 10	1003 E	R 10
111 G	L 14	112 G	N 14	1001 G	P 14	1002 G	Q 14	1003 G	R 14
111 I	L 18	112 I	N 18	1001 I	P 18	1002 I	Q 18	1003 I	R 18
111 K	L 22	112 K	N 22	1001 K	P 22	1002 K	Q 22	1003 K	R 22
111 M	L 26	112 M	N 26	1001 M	P 26	1002 M	Q 26	1003 M	R 26
111 O	L 30	112 O	N 30	1001 O	P 30	1002 O	Q 30	1003 O	R 30
111 Q	L 35	112 Q	N 35	1001 Q	P 35	1002 Q	Q 35	1003 Q	R 35
111 S	L 40	112 S	N 40	1001 S	P 40	1002 S	Q 40	1003 S	R 40
111 U	L 45	112 U	N 45	1001 U	P 45	1002 U	Q 45	1003 U	R 45
111 W	L 50	112 W	N 50	1001 W	P 50	1002 W	Q 50	1003 W	R 50
111 X	L 55	112 X	N 55	1001 X	P 55	1002 X	Q 55	1003 X	R 55
111 Y	L 60	112 Y	N 60	1001 Y	P 60	1002 Y	Q 60	1003 Y	R 60

APPENDIX—*continued*

TABLE I.

Tables showing the Relation between the Part Numbers in B.S. Specification 2 A 1 and those for the corresponding sizes in B.S. Specification 4 A 1.

BOLTS.

3/4 in. B.S.F.		13/16 in. B.S.F.		7/8 in. B.S.F.		15/16 in. B.S.F.		1 in. B.S.F.	
Part No.		Part No.		Part No.		Part No.		Part No.	
2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1	2 A 1	4 A 1
1004 E	S 10	1005 E	T 10	—	—	—	—	—	—
1004 G	S 14	1005 G	T 14	1006 G	U 14	1007 G	V 14	1008 G	W 14
1004 I	S 18	1005 I	T 18	1006 I	U 18	1007 I	V 18	1008 I	W 18
1004 K	S 22	1005 K	T 22	1006 K	U 22	1007 K	V 22	1008 K	W 22
1004 M	S 26	1005 M	T 26	1006 M	U 26	1007 M	V 26	1008 M	W 26
1004 O	S 30	1005 O	T 30	1006 O	U 30	1007 O	V 30	1008 O	W 30
1004 Q	S 35	1005 Q	T 35	1006 Q	U 35	1007 Q	V 35	1008 Q	W 35
1004 S	S 40	1005 S	T 40	1006 S	U 40	1007 S	V 40	1008 S	W 40
1004 U	S 45	1005 U	T 45	1006 U	U 45	1007 U	V 45	1008 U	W 45
1004 W	S 50	1005 W	T 50	1006 W	U 50	1007 W	V 50	1008 W	W 50
1004 X	S 55	1005 X	T 55	1006 X	U 55	1007 X	V 55	1008 X	W 55
1004 Y	S 60	1005 Y	T 60	1006 Y	U 60	1007 Y	V 60	1008 Y	W 60

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VICKERS AVIATION LIMITED

[4 A 1. *June,* 1931]
(Cancelling B.S. Specification 3 A. 1.)

TABLE II.

NUTS (ORDINARY).

Size	Part No.	
	2 A 1	4 A 1
4 B.A.	115 C	BP
2 B.A.	115 B	CP
1/4 in. B.S.F.	116 A	EP
5/16 „	116 C	GP
3/8 „	116 E	JP
7/16 „	116 G	LP
1/2 „	116 H	NP
9/16 „	116 J	PP
5/8 „	116 K	QP
11/16 „	116 L	RP
3/4 „	116 M	SP
13/16 „	116 N	TP
7/8 „	116 P	UP
15/16 „	116 Q	VP
1 „	116 R	WP

TABLE III.

LOCK NUTS.

Size.	Part No.	
	2 A 1	4 A 1
4 B.A.	115 C	BT
2 B.A.	115 B	CT
1/4 in. B.S.F.	117 A	ET
5/16 „	117 C	GT
3/8 „	117 E	JT
7/16 „	117 G	LT
1/2 „	117 H	NT
9/16 „	117 J	PT
5/8 „	117 K	QT
11/16 „	117 L	RT
3/4 „	117 M	ST
13/16 „	117 N	TT
7/8 „	117 P	UT
15/16 „	117 Q	VT
1 „	117 R	WT

TABLE IV.

SLOTTED NUTS.

Size.	Part No.	
	2 A 1	4 A 1
2 B.A.	114 B	CS
1/4 in. B.S.F.	118 A	ES
5/16 „	118 C	GS
3/8 „	118 E	JS
7/16 „	118 G	LS
1/2 „	118 H	NS
9/16 „	118 J	PS
5/8 „	118 K	QS
11/16 „	118 L	RS
3/4 „	118 M	SS
13/16 „	118 N	TS
7/8 „	118 P	US
15/16 „	118 Q	VS
1 „	118 R	WS

TABLE V.

CASTLE NUTS.

Size.	Part No.	
	2 A 1	4 A 1
1/4 in. B.S.F.	119 A	EC
5/16 „	119 C	GC
3/8 „	119 E	JC
7/16 „	119 G	LC
1/2 „	119 H	NC

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STANDARD COLOUR SCHEME FOR METALS

COLOURS.

The colours used are Red, Yellow, Black, Blue, Green, Brown and White.

APPLICATION.

BARS AND TUBES.—Each bar and tube is to be painted at each end with the colour or colours indicated, in the following manner:

For one colour.—1 Band 12 ins. wide.
For two colours.—2 Bands each 6 ins. wide.
For three colours.—3 Bands each 4 ins. wide.

SHEETS AND STRIP.—Each sheet and strip shall be painted with a band or bands of the required colours running diagonally across the corner bearing the identification stamp marks. The width of the band or bands is to be in accordance with paragraph 2 (*a*) and the painting is to commence six inches from the corner, measured at right angles to the length of the band. Strips or sheets less than one foot wide shall be painted at one end in a similar manner to bars and tubes.

Alternatively, sheets and strips may be painted with discs three inches in diameter for single colours, additional colours when required being applied in concentric annular rings one and a half inches wide.

Brass, Bronze and Copper.

Number and Type.	Colour.
B. 1.—High Tensile Brass Bar	Red.
B. 4.—Copper Sheets, Annealed	Black.
B. 5.—Brass Sheets, Hard	Blue.
B. 6.—Naval Brass Bars	Blue.
B. 8.—Phosphor Bronze, Cast Bars	Yellow.
B.11.—Brass Bars for Brazing	Brown.
B.12.—Brass Sheets, Annealed	Green.
B.13.—Brass Bars	Black.
B.15.—Copper Sheets, Half-hard	Yellow.
B.16.—Brass Sheets, Half-hard	Red.
Copper Bars, B.E.S.A. Publication No. 24—1925, Part V. (Spec. 12.A.)	Yellow, black.

Aluminium and Aluminium Alloys.

Number and Type.	Colour.
L. 1.—Duralumin Bars. Heat-treated	Yellow.
L. 3.—Duralumin Sheets. Heat-treated	Yellow.
L. 4.—Aluminium Sheets, Hard	Green.
L.16.—Aluminium Sheets, Half-hard	Blue.
L.17.—Aluminium Sheets, Soft	Black.

Aluminium and Aluminium Alloys—*continued.*

Number and Type.	Colour.
L.25.—" Y " Alloy Bars	Red.
L.30.—Aluminium Ingots (Virgin), 98% purity	Black, green.
L.31.—Aluminium Ingots (Virgin), 99% purity	Red.
L.32.—Aluminium Alloy Bars	Green.
L.34.—Aluminium Bars and Sections	Red, black.

Steel.

Number and Type.	Colour.
S. 1.—Mild Steel Bars, Bright	Yellow.
S. 2.—Alloy Steel Bars, Heat-treated	Red.
S. 3.—Mild Steel Sheets	Green.
S. 4.—5% Nickel Steel Sheets	Red.
S. 6.A.—" 40 " Carbon Steel Bars, Forging	Green, brown.
S. 6.B.—" 40 " Carbon Steel Bars, Machining	Green.
S.11.A.—Nickel Chrome Steel Bars, Forging	Red, yellow.
S.11.B.—Nickel Chrome Steel Bars, Machining	Red, blue, red.
S.14.A.—Carbon Case Hardening Steel Bars, Forging	Yellow, green.
S.14.B.—Carbon Case Hardening Steel Bars, Machining	Yellow, brown.
S.15.A.—3% Nickel Case Hardening Steel Bars, Forging	Brown, yellow, brown.
S.15.B.—3% Nickel Case Hardening Steel Bars, Machining	Yellow, brown, yellow.
S.20.—Tinned Steel Sheets	Black, green.
S.21.—" 20 " Carbon Steel	Yellow, blue.
S.24.—Key Steel	Red, green.
S.28.A.—Nickel Chrome Steel (100-ton) Bars, Forging	Red, blue.
S.28.B.—Nickel Chrome Steel (100-ton) Bars, Machining	Blue, red, yellow.
S.31.—Steel Wire, Cold Headed Bolts	Blue, yellow, blue.
S.61.A.—Stainless Steel Low Tensile Bars, Forging	Black, yellow, red.
S.61.B.—Stainless Steel Low Tensile Bars, Machining	Brown, yellow, red.
S.62.A.—Stainless Steel High Tensile Bars, Forging	Yellow, red, yellow.
S.62.B.—Stainless Steel High Tensile Bars, Machining	Yellow, black, yellow.
S.65.A.—Nickel Chrome Steel Bars, Forging	Blue, black, red.
S.65.B.—Nickel Chrome Steel Bars, Machining	Red, brown.
S.67.A.—5% Nickel Case Hardening Steel Bars, Forging	Brown, yellow, blue.
S.67.B.—5% Nickel Case Hardening Steel Bars, Machining	Brown, red, blue.
S.68.A.—16% Tungsten Steel Bars, Forging	Yellow, black.
S.69.A.—3½% Nickel Steel Bars, Forging	Blue, green, blue.
S.69.B.—3½% Nickel Steel Bars, Machining	Blue.
S.70.A.—" 55 " Carbon Steel Bars, Forging	Blue, green.
S.71.A.—" 30 " Carbon Steel Bars, Forging	Brown, green, brown.
S.71.B.—" 30 " Carbon Steel Normalised Bars, Machining	Yellow, green, yellow.
S.76.A.—" 40 " Carbon Steel Bars, Forging	Green, red, green.
S.76.B.—" 40 " Carbon Steel Bars, Machining	Green, blue, green.
S.77.A.—" 30 " Carbon Steel Bars, Forging	Yellow, blue, yellow.
S.77.B.—" 30 " Carbon Steel Bars, Machining	Brown, blue, brown.
S.79.A.—" 55 " Carbon Steel Bars, Forging	Green, red, blue.
S.80.A.—High Chromium Steel Bars, Forging	Black, yellow, brown.

STANDARD COLOUR SCHEME FOR METALS—*continued*

Steel—*continued*.

Number and Type.	Colour.
S.80.B.—High Chromium Steel Bars, Machining	Red, black, brown.
S.81.A.—Nickel Chrome Steel (70-ton) Bars, Forging ..	Black, blue.
S.81.B.—Nickel Chrome Steel (70-ton) Bars, Machining ..	Black, brown.
S.82.A.—Nickel Chrome Case Hardening Steel Bars, Forging	Red, brown, yellow.
S.82.B.—Nickel Chrome Case Hardening Steel Bars, Machining	Yellow, red, green.
S.83.A.—5% Nickel High Tensile Case Hardening Steel Bars, Forging	Red, brown, blue.
S.83.B.—5% Nickel High Tensile Case Hardening Steel Bars, Machining	Red, brown, green.
B.S.S.51.—Wrought Iron, Grade "B"	Green, black, green.

Tubes.

Number and Type.	Colour.
T. 1.—"30" Carbon Steel Tubes	Green.
T. 2.—Steel (Nickel Chrome) Axle Tubes	Red.
T. 4.—Duralumin Tubes, Heat-treated	Yellow.
T. 5.—"50" Carbon Steel Tubes, Heat-treated	Red, yellow.
T. 7.B.—(Supplemented by D.T.D. 108) Copper Tubes, Annealed	White.
T. 7.C.—Copper Tubes, Annealed	Black.
T. 8.—Brass Tubes, Annealed	Blue.
T. 9.—Aluminium Tubes	Black.
T.14.—Carbon Steel Axle Tubes, Heat-treated	Red, blue.
T.18.—Brass Tubes, Hard	Red, blue.
T.21.—"30" Carbon Steel Tubes, Annealed	Blue.
T.26.—"15" Carbon Steel Tubes, Annealed	Yellow, blue.
T.47.—7 m/m. Brass Tubes for Radiators	Yellow.
T.48.—10 m/m. Brass Tubes for Radiators	Black.

A.M. Specifications.

Number and Type.	Colour.
D.T.D. 1.—Nickel Chromium Steel, Case Hardening ..	Blue, yellow, black.
D.T.D. 3.—High Nickel Case Hardening Steel (S.17 Type)	Blue, brown, yellow.
D.T.D. 4.—Chrome Vanadium Steel Valve Spring Wire ..	Red, green, red.
D.T.D. 5.—Carbon Steel Valve Spring Wire	Black, green.
D.T.D. 6.—Cobalt Chrome Valve Steel	Red, brown, red.
D.T.D. 7.—Carbon Chrome Valve Steel	Blue, brown, blue.
D.T.D. 10.—High Nickel Copper Alloy	Red, blue.
D.T.D. 11.—Phosphor Bronze Wire and Strip	Yellow.
D.T.D. 12.—Low Carbon Steel Sheets	Yellow, green.
D.T.D. 13.—Silicon Chrome Valve Steel	Green, brown, green.
D.T.D. 23.—Chromium Stainless Steel Sheets	Brown, green.
D.T.D. 39.—High Chromium Stainless Steel Sheets ..	Blue.
D.T.D. 41.—"15" Carbon Steel Tubes for Welding ..	Yellow.

STANDARD COLOUR SCHEME FOR METALS—*continued*

A.M. Specifications—*continued*.

Number and Type.	Colour.
D.T.D. 42.—Chromium Nickel Stainless Steel Sheets—	
High Tensile	Red, black.
Low Tensile	Black.
D.T.D. 43.—Chromium Nickel Stainless Steel Bars—	
High Tensile	Red, black.
Low Tensile	Black.
D.T.D. 46.—Chromium Stainless Steel Strip	Brown.
D.T.D. 49.—High Nickel Chrome Steel for Valves ..	Red, yellow, red.
D.T.D. 50.—Aluminium Silicon Sheets	Brown.
D.T.D. 53.—Chromium Stainless Steel Bars—	
Low Tensile	Black, yellow, black.
D.T.D. 54.—Nickel Chromium Steel Strip—	
Hardened and Tempered	Red, yellow.
Softened	Yellow, red, green.
D.T.D. 57.—Chromium Nickel Stainless Steel Sheet and Strip	Black, blue.
D.T.D. 60.—High Chromium Stainless Steel Sheets and Strip	Blue, black, blue.
D.T.D. 61.—Chromium Nickel Welding Wire, Stainless	Yellow
D.T.D. 76.—High Chromium Stainless Steel Bars ..	Blue, black, blue.
D.T.D. 78.—Phosphor-Bronze Bars, Cold drawn	Red, yellow.
D.T.D. 79.—Phosphor-Bronze Tubes, Cold drawn ..	Red, yellow.
D.T.D. 82.—Carbon Steel Welding Wire	Yellow, green, blue.
D.T.D. 87.—Steel suitable for Nitrogen Hardening ..	Red, black, red.
D.T.D. 89.—Steel Tubes, Low Carbon Manganese ..	Green, yellow, green.
D.T.D. 91.—Steel Tubes, Medium Carbon Manganese ..	Red, yellow, red.
D.T.D. 97.—Non-corrosive Steel Tubes, Low Tensile ..	Black, yellow, red.
D.T.D. 98.—Nickel Chromium Steel Sheet, 40/50-tons Proof—	
Hardened and Tempered	Black, blue, black.
Softened	Black, brown.
D.T.D. 99.—Nickel Chromium Steel Strip, 55-tons Proof ..	Blue, yellow, black.
D.T.D.100.—Nickel Chromium Steel Strip, 40/50-tons Proof	Red, yellow, black.
D.T.D.102.—Non-corrosive Steel Tubes, 35-ton	Blue, green.
D.T.D.105.—Non-corrosive Steel Tubes, 50-ton	Blue, brown.
D.T.D.108.—Copper Tubes (Supplementary to T.7.B.) ..	White.
D.T.D.111.—Metal Coated Wrought Light Alloy Sheet ..	Yellow, blue.
D.T.D.113.—Sections and small round Tubes for Welding ..	Green, yellow, blue.
D.T.D.115.—Silico Manganese Steel Bars	Red, black, green.
D.T.D.117.—Gunmetal Bar, Hard Rolled	Red, black, green.
D.T.D.118.—Magnesium Alloy Sheets (suitable for Welding)	Red, blue, black.
D.T.D.120.—Magnesium Alloy Sheets (not suitable for Welding)	Red, brown, black.
D.T.D.124.—Carbon Steel Strip (suitable for Welding) ..	Red, blue, green.
D.T.D.125.—Magnesium Alloy Sheets (Hard Rolled, not suitable for Welding)	Red, green, black.

STANDARD COLOUR SCHEMES FOR METALS—*continued*

A.M. SPECIFICATIONS—*continued*.

Number and Type.	Colour.
D.T.D.127.—Magnesium Alloy Bars and Sections (16-tons)	Yellow, red, black.
D.T.D.129.—Magnesium Alloy Bars and Sections (20-tons)	Yellow, blue, black.
D.T.D.137.—Carbon Steel Strip, 50-tons Proof	Red, blue, brown.
D.T.D.138.—Carbon Steel Strip, 65-tons Proof	Red, green, blue.
D.T.D.141.—Mild Steel Sheets, C.R.C.A.	Yellow, red, brown.
D.T.D.146.—High Chromium non-corroding Steel Sheet and Strip, 30-tons Proof	Red, green, brown.

SOLDERS.

Number and Type.	Colour.
D.T.D.51.—Cadmium Zinc Solder	Green.
B.E.S.A.219/1925.—Grade " A "	Blue.
B.E.S.A.219/1925.—Grade " B "	Yellow.
B.E.S.A.219/1925.—Grade " C "	Black.
B.E.S.A.219/1925.—Grade " D " (Plumbers)	Brown.

TOOL STEELS.

Number and Type.	Colour.
A.M.71.—Temper 1. Carbon Tool Steel, Extra Hard ..	Red, blue, yellow.
A.M.71.—Temper 2. Carbon Tool Steel, Very Hard ..	Red, yellow, blue.
A.M.71.—Temper 3. Carbon Tool Steel, Hard	Red, yellow, green.
A.M.71.—Temper 4. Carbon Tool Steel, Medium Hard ..	Red, green, yellow.
A.M.71.—Temper 5. Carbon Tool Steel, Tough	Red, black, yellow.
A.M.71.—Tungsten Tool Steel, Grade " A "	Yellow, blue, green.
A.M.71.—Tungsten Tool Steel, Grade " B "	Blue, yellow, green.

VICKERS AVIATION LIMITED

TABLE OF GAUGES

No.	Standard Wire Gauge	Shakespeare's Birmingham Metal Gauge		Shakespeare's Birmingham Wire Gauge	No.	Standard Wire Gauge	Shakespeare's Birmingham Metal Gauge		Shakespeare's Birmingham Wire Gauge
	Inch	Inch	M.M.	Inch		Inch	Inch	M.M.	Inch
000	·372	·005	·127		20	·036	·065	1·651	·039
00	·348	·006	·1524		21	·032	·068	1·727	·033
0	·324	·007	·1778		22	·028	·072	1·829	·030
1	·300	·008	·203	·296	23	·024	·077	1·956	·027
2	·276	·0095	·229	·270	24	·022	·082	2·082	·024
3	·252	·0105	·254	·256	25	·020	·090	2·286	·022
4	·232	·012	·305	·240	26	·018	·100	2·54	·020
5	·212	·014	·356	·213	27	·0164	·112	2·845	·0185
6	·192	·016	·406	·200	28	·0148	·124	3·150	·017
7	·176	·019	·483	·183	29	·0136	·136	3·454	·016
8	·160	·0215	·533	·167	30	·0124	·150	3·810	·015
9	·144	·024	·584	·150	31	·0116	·166	4·216	·014
10	·128	·027	·686	·136	32	·0108	·182	4·623	·013
11	·116	·031	·793	·121	33	·0100	·200	5·080	·012
12	·104	·035	·889	·110	34	·0092	·216	5·486	·011
13	·092	·038	·965	·096	35	·0084	·238	6·045	·010
14	·080	·042	·067	·086	36	·0076	·250	6·350	·009
15	·072	·047	1·194	·074	37	·0068	·270	6·858	·008
16	·064	·051	1·295	·067	38	·0060	·278	7·061	·007
17	·056	·055	1·397	·060	39	·0052	·289	7·341	·0065
18	·048	·060	1·524	·051	40	·0048	·300	7·620	·006
19	·040	·063	1·600	·046					

MENSURATION OF SURFACES AND SOLIDS

The circumference of a circle = diameter × $\frac{22}{7}$ (or 3·1416); area of circle = square of the diameter × 0·7854.

The area of a square, rhombus, or rhomboid = base × height.

The area of a triangle = $\frac{1}{2}$ base × perpendicular height.

Area of trapezium = $\frac{1}{2}$ sum of two parallel sides × height.

Area of any right-lined figure of four or more unequal sides is found by dividing it into triangles, finding area of each and adding together.

For any regular polygon, inscribe a circle; then $\frac{1}{2}$ radius of that circle × length of one side × number of sides = area.

The area of a parabola = base × height × $\frac{2}{3}$.

The area of an ellipse = long axis × short axis × 0·7854.

Surface and cubic content of prism or cylinder—1st (area of two ends) + (length × perimeter) = surface; 2nd, area of base × height = content.

For a cone or pyramid—1st, $\frac{1}{2}$ (slant height × perimeter of base) + area of base = surface; 2nd, $\frac{1}{3}$ (area of base × perpendicular height) = content.

For a cube or parallelopipedon—1st, sum of areas of all the sides = surface; 2nd, length × breadth × depth = content.

For a sphere—1st, square of diameter × 3·1416 = surface; 2nd, cube of diameter × 0·5236 = content.

Area of sector of circle = length of arc × $\frac{1}{2}$ radius.

Area of segment of circle = area of sector less area of triangle.

Side of square of area equal circle = diameter × 0·8862.

Diameter of circle equal in area to square = side × 1·1284.

VICKERS AVIATION LIMITED

TUBE CONSTANTS

TABLE SHOWING RADII OF GYRATION, SECTIONAL AREAS, MOMENTS OF INERTIA & MODULI OF SECTION OF ROUND TUBES.

$K=\sqrt{\frac{I}{A}}=\frac{\sqrt{D^2+d^2}}{4}$ $A=\pi t\ (D-t)$ $I=\frac{\pi}{64}(D^4-d^4)$ $Z=\frac{A}{4}\frac{(D-2t+2t^2)}{D}$

Outside Diameter, ins.		$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Decimals of an inch		·375	·5	·625	·75	·875	1·0	1·125	1·25	1·375	1·5	1·625
24 G ·022″	K	·125	·1691	·2133	·2575	·3017	·3458	·39	·4342	·4784	·5226	·5668
	A	·0244	·0399	·0417	·0503	·059	·0676	·0762	·0849	·0935	·1021	·1108
	I	·00038	·0009	·0019	·0033	·0054	·0081	·0116	·0161	·0215	·0279	·0356
	Z	·002	·0039	·0061	·0089	·0123	·0162	·0207	·0257	·0313	·0373	·0438
23 G ·024″	K	·1244	·1685	·2126	·2568	·3012	·345	·3893	·4337	·4777	·5219	·5658
	A	·0265	·0359	·0453	·0547	·0642	·0736	·083	·0925	·1019	·1113	·1207
	I	·00041	·001	·0021	·0036	·0058	·0087	·0125	·0174	·0232	·0303	·0387
	Z	·0022	·0041	·0066	·0096	·0133	·0175	·0223	·0278	·0338	·0404	·0476
22 G (Approx.) ·025″	K	·1241	·1682	·2122	·2565	·3008	·3446	·389	·4332	·4772	·5212	·5652
	A	·0275	·0373	·0471	·0569	·0668	·0766	·0864	·0962	·106	·116	·126
	I	·00042	·00106	·00212	·00375	·00605	·0091	·0131	·0181	·0242	·0315	·0403
	Z	·00226	·00422	·0068	·0099	·0138	·0182	·0233	·0289	·0351	·042	·0495
22 G ·028″	K	·123	·1672	·2113	·2555	·2998	·3437	·388	·4322	·4762	·5205	·5647
	A	·0305	·0415	·0525	·0635	·0745	·0855	·0965	·1075	·1185	·1295	·1405
	I	·00046	·00116	·0023	·0042	·0067	·0101	·0145	·0201	·0269	·0351	·0448
	Z	·0025	·0045	·0075	·0112	·0153	·0202	·0258	·0321	·0391	·0468	·0552
21 G ·032″	K	·1218	·1658	·21	·2541	·2982	·3442	·3866	·4309	·475	·519	·5634
	A	·0345	·047	·0596	·0722	·0847	·0973	·1098	·1224	·135	·1475	·1601
	I	·00052	·0013	·0026	·0046	·0075	·0114	·0164	·0226	·0304	·0398	·0508
	Z	·0028	·0051	·0084	·0124	·0172	·0228	·0291	·0362	·0447	·053	·0625
20 G ·036″	K	·1205	·1645	·2086	·2528	·2969	·341	·3852	·4295	·4736	·5176	·5621
	A	·0383	·0524	·0666	·0807	·0948	·109	·1231	·1372	·1514	·1655	·1797
	I	·00056	·0014	·002	·005	·0083	·0127	·0183	·0254	·034	·0442	·0567
	Z	·003	·0058	·0093	·0135	·019	·0254	·0326	·0407	·0495	·0592	·0698
19 G ·04″	K	·1192	·1632	·2073	·2514	·2955	·3395	·3839	·4281	·4721	·5162	·5609
	A	·0421	·0578	·0735	·0892	·1049	·1207	·1364	·1521	·1679	·1836	·1993
	I	·00059	·0016	·0032	·0056	·0097	·0139	·0201	·0279	·0375	·049	·0626
	Z	·0032	·0065	·0101	·015	·021	·0279	·0358	·0447	·0545	·0653	·0771
18 G ·048″	K	·1167	·1606	·2048	·2486	·2928	·337	·3812	·4253	·4694	·5135	·558
	A	·0493	·0682	·087	·1059	·1247	·1436	·1624	·1813	·2001	·219	·2378
	I	·00067	·0018	·0037	·0065	·0107	·0163	·0236	·0328	·044	·0577	·074
	Z	·0036	·0072	·0117	·0175	·0245	·0326	·0419	·0524	·0641	·077	·0911

VICKERS AVIATION LIMITED

TUBE CONSTANTS—*continued*

TABLE SHOWING RADII OF GYRATION, SECTIONAL AREAS, MOMENTS OF INERTIA & MODULI OF SECTION OF ROUND TUBES.

$K=\sqrt{\frac{I}{A}}=\frac{\sqrt{D^2+d^2}}{4}$ $A=\pi t\ (D-t)$ $I=\frac{\pi}{64}(D^4-d^4)$ $Z=\frac{A}{4}\frac{(D-2t+2t^2)}{D}$

Outside Diameter, ins.		$1\frac{3}{4}$	$1\frac{7}{8}$	2·0	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3
Decimals of an inch		1·75	1·875	2·0	2·125	2·25	2·375	2·5	2·625	2·75	2·875	3·0
24 G ·022″	K	·6109	·6552	·6994	·7435	·7877						
	A	·1194	·1281	·1367	·1455	·154						
	I	·0445	·0548	·0667	·0802	·0955						
	Z	·0509	·0585	·0667	·0755	·0849						
23 G ·024″	K	·6102	·6545	·6987	·7428	·787	·8311					
	A	·1301	·1396	·149	·1584	·1679	·1726					
	I	·0486	·0599	·0728	·0876	·1041	·1226					
	Z	·0554	·0638	·0728	·0824	·0925	·1032					
22 G (Approx.) ·025″	K	·6098	·6542	·6983	·7425	·7867	·8309	·875	For Specifications T1; T6; T21; T26; only			
	A	·135	·145	·155	·165	·174	·184	·194				
	I	·0504	·0622	·0766	·0909	·107	·126	·148				
	Z	·0576	·0662	·0766	·0855	·0954	·1074	·1191				
22 G ·028″	K	·6089	·6531	·6974	·7414	·7856	·8296	·874				
	A	·1515	·1625	·1735	·1845	·1955	·2065	·2175				
	I	·0562	·0693	·0844	·1015	·1207	·1423	·1661				
	Z	·0642	·074	·0844	·0955	·1073	·1198	·1329				
21 G ·032″	K	·6073	·6516	·696	·74	·7841	·8283	·8725	·9165			
	A	·1727	·1852	·1978	·2103	·2229	·2355	·248	·2606			
	I	·0637	·0787	·0958	·1153	·1371	·1616	·1889	·219			
	Z	·0728	·0839	·0958	·1085	·1219	·1361	·1511	·1669			
20 G ·036″	K	·606	·6502	·6946	·7384	·7828	·827	·8711	·9151	·9596		
	A	·1938	·2079	·2221	·2362	·2503	·2645	·2787	·2928	·307		
	I	·0711	·0879	·1071	·1289	·1533	·1807	·2115	·2456	·2827		
	Z	·0813	·0938	·1071	·1213	·1363	·1522	·1692	·1871	·2056		
19 G ·04″	K	·6046	·6489	·6932	·737	·7814	·8257	·8698	·9138	·9582	1·0024	
	A	·215	·2307	·2462	·2621	·2778	·2936	·3093	·325	·3407	·3564	
	I	·0787	·0972	·1185	·1427	·17	·2006	·2346	·2721	·3135	·3588	
	Z	·0899	·1037	·1185	·1343	·1511	·1689	·1877	·2074	·228	·2496	
18 G ·048″	K	·602	·646	·6905	·7343	·7785	·823	·867	·9109	·9553	·9994	1·0438
	A	·2567	·2755	·2944	·3132	·3321	·3509	·3698	·3886	·4075	·4263	·4453
	I	·0931	·115	·1404	·169	·2014	·2376	·278	·3227	·3721	·4261	·4881
	Z	·1064	·1228	·1404	·1591	·179	·2001	·2224	·2459	·2706	·2964	·3234

TUBE CONSTANTS—*continued*

TABLE SHOWING RADII OF GYRATION, SECTIONAL AREAS, MOMENTS OF INERTIA & MODULI OF SECTION OF ROUND TUBES.

$K=\sqrt{\frac{I}{A}}=\frac{\sqrt{D^2+d^2}}{4}$ $A=\pi t\,(D\text{-}t)$ $I=\frac{\pi}{64}(D^4\text{-}d^4)$ $Z=\frac{A}{4}\left(\frac{D\text{-}2t+2t^2}{D}\right)$

Outside Diameter, ins.		$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Decimals of an inch		·375	·5	·625	·75	·875	1·0	1·125	1·25	1·375	1·5	1·625
17 G ·056″	K	·114	·1582	·2022	·246	·29	·3342	·3784	·4226	·4666	·5109	·5551
	A	·0561	·0781	·1001	·1221	·1441	·166	·188	·21	·232	·254	·276
	I	·00076	·0019	·0041	·0074	·0121	·0185	·0269	·0376	·0506	·0663	·0851
	Z	·0039	·0078	·0131	·0197	·0277	·0371	·0479	·0601	·0736	·0884	·1047
16 G ·064″	K	·1122	·1558	·1996	·2436	·2873	·3317	·3758	·4199	·464	·508	·5528
	A	·0625	·0876	·1128	·1379	·163	·1882	·2133	·2385	·2636	·2887	·3139
	I	·00082	·0021	·0045	·0082	·0135	·0207	·0301	·0421	·0567	·0746	·0958
	Z	·0042	·0085	·0144	·0218	·0308	·0414	·0536	·0673	·0826	·0995	·1179
15 G ·072″	K		·1534	·1972	·241	·285	·329	·3731	·4171	·4613	·5052	·5498
	A		·0968	·1251	·1534	·1816	·2099	·2382	·2665	·2947	·3230	·3513
	I		·0023	·0049	·0089	·0148	·0227	·0332	·0464	·0627	·0825	·1061
	Z		·0091	·0156	·0238	·0338	·0455	·059	·0747	·0912	·11	·1306
14 G ·08″	K			·1947	·2385	·2821	·3265	·3706	·4146	·4587	·5026	·5472
	A			·137	·1684	·1998	·2312	·2636	·2941	·3255	·3569	·3883
	I			·0052	·0096	·016	·0246	·0361	·0506	·0685	·0903	·1162
	Z			·0166	·0256	·0365	·0493	·0641	·0809	·0997	·1204	·143
13 G ·092″	K				·2349	·2783	·3228	·3666	·4107	·4548	·4988	·5435
	A				·1902	·2263	·2624	·2985	·3347	·3708	·4069	·443
	I				·0105	·0173	·0273	·0401	·0564	·0767	·1014	·1308
	Z				·028	·0396	·0546	·0713	·0903	·1116	·1352	·161
12 G ·104″	K					·275	·319	·363	·4069	·4509	·495	·5395
	A					·2519	·2927	·3336	·3744	·4157	·4561	·4969
	I					·0191	·0298	·044	·062	·0844	·1117	·1445
	Z					·0436	·0597	·0783	·0994	·1228	·149	·1778
11 G ·116″	K						·3152	·359	·403	·447	·4911	·5356
	A						·3221	·3676	·4132	·4587	·5043	·5498
	I						·032	·0478	·0671	·0916	·1216	·1575
	Z						·064	·0843	·1074	·1333	·1621	·1938
10 G ·128″	K							·3554	·3992	·4432	·4872	·5318
	A							·4009	·4512	·5014	·5517	·6019
	I							·0506	·0718	·0984	·1308	·1697
	Z							·09	·1149	·1431	·1743	·2089

TUBE CONSTANTS—*continued*

TABLE SHOWING RADII OF GYRATION, SECTIONAL AREAS, MOMENTS OF INERTIA & MODULI OF SECTION OF ROUND TUBES.

$K=\sqrt{\frac{I}{A}}=\frac{\sqrt{D^2+d^2}}{4}$ $A=\pi t\,(D\text{-}t)$ $I=\frac{\pi}{64}(D^4\text{-}d^4)$ $Z=\frac{A}{4}\left(\frac{D\text{-}2t+2t^2}{D}\right)$

Outside Diameter, ins.		$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3
Decimals of an inch		1·75	1·875	2·0	2·125	2·25	2·375	2·5	2·625	2·75	2·875	3·0
17 G ·056″	K	·5992	·6434	·6876	·7317	·7759	·8201	·8643	·9081	·9526	·9967	1·041
	A	·298	·32	·3419	·3639	·3859	·4079	·4299	·451	·4739	·4959	·5178
	I	·107	·1324	·1616	·1949	·2324	·2743	·3212	·373	·4301	·4927	·5611
	Z	·1223	·1412	·1616	·1834	·2066	·231	·257	·2842	·3128	·3428	·3741
16 G ·064″	K	·5964	·6406	·6849	·7288	·7731	·8172	·8613	·9057	·9499	·9939	1·0382
	A	·339	·3641	·3893	·4144	·4396	·4647	·4898	·515	·5401	·5653	·5904
	I	·1208	·1495	·1826	·2303	·2628	·3104	·3635	·4224	·4873	·5586	·6364
	Z	·1379	·1595	·1826	·2073	·2336	·2614	·2908	·3218	·3544	·3886	·4243
15 G ·072″	K	·5938	·638	·6821	·7261	·7763	·8147	·8585	·9031	·9471	·9913	1·0355
	A	·3796	·4078	·4361	·4644	·4927	·5209	·5492	·5775	·6058	·634	·6623
	I	·1338	·1659	·2029	·245	·2925	·3458	·4051	·4709	·5434	·6232	·7102
	Z	·1529	·177	·2029	·2306	·26	·2912	·3241	·3588	·3952	·4335	·4735
14 G ·08″	K	·591	·6352	·6792	·7235	·7675	·812	·8558	·9003	·9441	·9885	1·0327
	A	·4197	·4511	·4825	·5139	·5444	·5768	·6082	·6396	·671	·7024	·7338
	I	·1466	·1821	·2227	·2691	·3215	·3802	·4456	·518	·5983	·6863	·7825
	Z	·1676	·1947	·2227	·2533	·2858	·3202	·3565	·3948	·4351	·4774	·5217
13 G ·092″	K	·587	·6312	·6753	·7195	·7636	·8078	·8517	·8961	·9403	·9845	1·0286
	A	·4792	·5153	·5514	·5875	·6237	·6598	·6959	·732	·7682	·8043	·8404
	I	·1654	·2054	·2515	·3024	·3636	·4305	·5051	·5879	·6792	·7796	·8892
	Z	·189	·2191	·2515	·2862	·3232	·3625	·4041	·4479	·494	·5423	·5928
12 G ·104″	K	·583	·6273	·6715	·7155	·7596	·804	·8477	·8921	·9362	·9804	1·0245
	A	·5377	·5786	·6194	·6603	·7011	·7419	·7828	·8236	·8644	·9053	·9461
	I	·183	·2277	·2792	·338	·4047	·4794	·5627	·6555	·7577	·8701	·9931
	Z	·2091	·242	·2792	·3182	·3597	·4037	·4502	·4994	·5511	·6053	·6621
11 G ·116″	K	·5791	·6232	·6675	·7115	·7555	·8	·8437	·888	·9322	·9762	1·0205
	A	·5954	·6409	·6865	·732	·7776	·8231	·8687	·9142	·9598	1·0053	1·0509
	I	·1998	·2484	·3058	·3706	·4441	·5265	·6186	·7201	·8339	·9582	1·0944
	Z	·2283	·2656	·3058	·3488	·3947	·4434	·4949	·5493	·6065	·6666	·7296
10 G ·128″	K	·5752	·6193	·6634	·7075	·7516	·7961	·8398	·884	·9281	·9722	1·0164
	A	·6522	·7025	·7527	·803	·8533	·9035	·9538	1·004	1·0543	1·1046	1·1548
	I	·2158	·2694	·3313	·4019	·4821	·572	·6726	·7843	·9079	1·0439	1·1929
	Z	·2466	·2814	·3313	·3783	·4285	·4817	·5381	·5976	·6603	·7262	·7953

TO FIND THE WEIGHT OF A CASTING FROM THAT OF THE PATTERN

A pattern weighing one pound	Will Weigh when Cast in					
	Cast Iron	Yellow Brass	Gun Metal	Zinc	Copper	Aluminium
Bay Wood	8·8	9·9	10·3	8·5	10·5	3·2
Beech	8·5	9·5	10·0	8·2	10·1	3·1
Cedar	16·1	18·0	18·9	15·6	19·2	5·8
Cherry	10·7	12·0	12·6	10·4	12·8	3·9
Linden	12·0	13·5	14·1	11·6	14·3	4·3
Mahogany	8·5	9·5	10·0	8·2	10·1	3·1
Maple	9·2	10·3	10·8	8·9	11·0	3·2
Oak	9·4	10·5	11·0	9·1	11·2	3·4
Pear	10·9	12·2	12·8	10·6	13·0	3·9
Pine, white ..	14·7	16·5	17·3	14·3	17·5	5·3
Pine, yellow ..	13·1	14·7	15·4	12·7	15·6	4·7
Whitewood ..	16·4	18·4	19·3	15·9	19·5	5·9

Allowance must be made for the metal in the pattern.

REDUCTION FOR ROUND CORES AND CORE PRINTS

RULE.—Multiply the square of the diameter by the length of the core and prints in inches, and the product by 0·014. This will give the weight of the white pine core, to be deducted from the weight of the pattern.

PLATE GAUGES

AND

WEIGHTS

Gauge	Thickness in Inches	Weight in lbs./sq. ft. in Mild Steel	Weight in lbs./sq. ft. in Duralumin
30	·0124	·50	·18
28	·0148	·59	·22
26	·018	·72	·26
24	·022	·88	·32
22	·028	1·12	·41
20	·036	1·44	·52
18	·048	1·92	·70
16	·064	2·56	·93
14	·08	3·20	1·16
12	·104	4·16	1·51
10	·128	5·12	1·86
8	·16	6·40	2·33
6	·192	7·68	2·80
5	·212	8·48	3·096
4	·232	9·28	3·38
3	·252	10·08	3·68
2	·276	11·04	4·03
1	·300	12·00	4·328

WEIGHTS AND DIMENSIONS OF ALUMINIUM SHEETS

(Together with Brass, Copper, Steel and Tin for Comparison)

SIZE		THICKNESS		WEIGHT: LBS. PER SQ. FOOT.				
S.W.G.	Birm. Sheet Gauge	Inch	Mm.	Aluminium	Brass	Copper	Steel	Tin
		·375	9·525	5·18	16·7	17·1	15·0	14·4
3/0		·372	9·449	5·14	16·5	17·0	14·9	14·3
2/1		·348	8·839	4·81	15·5	15·9	13·9	13·4
1/0		·324	8·229	4·48	14·4	14·8	13·0	12·5
		·312	7·937	4·31	13·9	14·2	12·5	12·0
1	40	·300	7·620	4·15	13·3	13·7	12·0	11·5
	39	·289	7·341	3·99	12·9	13·2	11·6	11·1
	38	·278	7·061	3·84	12·4	12·7	11·1	10·7
2		·276	7·010	3·81	12·3	12·6	11·0	10·6
	37	·270	6·858	3·73	12·0	12·3	10·8	10·4
3		·252	6·401	3·48	11·2	11·5	10·1	9·68
	36	·250	6·350	3·45	11·1	11·4	10·0	9·60
	35	·238	6·045	3·29	10·6	10·9	9·52	9·14
4		·232	5·893	3·20	10·3	10·6	9·28	8·91
	34	·216	5·486	2·98	9·61	9·86	8·64	8·31
5		·212	5·385	2·93	9·43	9·68	8·48	8·14
	33	·200	5·080	2·76	8·90	9·12	8·00	7·68
6		·192	4·877	2·65	8·54	8·76	7·68	7·37
		·187	4·762	2·58	8·32	8·53	7·48	7·18
	32	·182	4·623	2·52	8·10	8·31	7·28	6·99
7		·176	4·470	2·43	7·83	8·03	7·05	6·76
	31	·166	4·216	2·29	7·38	7·58	6·64	6·37
8		·160	4·064	2·21	7·12	7·30	6·40	6·15
	30	·150	3·810	2·07	6·67	6·85	6·00	5·76
9		·144	3·658	1·99	6·41	6·57	5·76	5·53
	29	·136	3·454	1·88	6·05	6·20	5·44	5·22
10		·128	3·251	1·77	5·69	5·84	5·12	4·92
		·125	3·175	1·73	5·56	5·70	5·00	4·80
	28	·124	3·150	1·71	5·52	5·66	4·96	4·76
11		·116	2·946	1·60	5·16	5·29	4·64	4·46
	27	·112	2·845	1·55	4·98	5·11	4·48	4·30
12		·104	2·642	1·44	4·63	4·75	4·16	3·99
	26	·100	2·540	1·38	4·45	4·57	4·00	3·84
13		·092	2·337	1·27	4·09	4·20	3·68	3·53
	25	·090	2·286	1·24	4·00	4·11	3·60	3·46
	24	·082	2·082	1·13	3·65	3·75	3·28	3·15
14		·080	2·032	1·11	3·56	3·65	3·20	3·07
	23	·077	1·956	1·07	3·43	3·52	3·08	2·96
15	22	·072	1·829	·995	3·20	3·29	2·88	2·77
	21	·068	1·727	·940	3·02	3·11	2·72	2·61
Specific gravity				2·67	8·62	8·82	7·74	7·40
Ratio of weights				1	3·23	3·30	2·90	2·78

WEIGHTS AND DIMENSIONS OF ALUMINIUM SHEETS—*continued*

(Together with Brass, Copper, Steel and Tin for Comparison)

SIZE		THICKNESS		WEIGHT: LBS. PER SQ. FOOT.				
S.W.G.	Birm. Sheet Gauge	Inch	Mm.	Aluminium	Brass	Copper	Steel	Tin
	20	·065	1·651	·898	2·89	2·97	2·60	2·50
16		·064	1·626	·885	2·85	2·92	2·56	2·46
	19	·063	1·600	·870	2·80	2·88	2·52	2·42
		·062	1·587	·857	2·76	2·83	2·48	2·38
	18	·060	1·524	·829	2·67	2·74	2·40	2·30
17		·056	1·422	·774	2·49	2·56	2·24	2·15
	17	·055	1·397	·760	2·45	2·51	2·20	2·11
	16	·051	1·295	·705	2·27	2·33	2·04	1·96
18		·048	1·219	·663	2·13	2·19	1·92	1·84
	15	·047	1·194	·649	2·09	2·15	1·88	1·81
	14	·042	1·067	·580	1·87	1·92	1·68	1·61
19		·040	1·016	·552	1·78	1·83	1·60	1·54
	13	·038	·965	·525	1·69	1·74	1·52	1·46
20		·036	·914	·497	1·60	1·65	1·44	1·38
	12	·035	·889	·484	1·56	1·60	1·40	1·34
21		·032	·813	·442	1·42	1·46	1·28	1·23
	11	·031	·793	·429	1·38	1·42	1·24	1·19
22		·028	·711	·387	1·25	1·28	1·12	1·08
	10	·027	·686	·373	1·20	1·24	1·08	1·04
23		·024	·610	·332	1·07	1·10	·960	·921
	9	·023	·584	·318	1·02	1·05	·920	·883
24		·022	·559	·304	·979	1·01	·880	·845
	8	·021	·533	·290	·935	·960	·840	·806
25		·020	·508	·276	·890	·914	·800	·768
	7	·019	·483	·262	·846	·868	·760	·730
26		·018	·457	·249	·801	·823	·720	·691
27		·0164	·416	·227	·730	·750	·656	·630
	6	·0160	·406	·221	·712	·731	·640	·614
		·0156	·397	·215	·694	·713	·624	·599
28		·0148	·376	·204	·658	·677	·592	·568
	5	·0140	·356	·193	·623	·640	·560	·537
29		·0136	·345	·188	·605	·622	·544	·522
30		·0124	·315	·171	·552	·566	·496	·476
	4	·0120	·305	·166	·534	·548	·480	·461
	3	·0105	·267	·145	·467	·480	·420	·403
	2	·0090	·229	·125	·400	·412	·360	·346
	1	·008	·203	·111	·356	·366	·320	·307
Specific gravity				2·67	8·62	8·82	7·74	7·40
Ratio of Weights				1	3·23	3·30	2·90	2·78

DURALUMIN WEIGHTS

WIRE

S.W.G.	Decimal Equivalent	Millimetre Equivalent	Approximate Weight		Length
			Per 100 ft. lbs.	Kilos per 100 metres	
0	·324	8·23	**10·32**	15·36	Supplied in coils up to **30 ft.** (9 metres)
1	·300	7·62	**8·84**	13·15	
2	·276	7·01	**7·52**	11·19	
3	·252	6·40	**6·23**	9·27	
4	·232	5·89	**5·27**	7·84	
5	·212	5·38	**4·42**	6·58	
6	·192	4·88	**3·60**	5·36	
7	·176	4·47	**3·04**	4·52	
8	·160	4·06	**2·51**	3·73	
9	·144	3·66	**2·03**	3·02	
10	·128	3·25	**1·63**	2·43	
11	·116	2·95	**1·32**	1·96	
12	·104	2·64	**1·07**	1·59	
13	·092	2·34	**·83**	1·24	
14	·080	2·03	**·62**	·92	
15	·072	1·83	**·51**	·76	
16	·064	1·63	**·40**	·60	
17	·056	1·42	**·31**	·46	
18	·048	1·22	**·22**	·33	
19	·040	1·02	**·16**	·24	
20	·036	·91	**·13**	·19	
21	·032	·81	**·10**	·15	
22	·028	·71	**·08**	·12	
23	·024	·61	**·06**	·09	
24	·022	·56	**·05**	·07	

ROUND RODS AND BARS

Sizes ins.	Decimal Equivalent	Millimetre Equivalent	Approximate Weight		Length	Remarks
			Lbs. per ft. run	Kilos per lineal metre		
1/4	·250	6·35	**·060**	·089	**10—12 ft.**	Rods from 5/16 in. (7·94 m/m. dia.) to 3 in. (76·2 m/m. dia.), can be supplied in any diameters intermediate to these if required in sufficient quantities to warrant manufacture.
5/16	·3125	7·94	**·090**	·134	(3·05—3·66 metres)	
3/8	·375	9·52	**·134**	·20	,, ,, ,,	
7/16	·4375	11·11	**·183**	·27	,, ,, ,,	
1/2	·500	12·70	**·240**	·36	,, ,, ,,	
9/16	·5625	14·29	**·302**	·45	,, ,, ,,	
5/8	·625	15·87	**·372**	·56	,, ,, ,,	
3/4	·750	19·05	**·538**	·80	,, ,, ,,	
7/8	·875	22·22	**·729**	1·08	,, ,, ,,	
1	1·000	25·40	**·957**	1·42		
1 1/4	1·250	31·75	**1·490**	2·22		
1 1/2	1·500	38·10	**2·150**	3·20		
1 3/4	1·750	44·45	**2·930**	4·36		
2	2·000	50·80	**3·830**	5·70		Bars above 3 in. dia. (76·2 m/m.) are only supplied in the hammered finish.
2 1/4	2·250	57·15	**4·850**	7·22	**8—10 ft.** (2·4—3·0m)	
2 1/2	2·500	63·50	**5·990**	8·91	**6—8 ft.** (1·8—2·4m)	
2 3/4	2·750	69·85	**7·2**	10·75		
3	3·000	76·20	**8·65**	12·89	**4—6 ft.** (1·2—1·8m)	

DURALUMIN WEIGHTS—*continued*

SQUARE RODS

Sizes inches	m/m. Equivalent	Approximate Weight		Length
		Lbs. per ft. run	Kilos per lineal metre	
1/2	12·70	**·305**	·45	**10—12 ft.**
5/8	15·87	**·475**	·70	(3·05—3·66 metres)
3/4	19·05	**·685**	1·02	,, ,, ,,
7/8	22·22	**·933**	1·39	,, ,, ,,
1	25·40	**1·220**	1·82	,, ,, ,,
1 1/8	28·57	**1·543**	2·30	,, ,, ,,
1 1/4	31·75	**1·905**	2·83	,, ,, ,,
1 3/8	34·92	**2·23**	3·28	,, ,, ,,
1 1/2	38·10	**2·745**	4·08	,, ,, ,,
1 5/8	41·27	**3·27**	4·85	**8—10 ft.**
1 3/4	44·45	**3·735**	5·56	(2·44—3·05 metres)
2	50·80	**4·860**	7·23	**6—8 ft.**
2 1/8	53·98	**5·508**	8·20	(1·83—2·44 metres)

HEXAGON RODS (Whitworth Standard)

Sizes of bolts inches	Across Flats	m/m. Equivalent	Approximate Weight		Length
			Lbs. per ft. run	Kilos per lineal metre	
1/4	**·525**	13·33	**·291**	·43	**10—12 ft.**
5/16	**·601**	15·26	**·375**	·56	(3·05—3·66 metres)
3/8	**·709**	18·01	**·521**	·78	,, ,, ,,
7/16	**·820**	20·83	**·708**	1·05	,, ,, ,,
1/2	**·919**	23·34	**·875**	1·30	,, ,, ,,
9/16	**1·011**	25·68	**1·062**	1·58	**8—10 ft.**
5/8	**1·101**	27·96	**1·250**	1·86	(2·44—3·05 metres)
11/16	**1·201**	30·50	**1·521**	2·26	,, ,, ,,
3/4	**1·301**	33·04	**1·791**	2·67	,, ,, ,,
13/16	**1·390**	35·30	**2·062**	3·07	,, ,, ,,
7/8	**1·479**	37·57	**2·333**	3·32	,, ,, ,,
15/16	**1·574**	39·98	**2·625**	3·91	,, ,, ,,
1	**1·670**	42·42	**2·916**	4·34	,, ,, ,,
1 1/8	**1·860**	47·24	**3·586**	5·34	,, ,, ,,
1 1/4	**2·048**	52·02	**4·541**	6·76	,, ,, ,,
1 1/2	**2·413**	61·29	**5·860**	8·72	,, ,, ,,

VICKERS AVIATION LIMITED

DURALUMIN WEIGHTS—*continued*

EXTRUDED RECTANGULAR SECTIONS

Thickness 3/16 in. = 4·76 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
⅝	15·87	**·14**	·21
·79	20	**·18**	·27
·87	22	**·20**	·29
1	25·4	**·23**	·34
1¼	31·75	**·28**	·42
1½	38·10	**·34**	·51
2	50·80	**·46**	·68
2½	63·50	**·57**	·85
2¾	69·85	**·63**	·93
2⅞	73·02	**·65**	·96
3	76·20	**·68**	1·02

Thickness ¼ in. = 6·35 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
½	12·70	**·15**	·23
⅝	15·87	**·19**	·28
¾	19·05	**·23**	·34
·87	22	**·26**	·39
1	25·4	**·30**	·45
1¼	31·75	**·38**	·57
1½	38·10	**·45**	·68
1¾	44·50	**·53**	·79
2	50·80	**·60**	·90
2½	63·50	**·76**	1·13
3	76·20	**·91**	1·36

Thickness 5/16 in. = 7·94 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
⅝	15·87	**·24**	·35
¾	19·05	**·28**	·42
1¼	31·70	**·48**	·72
1½	38·10	**·57**	·85
1⅝	41·27	**·62**	·92
2	50·80	**·76**	1·13
2½	63·50	**·95**	1·41
3	76·20	**1·13**	1·70

Thickness ⅜ in. = 9·52 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
½	12·70	**·23**	·34
9/16	14·29	**·26**	·39
⅝	15·87	**·28**	·42
¾	19·05	**·34**	·51
*1	25·40	**·46**	·68
1⅛	28·57	**·51**	·76
*1¼	31·75	**·57**	·85
1½	38·10	**·69**	1·02
2	50·80	**·91**	1·36
2½	63·50	**1·14**	1·70
2⅝	66·60	**1·20**	1·79
2¾	69·85	**1·25**	1·87
3	76·20	**1·37**	2·04
3½	88·90	**1·60**	2·38

Thickness 7/16 in. = 11·11 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
½	12·70	**·27**	·40
⅝	15·87	**·33**	·49
¾	19·05	**·40**	·60
2½	63·50	**1·33**	1·98
2¾	69·85	**1·46**	2·18
3	76·20	**1·60**	2·38

Thickness ½ in. = 12·70 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
⅝	15·87	**·38**	·57
¾	19·05	**·45**	·68
⅞	22·22	**·53**	·79
*1	25·40	**·60**	·90
1¼	31·75	**·76**	1·13
*1½	38·10	**·91**	1·36
1⅝	41·27	**·99**	1·47
2	50·80	**1·22**	1·81
2⅜	60·40	**1·45**	2·16
2½	63·50	**1·52**	2·26
2¾	69·85	**1·67**	2·49
3	76·20	**1·82**	2·72
3⅜	85·72	**2·05**	3·05

Thickness ⅝ in. = 15·87 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
·3	7·63	**·226**	·34
·4	10·13	**·30**	·45
¾	19·05	**·57**	·79
⅞	22·22	**·67**	1·00
1	25·40	**·76**	1·13
1⅛	28·57	**·85**	1·26
1¼	31·75	**·96**	1·44
1½	38·10	**1·13**	1·69
1¾	44·45	**1·33**	1·98
2½	63·50	**1·90**	2·82

Thickness 11/16 in. = 17·46 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
1⅛	28·57	**·94**	1·40
1¼	31·75	**1·05**	1·56

Thickness ¾ in. = 19·05 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
13/16	20·60	**·74**	1·10
⅞	22·22	**·80**	1·19
1	25·40	**·91**	1·36
1⅝	41·27	**1·47**	2·19
2	50·80	**1·82**	2·72
2⅛	53·97	**1·94**	2·89
2½	63·50	**2·28**	3·40
3	76·20	**2·74**	4·07

*Round Corners.

VICKERS AVIATION LIMITED

DURALUMIN WEIGHTS—*continued*

EXTRUDED RECTANGULAR SECTIONS

Thickness ⅞ in. = 22·22 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
9/16	14·29	**·60**	·89
13/16	20·60	**·87**	1·30
1¼	31·75	**1·33**	1·98
1½	38·10	**1·60**	2·38
1⅞	47·62	**1·99**	2·97
2¾	69·85	**2·92**	4·36

Thickness 1 in. = 25·40 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
1⅛	28·57	**1·37**	2·04
1½	38·10	**1·82**	2·72
1⅝	41·27	**1·98**	2·94
1¾	44·45	**2·13**	3·17
2	50·80	**2·42**	3·61
2⅛	53·97	**2·58**	3·85
2¼	57·15	**2·74**	4·07
2½	63·50	**3·04**	4·53
3	76·20	**3·65**	5·43

Thickness 1⅛ in. = 28·57 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
1⅜	34·92	**1·89**	2·81
1¾	44·45	**2·39**	3·56
*2¼	57·15	**3·09**	4·60

Thickness 1¼ in. = 31·75 m m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
1⅜	34·92	**2·09**	3·11
2	50·80	**3·04**	4·53
2½	63·50	**3·80**	5·64

Thickness 1 5/16 in. = 33·34 m/m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
1⅝	41·27	**2·60**	3·87
*3⅝	92·07	**5·74**	8·55

Thickness 1⅝ in. = 41·27 m m.

Width ins.	Width m/m.	Weight per ft. run in lb.	Weight per lineal metre in kg.
2¼	57·15	**4·45**	6·62

ADDITIONAL SIZES

Width inches	Width m/m.	Weight per ft. run in lbs.	Weight per lineal metre in kilos
2¼×·42	57·15×10·68	**1·15**	1·71
***1·6×·8**	40·6 ×20·3	**1·56**	2·32
***2×2¾**	50·8 ×69·85	**6·7**	9·97

*Round Corners.

DURALUMIN TUBES

SWG.		0		1		2		3		4		5		6		7		8		9	
m/m.		8·23		7·62		7·01		6·40		5·89		5·38		4·88		4·47		4·06		3·66	
Ins.		·324		·300		·276		·252		·232		·212		·192		·176		·160		·144	
External Dia.		Weights per lineal foot in lbs. and per lineal meter in kilos.																			
ins.	m/m.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.
½	12·70																	·21	·31	·20	·30
⅝	15·87															·30	·45	·28	·42	·27	·39
¾	19·05													·41	·61	·39	·58	·36	·54	·33	·49
⅞	22·22											·54	·80	·50	·74	·47	·70	·44	·65	·40	·60
1	25·40											·64	·95	·59	·88	·55	·82	·51	·76	·47	·70
1⅛	28·57											·73	1·10	·68	1·01	·64	·95	·59	·91	·54	·80
1¼	31·75									·90	1·34	·84	1·25	·78	1·16	·72	1·07	·67	1·00	·61	·91
1⅜	34·92									1·01	1·50	·94	1·40	·87	1·29	·81	1·21	·74	1·10	·68	1·01
1½	38·10							1·20	1·79	1·12	1·67	1·04	1·55	·96	1·43	·89	1·32	·82	1·22	·75	1·12
1⅝	41·27							1·32	1·96	1·23	1·83	1·14	1·70	1·05	1·56	·97	1·44	·90	1·34	·81	1·21
1¾	44·45							1·44	2·14	1·35	2·01	1·25	1·86	1·14	1·70	1·06	1·58	·97	1·44	·88	1·31
1⅞	47·62							1·56	2·32	1·46	2·17	1·35	2·01	1·23	1·83	1·14	1·70	1·05	1·56	·95	1·41
2	50·80			1·95	2·90	1·82	2·71	1·68	2·50	1·57	2·34	1·45	2·16	1·33	1·93	1·23	1·83	1·12	1·67	1·02	1·52
2⅛	53·97			2·09	3·11	1·95	2·90	1·80	2·68	1·68	2·50	1·55	2·31	1·42	2·11	1·31	1·95	1·20	1·79	1·09	1·62
2¼	57·15			2·23	3·32	2·08	3·10	1·92	2·86	1·79	2·66	1·65	2·46	1·51	2·25	1·39	2·07	1·28	1·90	1·16	1·73
2⅜	60·32			2·37	3·53	2·21	3·29	2·04	3·03	1·90	2·83	1·75	2·60	1·60	2·38	1·48	2·20	1·35	2·01	1·23	1·83
2½	62·50	2·69	4·00	2·51	3·73	2·34	3·48	2·16	3·21	2·01	2·99	1·85	2·75	1·69	2·51	1·56	2·32	1·43	2·13	1·30	1·93
2⅝	66·67	2·85	4·24	2·65	3·94	2·48	3·69	2·28	3·39	2·12	3·15	1·95	2·90	1·78	2·65	1·65	2·46	1·51	2·25	1·36	2·02
2¾	69·85	3·00	4·46	2·80	4·17	2·61	3·88	2·40	3·57	2·23	33·2	2·06	3·07	1·88	2·80	1·73	2·57	1·58	2·35	1·43	2·13
2⅞	73·02	3·16	4·70	2·94	4·37	2·74	4·08	2·52	3·75	2·34	3·48	2·16	3·21	1·97	2·93	1·81	2·69	1·66	2·47	1·50	2·23
3	76·2	3·31	4·93	3·08	4·58	2·87	4·27	2·65	3·94	2·45	3·65	2·66	3·96	2·06	3·07	1·90	2·83	1·74	2·59	1·57	2·34

Tubes are not supplied in lengths exceeding 12 feet (3·66 metres) or 16 lbs. in weight.
Intermediate sizes are supplied provided the quantities required warrant manufacture.

	Duralumin	Aluminium	Brass	Copper
Specific Gravity	2·8	2·67	8·56	8·90
Ratio of Weights	1	·96	3·06	3·18

DURALUMIN TUBES—*continued*

SWG.		10		11		12		13		14		15		16		17		18		19		20	
m/m.		3·25		2·95		2·64		2·34		2·03		1·83		1·63		1·42		1·22		1·02		·91	
Ins.		·128		·116		·104		·092		·080		·072		·064		·056		·048		·040		·036	
External Dia.		Weights per lineal foot in lbs. and per lineal meter in kilos.																					
ins.	m/m.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.
½	12·70	·18	·27	·17	·25	·16	·24	·14	·21	·13	·19	·12	·18	·10	·16	·09	·14	·08	·12	·07	·10	·06	·094
⅝	15·87	·24	·36	·23	·34	·21	·31	·19	·28	·17	·25	·15	·23	·14	·21	·12	·18	·10	·16	·09	·13	·08	·124
¾	19·05	·30	·45	·28	·42	·26	·40	·23	·35	·20	·31	·19	·28	·17	·25	·15	·22	·13	·19	·11	·16	·10	·149
⅞	22·22	·37	·55	·34	·51	·31	·46	·28	·42	·24	·37	·22	·33	·20	·30	·17	·26	·15	·23	·13	·19	·11	·174
1	25·40	·43	·64	·40	·60	·36	·54	·32	·48	·28	·43	·26	·39	·23	·35	·20	·31	·17	·26	·15	·22	·13	·198
1⅛	28·57	·50	·74	·45	·67	·41	·61	·37	·55	·32	·48	·29	·44	·26	·39	·23	·35	·20	·30	·16	·25	·15	·223
1¼	31·75	·56	·83	·51	·76	·46	·68	·41	·61	·36	·54	·33	·49	·29	·44	·26	·39	·22	·33	·18	·28	·17	·253
1⅜	34·92	·62	·92	·56	·83	·51	·76	·45	·68	·40	·60	·36	·54	·32	·49	·28	·43	·24	·37	·20	·30	·18	·268
1½	38·10	·68	1·01	·62	·92	·56	·83	·50	·75	·43	·64	·40	·60	·35	·53	·31	·47	·27	·40	·22	·33	·20	·298
1⅝	41·27	·74	1·10	·68	1·01	·61	·91	·54	·80	·48	·71	·43	·64	·38	·58	·34	·51	·29	·43	·24	·36	·22	·322
1¾	44·45	·80	1·19	·74	1·10	·66	·98	·59	·88	·52	·77	·47	·70	·42	·62	·36	·54	·31	·46	·26	·39	·24	·357
1⅞	47·62	·86	1·28	·80	1·19	·71	1·06	·62	·93	·55	·83	·50	·75	·45	·67	·39	·58	·33	·49	·28	·42		
2	50·80	·93	1·38	·84	1·25	·76	1·13	·68	1·01	·59	·89	·54	·80	·48	·71	·42	·62	·36	·54				
2⅛	53·97	·99	1·47	·90	1·34	·81	1·21	·72	1·08	·63	·94	·57	·85	·51	·76	·44	·65	·38	·57				
2¼	57·15	1·05	1·56	·96	1·43	·86	1·28	·77	1·15	·67	1·00	·61	·91	·54	·81	·47	·70	·40	·60				
2⅜	60·32	1·12	1·67	1·02	1·52	·91	1·35	·81	1·22	·71	1·06	·64	·96	·57	·85	·50	·74	·43	·64				
2½	62·50	1·18	1·76	1·07	1·59	·96	1·43	·86	1·29	·75	1·12	·68	1·01	·60	·90								
2⅝	66·67	1·24	1·85	1·13	1·68	1·02	1·52	·90	1·35	·79	1·18	·71	1·06	·63	·95								
2¾	69·85	1·30	1·93	1·19	1·77	1·07	1·59	·95	1·41	·83	1·24	·73	1·10	·66	·99								
2⅞	73·02	1·37	2·04	1·26	1·87	1·12	1·67	·99	1·48	·86	1·29	·78	1·17	·69	1·04								
3	76·20	1·43	2·13	1·30	1·93	1·17	1·74	1·04	1·55	·90	1·35	·81	1·22	·73	1·09								

Tubes are not supplied in lengths exceeding 12 feet (3·66 metres) or 16 lbs. in weight.
Intermediate sizes are supplied provided the quantities required warrant manufacture.

	Duralumin	Aluminium	Brass	Copper
Specific Gravity	2·8	2·67	8·56	8·90
Ratio of Weights	1	·96	3·06	3·18

DURALUMIN WEIGHTS—*continued*

SHEET

Thickness SWG.	Dec. Equivalent	Millimetre Equivalent	Weight		Size
			Per sq. ft. in lbs.	Per sq. m. in kg.	
0	·324	8·23	**4·730**	23·10	**3′** (·91 metres) × **2′** (·61 metres) max.
1	·300	7·62	**4·328**	21·13	**3′** (·91 ,,) × **2′** (·61 ,,) ,,
2	·276	7·01	**4·030**	19·68	**3′ 6″** (1·07 ,,) × **2′** (·61 ,,) ,,
3	·252	6·40	**3·680**	17·97	**3′ 6″** (1·07 ,,) × **2′** (·61 ,,) ,,
4	·232	5·89	**3·380**	16·50	**4′** (1·22 ,,) × **2′** (·61 ,,) ,,
5	·212	5·38	**3·096**	15·11	**4′ 6″** (1·37 ,,) × **2′** (·61 ,,) ,,
6	·192	4·88	**2·800**	13·67	**5′** (1·53 ,,) × **2′** (·61 ,,) ,,
7	·176	4·47	**2·570**	12·55	**5′ 6″** (1·68 ,,) × **2′** (·61 ,,) ,,
8	·160	4·06	**2·330**	11·38	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
9	·144	3·66	**2·103**	10·26	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
10	·128	3·25	**1·860**	9·08	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
11	·116	2·95	**1·694**	8·27	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
12	·104	2·64	**1·510**	7·37	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
13	·092	2·34	**1·343**	6·55	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
14	·080	2·03	**1·160**	5·66	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
15	·072	1·83	**1·051**	5·13	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
16	·064	1·63	**·934**	4·56	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
17	·056	1·42	**·817**	3·99	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
18	·048	1·22	**·700**	3·42	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
19	·040	1·02	**·584**	2·85	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
20	·036	·914	**·525**	2·56	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
21	·032	·813	**·467**	2·28	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
22	·028	·711	**·408**	1·99	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
23	·024	·610	**·350**	1·70	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
24	·022	·559	**·321**	1·57	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
25	·020	·508	**·292**	1·42	**6′** (1·83 ,,) × **2′** (·61 ,,) ,,
26	·018	·457	**·263**	1·28	**6′** (1·83 ,,) × **18″** (·46 ,,) ,,
27	·016	·4164	**·239**	1·16	**6′** (1·83 ,,) × **15″** (·38 ,,) ,,
28	·014	·3768	**·216**	1·05	**6′** (1·83 ,,) × **12″** (·30 ..) ,,
29	·013	·3456	**·198**	·96	**6′** (1·83 ,,) × **12″** (·30 ,,) ,,
30	·012	·3154	**·181**	·88	**6′** (1·83 ,,) × **12″** (·30 ,,) ,,

English — Metric
Metric — English

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VICKERS AVIATION LIMITED

Equivalent Values of Millimetres and Inches

and Fractions of Inches (·00001 in. — ·000254 mm.)

mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.
·1	·00394		4·1	·16141		8·1	·31889	
·2	·00787		4·2	·16535		8·2	·32283	
·3	·01181		4·3	·16929		8·3	·32677	
·397	·015625	— 1/64	4·366	·171875	— 11/64	8·334	·328125	— 21/64
·4	·01575		4·4	·17322		8·4	·33070	
·5	·01968		4·5	·17716		8·5	·33464	
·6	·02362		4·6	·18110		8·6	·33858	
·7	·02756		4·7	·18503		8·7	·34251	
·794	·03125	— 1/32	4·763	·18750	— 3/16	8·731	·34375	— 11/32
·8	·03149		4·8	·18897		8·8	·34645	
·9	·03543		4·9	·19291		8·9	·35039	
1·0	·03937		5·0	·19685		9·0	·35433	
1·1	·0433		5·1	·20078		9·1	·35826	
1·191	·046875	— 3/64	5·159	·203125	— 13/64	9·128	·359375	— 23/64
1·2	·04724		5·2	·20472		9·2	·36220	
1·3	·05118		5·3	·20866		9·3	·36614	
1·4	·05512		5·4	·21259		9·4	·37007	
1·5	·05905		5·5	·21653		9·5	·37401	
1·587	·06250	— 1/16	5·556	·21875	— 7/32	9·525	·37500	— 3/8
1·6	·06299		5·6	·22047		9·6	·37795	
1·7	·06693		5·7	·22440		9·7	·38188	
1·8	·07086		5·8	·22834		9·8	·38582	
1·9	·07480		5·9	·23228		9·9	·38976	
1·984	·078125	— 5/64	5·953	·234375	— 15/64	9·922	·390625	— 25/64
2·0	·07874		6·0	·23622		10·0	·39370	
2·1	·08267		6·1	·24015		10·1	·39763	
2·2	·08661		6·2	·24409		10·2	·40157	
2·3	·09055		6·3	·24803		10·3	·40551	
2·381	·09375	— 3/32	6·35	·25000	— 1/4	10·319	·40625	— 13/32
2·4	·09449		6·4	·25196		10·4	·40944	
2·5	·09842		6·5	·25590		10·5	·41338	
2·6	·10236		6·6	·25984		10·6	·41732	
2·7	·10630		6·7	·26377		10·7	·42125	
2·778	·109375	— 7/64	6·747	·265625	— 17/64	10·716	·421875	— 27/64
2·8	·11023		6·8	·26771		10·8	·42519	
2·9	·11417		6·9	·27165		10·9	·42913	
3·0	·11811		7·0	·27559		11·0	·43307	
3·1	·12204		7·1	·27952		11·1	·43700	
3·175	·12500	— 1/8	7·144	·28125	— 9/32	11·113	·43750	— 7/16
3·2	·12598		7·2	·28346		11·2	·44094	
3·3	·12992		7·3	·28740		11·3	·44488	
3·4	·13385		7·4	·29133		11·4	·44881	
3·5	·13779		7·5	·29527		11·5	·45275	
3·572	·140625	— 9/64	7·541	·296875	— 19/64	11·51	·453125	— 29/64
3·6	·14173		7·6	·29921		11·6	·45669	
3·7	·14566		7·7	·30314		11·7	·46062	
3·8	·14960		7·8	·30708		11·8	·46456	
3·9	·15354		7·9	·31102		11·9	·46850	
3·969	·15625	— 5/32	7·938	·31250	— 5/16	11·906	·46875	— 15/32
4·0	·15748		8·0	·31496		12·0	·47244	

VICKERS AVIATION LIMITED

Equivalent Values of Millimetres and Inches—*continued*

and Fractions of Inches (·00001 in. — ·000254 mm.)

mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.
12·1	·47637		16·1	·63386		20·1	·79133	
12·2	·48031		16·2	·63779		20·2	·79527	
12·3	·48425		16·272	·640625	— 41/64	20·241	·796875	— 51/64
12·303	·484375	— 31/64	16·3	·64173		20·3	·79921	
12·4	·48818		16·4	·64566		20·4	·80314	
12·5	·49212		16·5	·64960		20·5	·80708	
12·6	·49606		16·6	·65354		20·6	·81102	
12·7	·49999		16·669	·65625	— 21/32	20·638	·81250	— 13/16
—	·50000	— 1/2	16·7	·65747		20·7	·81495	
12·8	·50393		16·8	·66141		20·8	·81889	
12·9	·50787		16·9	·66535		20·9	·82283	
13·0	·51181		17·0	·66929		21·0	·82677	
13·097	·515625	— 33/64	17·066	·671875	— 43/64	21·035	·828125	— 53/64
13·1	·51574		17·1	·67322		21·1	·83070	
13·2	·51968		17·2	·67716		21·2	·83464	
13·3	·52362		17·3	·68110		21·3	·83858	
13·4	·52755		17·4	·68503		21·4	·84251	
13·494	·53125	— 17/32	17·463	·68750	— 11/16	21·432	·84375	— 27/32
13·5	·53149		17·5	·68897		21·5	·84645	
13·6	·53543		17·6	·69291		21·6	·85039	
13·7	·53936		17·7	·69684		21·7	·85432	
13·8	·54330		17·8	·70078		21·8	·85826	
13·891	·546875	— 35/64	17·860	·703125	— 45/64	21·828	·859375	— 55/64
13·9	·54724		17·9	·70472		21·9	·86220	
14·0	·55118		18·0	·70866		22·0	·86614	
14·1	·55511		18·1	·71259		22·1	·87007	
14·2	·55905		18·2	·71653		22·2	·87401	
14·288	·56250	— 9/16	18·256	·71875	— 23/32	22·225	·87500	— 7/8
14·3	·56299		18·3	·72047		22·3	·87795	
14·4	·56692		18·4	·72440		22·4	·88188	
14·5	·57086		18·5	·72834		22·5	·88582	
14·6	·57480		18·6	·73228		22·6	·88976	
14·684	·578125	— 37/64	18·653	·734375	— 47/64	22·622	·890625	— 57/64
14·7	·57873		18·7	·73621		22·7	·89369	
14·8	·58267		18·8	·74015		22·8	·89763	
14·9	·58661		18·9	·74409		22·9	·90157	
15·0	·59055		19·0	·74803		23·0	·90551	
15·081	·59375	— 19/32	19·050	·75000	— 3/4	23·019	·90625	— 29/32
15·1	·59448		19·1	·75196		23·1	·90944	
15·2	·59842		19·2	·75590		23·2	·91338	
15·3	·60236		19·3	·75984		23·3	·91732	
15·4	·60630		19·4	·76377		23·4	·92125	
15·478	·609375	— 39/64	19·447	·765625	— 49/64	23·416	·921875	— 59/64
15·5	·61023		19·5	·76771		23·5	·92519	
15·6	·61417		19·6	·77165		23·6	·92913	
15·7	·61811		19·7	·77558		23·7	·93306	
15·8	·62204		19·8	·77952		23·8	·93700	
15·875	·62500	— 5/8	19·844	·78125	— 25/32	23·813	·93750	— 15/16
15·9	·62598		19·9	·78346		23·9	·94094	
16·0	·62992		20·0	·78740		24·0	·94488	

Equivalent Values of Millimetres and Inches—*continued*

and Fractions of Inches (·00001 in. — ·000254 mm.)

mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.	mm.	Inches Dec.	Inches Fr.
24·1	·94881		25·004	·984375	— $\frac{63}{64}$	31·751	1·25000	— $1\frac{1}{4}$
24·2	·95275		25·1	·98818		35·0	1·37795	
24·210	·953125	— $\frac{61}{64}$	25·2	·99212		38·101	1·50000	— $1\frac{1}{2}$
24·3	·95669		25·3	·99606		40·0	1·57480	
24·4	·96062		25·4	·99999		44·451	1·75000	— $1\frac{3}{4}$
24·5	·96456		25·401	1·00000	— 1	45·0	1·77165	
24·6	·96850		25·5	1·00393		50·0	1·96850	
24·607	·96875	— $\frac{31}{32}$				50·801	2·00000	— 2
24·7	·97243							
24·8	·97637							
24·9	·98031							
25·0	·98425		26·0	1·02362		55·0	2·16535	
			27·0	1·06299		60·0	2·36220	
			28·0	1·10236		70·0	2·75590	
			29·0	1·14173		76·201	3·00000	— 3
			30·0	1·18110		80·0	3·14961	
						90·0	3·54331	
						100·0	3·93701	
						101·601	4·00000	— 4

BRITISH AND METRIC MEASUREMENTS

Feet into metres.

Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres
1	0·305	46	14·021	91	27·736	136	41·452	181	55·167
2	0·610	47	14·326	92	28·041	137	41·756	182	55·472
3	0·914	48	14·630	93	28·346	138	42·061	183	55·777
4	1·219	49	14·935	94	28·650	139	42·366	184	56·082
5	1·524	50	15·240	95	28·955	140	42·671	185	56·387
6	1·829	51	15·544	96	29·260	141	42·976	186	56·691
7	2·134	52	15·849	97	29·565	142	43·280	187	56·996
8	2·438	53	16·154	98	29·869	143	43·585	188	57·301
9	2·743	54	16·459	99	30·174	144	43·890	189	57·606
10	3·048	55	16·763	100	30·479	145	44·195	190	57·910
11	3·353	56	17·068	101	30·784	146	44·499	191	58·215
12	3·657	57	17·373	102	31·089	147	44·804	192	58·520
13	3·962	58	17·678	103	31·393	148	45·109	193	58·825
14	4·267	59	17·983	104	31·698	149	45·414	194	59·130
15	4·572	60	18·287	105	32·003	150	45·719	195	59·435
16	4·877	61	18·592	106	32·308	151	46·024	196	59·739
17	5·182	62	18·897	107	32·613	152	46·328	197	60·044
18	5·486	63	19·202	108	32·917	153	46·683	198	60·349
19	5·791	64	19·507	109	33·222	154	46·938	199	60·654
20	6·096	65	19·811	110	33·528	155	47·243	200	60·959
21	6·401	66	20·116	111	33·832	156	47·852	201	60·263
22	6·705	67	20·421	112	34·137	157	47·548	202	61·568
23	7·010	68	20·726	113	34·441	158	48·157	203	61·873
24	7·315	69	21·030	114	34·746	159	48·462	204	62·178
25	7·620	70	21·335	115	35·051	160	48·767	205	62·482
26	7·925	71	21·640	116	35·356	161	49·072	206	62·787
27	8·229	72	21·945	117	35·661	162	49·376	207	63·092
28	8·534	73	22·249	118	35·965	163	49·681	208	63·397
29	8·839	74	22·554	119	36·279	164	49·986	209	63·702
30	9·144	75	22·859	120	36·575	165	50·291	210	64·006
31	9·449	76	23·164	121	36·880	166	50·595	211	64·311
32	9·753	77	23·469	122	37·185	167	50·900	212	64·616
33	10·058	78	23·774	123	37·489	168	51·205	213	64·921
34	10·363	79	24·078	124	37·794	169	51·510	214	65·226
35	10·668	80	24·383	125	38·099	170	51·815	215	65·530
36	10·973	81	24·688	126	38·404	171	52·119	216	65·835
37	11·278	82	24·993	127	38·709	172	52·424	217	66·140
38	11·582	83	25·298	128	39·013	173	52·729	218	66·445
39	11·887	84	25·602	129	39·318	174	53·034	219	66·750
40	12·192	85	25·907	130	39·623	175	53·339	220	67·054
41	12·497	86	26·212	131	39·928	176	53·643	221	67·359
42	12·802	87	26·517	132	40·233	177	53·948	222	67·664
43	13·106	88	26·822	133	40·537	178	54·253	223	67·969
44	13·411	89	27·126	134	40·842	179	54·558	224	68·274
45	13·716	90	27·431	135	41·147	180	54·863	225	68·578

Feet into metres—*continued*

Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres
226	68·883	276	84·123	326	99·363	376	114·602	426	129·841
227	69·188	277	84·428	327	99·667	377	114·907	427	130·145
228	69·493	278	84·732	328	99·972	378	115·212	428	130·450
229	69·798	279	85·037	329	100·277	379	115·517	429	130·755
230	70·102	280	85·342	330	100·582	380	115·821	430	131·060
231	70·407	281	85·647	331	100·887	381	116·126	431	131·364
232	70·712	282	85·952	332	101·191	382	116·431	432	131·669
233	71·017	283	86·256	333	101·496	383	116·736	433	131·974
234	71·321	284	86·561	334	101·801	384	117·041	434	132·279
235	71·626	285	86·866	335	102·106	385	117·345	435	132·584
236	71·931	286	87·171	336	102·410	386	117·650	436	132·888
237	72·236	287	87·476	337	102·715	387	117·955	437	133·193
238	72·541	288	87·780	338	103·020	388	118·260	438	133·498
239	72·845	289	88·085	339	103·325	389	118·565	439	133·803
240	73·150	290	88·390	340	103·630	390	118·869	440	134·108
241	73·455	291	88·695	341	103·934	391	119·174	441	134·412
242	73·760	292	89·000	342	104·239	392	119·479	442	134·717
243	74·065	293	89·304	243	104·544	393	119·784	443	135·022
244	74·369	294	89·609	344	104·849	394	120·089	444	135·327
245	74·674	295	89·914	345	105·154	395	120·393	445	135·632
246	74·979	296	90·218	346	105·458	396	120·698	446	135·936
247	75·284	297	90·523	347	105·763	397	121·003	447	136·241
248	75·589	298	90·828	348	106·068	398	121·308	448	136·546
249	75·893	299	91·133	349	106·373	399	121·613	449	136·851
250	76·198	300	91·437	350	106·678	400	121·917	450	137·156
251	76·503	301	91·742	351	106·982	401	122·222	451	137·460
252	76·808	302	92·047	352	107·287	402	122·527	452	137·765
253	77·113	303	92·352	353	107·592	403	122·832	453	138·070
254	77·417	304	92·657	354	107·897	404	123·136	454	138·375
255	77·722	305	92·962	355	108·202	405	123·441	455	138·679
256	78·027	306	93·267	356	108·506	406	123·746	456	138·984
257	78·332	307	93·571	357	108·811	407	124·050	457	139·289
258	78·637	308	93·876	358	109·116	408	124·354	458	139·594
259	78·941	309	94·181	359	109·421	409	124·659	459	139·899
260	79·246	310	94·486	360	109·726	410	124·964	460	140·203
261	79·551	311	94·790	361	110·030	411	125·269	461	140·508
262	79·856	312	95·095	362	110·335	412	125·573	462	140·813
263	80·161	313	95·400	363	110·640	413	125·878	463	141·118
264	80·465	314	95·705	364	110·945	414	126·183	464	141·423
265	80·770	315	96·010	365	111·250	415	126·488	465	141·727
266	81·075	316	96·315	366	111·554	416	126·793	466	142·032
267	81·380	317	96·619	367	111·859	417	127·097	467	142·337
268	81·684	318	96·924	368	112·164	418	127·402	468	142·642
269	81·989	319	97·229	369	112·469	419	127·707	469	142·947
270	82·294	320	97·534	370	112·773	420	128·012	470	143·252
271	82·599	321	97·839	371	113·078	421	128·317	471	143·557
272	82·904	322	98·143	372	113·383	422	128·621	472	143·862
273	83·208	323	98·448	373	113·688	423	128·926	473	144·167
274	83·513	324	98·753	374	113·993	424	129·231	474	144·472
275	83·818	325	99·058	375	114·297	425	129·536	475	144·777

Feet into metres—*continued*

Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres
476	145·082	1500	457·188	7500	2285·940	13000	3962·296	19000	5791·046
477	145·387	2000	609·584			13500	4114·692	19500	5943·442
478	145·691	2500	761·980			14000	4267·088	20000	6095·836
				8000	2438·336				
479	145·996					14500	4359·484		
				8500	2590·732				
480	146·301	3000	914·376			15000	4571·880		
				9000	2743·128			20500	6248·232
		3500	1066·772						
				9500	2895·424			21000	6400·628
490	149·349	4000	1219·168			15500	4724·276		
				10000	3047·92			21500	6552·924
500	152·396	4500	1371·564			16000	4876·652		
								22000	6705·420
600	182·875	5000	1523·960			16500	5029·048		
								22500	6857·816
700	213·354			10500	3200·316	17000	5181·044		
800	243·834	5500	1676·356	11000	3352·712	17500	5333·836		
		6000	1828·752	11500	3505·108			23000	7010·212
900	274·313	6500	1981·148	12000	3657·504	18000	5486·256	23500	7162·608
1000	304·792	7000	2133·544	12500	3809·900	18500	5638·652	24000	7315·004

Metres into Feet.

Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet
1	3·2808	26	85·30	51	167·32	76	249·34	200	656·17
2	6·562	27	88·59	52	170·60	77	252·62	300	984·25
3	9·842	28	91·87	53	173·88	78	255·90	400	1312·34
4	13·123	29	95·15	54	177·16	79	259·18	500	1640·42
5	16·404	30	98·42	55	180·45	80	262·47	600	1968·50
6	19·685	31	101·70	56	183·72	81	265·74	700	2296·59
7	22·966	32	104·98	57	187·00	82	269·02	800	2624·67
8	26·247	33	108·27	58	190·29	83	272·30	900	2952·76
9	29·527	34	111·55	59	193·57	84	275·59	1000	3280·843
10	32·81	35	114·83	60	196·85	85	278·87	1500	4921·26
11	36·09	36	118·11	61	200·13	86	282·15	2000	6561·68
12	39·37	37	121·39	62	203·41	87	285·43	2500	8202·10
13	42·65	38	124·67	63	206·69	88	288·71	3000	9842·52
14	45·93	39	127·95	64	209·97	89	291·99	3500	11482·94
15	49·21	40	131·23	65	213·25	90	295·27	4000	13123·36
16	52·49	41	134·51	66	216·53	91	298·55	4500	14763·78
17	55·77	42	137·79	67	219·81	92	301·83	5000	16404·21
18	59·05	43	141·07	68	223·09	93	305·11	5500	18044·62
19	62·33	44	144·35	69	226·37	94	308·39	6000	19685·05
20	65·62	45	147·64	70	229·66	95	311·67	6500	21325·47
21	68·9	46	150·92	71	232·94	96	314·95	7000	22965·90
22	72·18	47	154·20	72	236·22	97	318·23	7500	24606·32
23	75·46	48	157·48	73	239·49	98	321·51	8000	26246·74
24	78·74	49	160·76	74	242·78	99	324·79	8500	27887·17
25	82·02	50	164·04	75	246·06	100	328·084		

Miles into Kilometres.

Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.
1	1·609	39	62·76	77	123·913	116	186·676	153	246·17
2	3·219	40	64·37	78	125·522	117	188·285	154	247·79
3	4·828	41	65·98	79	127·131	118	189·894	155	249·34
4	6·437	42	67·59	80	128·74	119	191·503	156	251·00
5	8·047	43	69·197	81	130·36	120	193·11	157	252·61
6	9·655	44	70·811	82	131·96	121	194·72	158	254·22
7	11·265	45	72·415	83	133·57	122	196·33	159	255·83
8	12·874	46	74·024	84	135·18	123	197·94	160	257·439
9	14·484	47	75·633	85	136·79	124	199·55	161	259·048
10	16·09	48	77·242	86	138·40	125	201·16	162	260·658
11	17·69	49	78·851	87	140·01	126	202·77	163	262·267
12	19·312	50	80·464	88	141·62	127	204·38	164	263·876
13	20·92	51	82·077	89	143·23	128	205·99	165	265·486
14	22·53	52	83·686	90	144·83	129	207·596	166	267·084
15	24·140	53	85·291	91	146·44	130	209·207	167	268·704
16	25·75	54	86·901	92	148·05	131	210·816	168	270·313
17	27·36	55	88·510	93	149·66	132	212·425	169	271·923
18	28·97	56	90·120	94	151·27	133	214·034	170	273·532
19	30·57	57	91·729	95	152·89	134	215·643	171	275·141
20	32·19	58	93·34	96	154·50	135	217·25	172	276·751
21	33·79	59	94·95	97	156·11	136	218·86	173	278·460
22	35·40	60	96·55	98	157·72	137	220·47	174	279·969
23	37·01	61	98·166	99	159·33	138	222·07	175	281·579
24	38·62	62	99·765	100	160·92	139	223·75	176	283·177
25	40·233	63	101·374	101	162·53	140	225·30	177	284·797
26	41·83	64	102·99	102	164·14	141	226·91	178	286·406
27	43·44	65	104·602	103	165·75	142	228·62	179	288·016
28	45·05	66	106·211	104	167·37	143	230·23	180	289·625
29	46·66	67	107·812	105	168·974	144	231·84	181	291·234
30	48·28	68	109·421	106	170·583	145	233·45	182	292·844
31	49·879	69	111·041	107	172·192	146	235·05	183	294·453
32	51·488	70	112·65	108	173·801	147	236·66	184	296·062
33	53·108	71	114·26	109	175·41	148	238·27	185	297·672
34	54·71	72	115·87	110	177·02	149	239·88	186	299·270
35	56·33	73	117·48	111	178·63	150	241·35	187	300·890
36	57·94	74	119·086	112	180·24	151	242·96	188	302·499
37	59·55	75	120·675	113	181·85	152	244·57	189	304·109
38	61·15	76	122·304	114	183·456			190	305·718
				115	185·067				

Kilometres into Miles

Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles
1	0·621504	11	6·8365	21	13·051	31	19·266	41	25·481
2	1·243008	12	7·4581	22	13·673	32	19·888	42	26·103
3	1·864512	13	8·0796	23	14·294	33	20·509	43	26·724
4	2·486016	14	8·7012	24	14·916	34	21·131	44	27·346
5	3·107520	15	9·3227	25	15·537	35	21·752	45	27·967
6	3·729024	16	9·9442	26	16·159	36	22·374	46	28·589
7	4·350528	17	10·5658	27	16·780	37	22·995	47	29·210
8	4·972032	18	11·1873	28	17·402	38	23·617	48	29·832
9	5·593536	19	11·8089	29	18·023	39	24·238	49	30·453
10	6·2150	20	12·43	30	18·645	40	24·86	50	31·075

Kilometres into miles—*continued*

Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles	Kilos.	Miles
51	31·696	101	62·772	151	93·846	201	124·922	251	155·997
52	32·318	102	63·393	152	94·468	202	125·544	252	156·618
53	32·939	103	64·015	153	95·089	203	126·165	253	157·240
54	33·561	104	64·636	154	95·711	204	126·787	254	157·862
55	34·182	105	65·258	155	96·332	205	127·408	255	158·483
56	34·804	106	65·879	156	96·954	206	128·030	256	159·105
57	35·425	107	66·501	157	97·575	207	128·651	257	159·726
58	36·047	108	67·122	158	98·197	208	129·273	258	160·347
59	36·668	109	67·744	159	98·818	209	129·894	259	160·968
60	37·290	110	68·365	160	99·440	210	130·516	260	161·590
61	37·911	111	68·986	161	100·061	211	131·137	261	162·212
62	38·533	112	69·608	162	100·683	212	131·759	262	162·833
63	39·155	113	70·229	163	101·304	213	132·380	263	163·455
64	39·776	114	70·851	164	101·926	214	133·002	264	164·077
65	40·397	115	71·472	165	102·547	215	133·623	265	164·698
66	41·019	116	72·094	166	103·169	216	134·245	266	165·320
67	41·640	117	72·715	167	103·790	217	134·867	267	165·941
68	42·262	118	73·237	168	104·412	218	135·488	268	166·562
69	42·883	119	73·958	169	105·033	219	136·109	269	167·183
70	43·505	120	74·58	170	105·655	220	136·731	270	167·805
71	44·126	121	75·201	171	106·276	221	137·352	271	168·427
72	44·748	122	75·822	172	106·898	222	137·974	272	169·048
73	45·369	123	76·443	173	107·519	223	138·595	273	169·670
74	45·991	124	77·064	174	108·141	224	139·217	274	170·292
75	46·612	125	77·685	175	108·762	225	139·838	275	170·913
76	47·234	126	78·307	176	109·384	226	140·460	276	171·535
77	47·855	127	78·928	177	110·005	227	141·081	277	172·156
78	48·477	128	79·550	178	110·627	228	141·703	278	172·777
79	49·0985	129	80·171	179	111·248	229	142·324	279	173·398
80	49·720	130	80·795	180	111·870	230	142·946	280	174·020
81	50·341	131	81·416	181	112·491	231	143·567	281	174·642
82	50·963	132	82·038	182	113·113	232	144·189	282	175·263
83	51·584	133	82·659	183	113·734	233	144·810	283	175·885
84	52·206	134	83·281	184	114·356	234	145·432	284	176·507
85	52·827	135	83·902	185	114·977	235	146·053	285	177·128
86	53·439	136	84·524	186	115·599	236	146·674	286	177·750
87	54·069	137	85·145	187	116·220	237	147·295	287	178·371
88	54·691	138	85·767	188	116·842	238	147·916	288	178·992
89	55·312	139	86·388	189	117·463	239	148·538	289	179·613
90	55·935	140	87·01	190	118·085	240	149·160	290	180·235
91	56·556	141	87·631	191	118·706	241	149·782	291	180·857
92	57·178	142	88·253	192	119·328	242	150·404	292	181·478
93	57·799	143	88·874	193	119·949	243	151·025	293	182·100
94	58·421	144	89·496	194	120·571	244	151·647	294	182·722
95	59·042	145	90·117	195	121·192	245	152·218	295	183·343
96	59·664	146	90·739	196	121·814	246	152·889	296	183·965
97	60·285	147	91·360	197	122·435	247	153·510	297	184·586
98	60·907	148	91·982	198	123·057	248	154·132	298	185·207
99	61·528	149	92·603	199	123·678	249	154·753	299	185·828
100	62·1504	150	93·225	200	124·301	250	155·375	300	186·450

Knots into kilometres per hour.

Knots	Kilos.	Knots	Kilos.	Knots	Kilos.	Knots	Kilos.	Knots	Kilos.
1	1·853123	26	48·183	51	94·509	76	140·836	101	187·165
2	3·706	27	50·037	52	96·362	77	142·689	102	189·018
3	5·559	28	51·889	53	98·215	78	144·542	103	190·872
4	7·412	29	53·742	54	100·068	79	146·395	104	192·725
5	9·265	30	55·594	55	101·922	80	148·249	105	194·578
6	11·119	31	57·447	56	103·775	81	150·103	106	196·431
7	12·972	32	59·299	57	105·628	82	151·956	107	198·284
8	14·825	33	61·153	58	107·481	83	153·809	108	200·137
9	16·678	34	63·006	59	109·334	84	155·662	109	201·990
10	18·531	35	64·859	60	111·187	85	157·515	110	203·841
11	20·384	36	66·712	61	113·040	86	159·369	111	205·694
12	22·237	37	68·565	62	114·893	87	161·221	112	207·547
13	24·090	38	70·418	63	116·746	88	163·074	113	209·400
14	25·944	39	72·271	64	118·599	89	164·927	114	211·253
15	27·797	40	74·125	65	120·452	90	166·781	115	213·106
16	29·649	41	75·978	66	122·305	91	168·634	116	214·960
17	31·503	42	77·831	67	124·158	92	170·487	117	216·813
18	33·356	43	79·684	68	126·011	93	172·340	118	218·666
19	35·209	44	81·537	69	127·864	94	174·193	119	220·519
20	37·062	45	83·390	70	129·718	95	176·046	120	222·372
21	38·917	46	85·243	71	131·570	96	177·899		
22	40·771	47	87·096	72	133·423	97	179·752		
23	42·624	48	88·949	73	135·276	98	181·606		
24	44·477	49	90·803	74	137·129	99	183·459		
25	46·329	50	92·656	75	138·982	100	185·312		

RATE OF CLIMB.

Feet per minute into metres per second.

Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres
1	0·00508	80	0·40639	210	1·06678	360	1·82877	510	2·59075
5	0·02540	85	0·43179	220	1·11758	370	1·87957	520	2·64155
10	0·05080	90	0·45719	230	1·16838	380	1·93037	530	2·69235
15	0·07620	95	0·48259	240	1·21918	390	1·98116	540	2·74315
20	0·10160	100	0·50799	250	1·26998	400	2·03196	550	2·79395
25	0·12700	110	0·55879	260	1·32078	410	2·08276	560	2·84475
30	0·15240	120	0·60959	270	1·37158	420	2·13356	570	2·89555
35	0·17780	130	0·66039	280	1·42237	430	2·18436	580	2·94635
40	0·20320	140	0·71119	290	1·47317	440	2·23516	590	2·99715
45	0·22860	150	0·76199	300	1·52397	450	2·28596	600	3·04794
50	0·25400								
55	0·27939	160	0·81279	310	1·57477	460	2·33676	610	3·09874
60	0·30479	170	0·86358	320	1·62557	470	2·38756	620	3·14954
65	0·33019	180	0·91438	330	1·67637	480	2·43836	630	3·20034
70	0·35559	190	0·96518	340	1·72717	490	2·48915	640	3·25114
75	0·38099	200	1·01598	350	1·77797	500	2·53995	650	3·30194

Feet per minute into Metres per second—*continued*

Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres
660	3·35274	760	3·86073	860	4·36872	960	4·87671	1600	8·12785
670	3·40354	770	3·91153	870	4·41952	970	4·92751	1700	8·63584
680	3·45434	780	3·96233	880	4·47032	980	4·97831	1800	9·14383
690	3·50514	790	4·01313	890	4·52112	990	5·02911	1900	9·65183
700	3·55594	800	4·06393	900	4·57192	1000	5·07991	2000	10·15982
710	3·60673	810	4·11473	910	4·62272	1100	5·58790		
720	3·65753	820	4·16552	920	4·67352	1200	6·09589		
730	3·70833	830	4·21632	930	4·72431	1300	6·60388		
740	3·75913	840	4·26712	940	4·77511	1400	7·11187		
750	3·80993	850	4·31792	950	4·82591	1500	7·61986		

RATE OF CLIMB.

Metres per second into feet per minute.

Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet	Metres	Feet
0·1	19·69	2·3	452·76	4·5	885·84	6·6	1299·24	8·8	1732·31
0·2	39·37	2·4	472·45	4·6	905·53	6·7	1318·92	8·9	1752·00
0·3	59·06	2·5	492·13	4·7	925·21	6·8	1338·61	9·0	1771·69
0·4	78·74	2·6	511·82	4·8	944·90	6·9	1358·29	9·1	1791·37
0·5	98·43	2·7	531·51	4·9	964·58	7·0	1377·98	9·2	1811·06
0·6	118·11	2·8	551·19	5·0	984·27	7·1	1397·66	9·3	1830·74
0·7	139·80	2·9	570·88	5·1	1003·95	7·2	1417·35	9·4	1850·43
0·8	157·50	3·0	590·56	5·2	1023·64	7·3	1437·03	9·5	1870·11
0·9	177·17	3·1	610·25	5·3	1043·33	7·4	1456·72	9·6	1889·80
1·0	196·85	3·2	629·93	5·4	1063·01	7·5	1476·40	9·7	1909·48
1·1	216·54	3·3	649·62	5·5	1082·70	7·6	1496·09	9·8	1929·17
1·2	236·22	3·4	669·30	5·6	1102·38	7·7	1515·78	9·9	1948·85
1·3	255·91	3·5	688·99	5·7	1122·07	7·8	1535·46	10·0	1968·54
1·4	275·60	3·6	708·67	5·8	1141·75	7·9	1555·15	11·0	2165·39
1·5	295·28	3·7	728·36	5·9	1161·44	8·0	1574·83	12·0	2362·25
1·6	314·97	3·8	748·04	6·0	1181·21	8·1	1594·52	13·0	2559·10
1·7	334·65	3·9	767·73	6·1	1200·81	8·2	1614·20	14·0	2755·95
1·8	354·34	4·0	787·42	6·2	1220·49	8·3	1633·89	15·0	2952·81
1·9	374·02	4·1	807·10	6·3	1240·18	8·4	1653·57	16·0	3149·66
2·0	393·71	4·2	826·79	6·4	1259·86	8·5	1673·26	17·0	3346·52
2·1	413·39	4·3	846·47	6·5	1279·55	8·6	1692·94	18·0	3543·37
2·2	433·08	4·4	866·16			8·7	1712·63	19·0	3740·22
								20·0	3937·08

AREA

SQUARE INCH (sq. in.) = 6·45 cm² SQUARE FOOT (sq. ft.) = 0·092 m² SQUARE YARD = 0·836 m²
ACRE = 0·404 hect. SQUARE MILE (sq. m.) = 259 hect.

Square feet into square metres.

Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)
1	0·0929	41	3·8088	81	7·5247	121	11·2405	161	14·9564
2	0·1858	42	3·9017	82	7·6176	122	11·3334	162	15·0493
3	0·2787	43	3·9946	83	7·7105	123	11·4263	163	15·1422
4	0·3716	44	4·0875	84	7·8033	124	11·5192	164	15·2351
5	0·4645	45	4·1804	85	7·8962	125	11·6121	165	15·3280
6	0·5574	46	4·2733	86	7·9891	126	11·7050	166	15·4209
7	0·6503	47	4·3662	87	8·0820	127	11·7979	167	15·5138
8	0·7432	48	4·4591	88	8·1749	128	11·8908	168	15·6067
9	0·8361	49	4·5520	89	8·2678	129	11·9837	169	15·6996
10	0·9290	50	4·6449	90	8·3607	130	12·0766	170	15·7925
11	1·0219	51	4·7377	91	8·4536	131	12·1695	171	15·8854
12	1·1148	52	4·8306	92	8·5465	132	12·2624	172	15·9783
13	1·2077	53	4·9235	93	8·6394	133	12·3553	173	16·0712
14	1·3006	54	5·0164	94	8·7323	134	12·4482	174	16·1641
15	1·3935	55	5·1093	95	8·8252	135	12·5411	175	16·2570
16	1·4864	56	5·2022	96	8·9181	136	12·6340	176	16·3499
17	1·5792	57	5·2951	97	9·0110	137	12·7269	177	16·4428
18	1·6721	58	5·3880	98	9·1039	138	12·8198	178	16·5357
19	1·7650	59	5·4809	99	9·1968	139	12·9127	179	16·6286
20	1·8579	60	5·5738	100	9·2897	140	13·0056	180	16·7215
21	1·9508	61	5·6667	101	9·3826	141	13·0985	181	16·8144
22	2·0437	62	5·7596	102	9·4755	142	13·1914	182	16·9073
23	2·1366	63	5·8525	103	9·5684	143	13·2843	183	17·0002
24	2·2295	64	5·9454	104	9·6613	144	13·3772	184	17·0930
25	2·3224	65	6·0383	105	9·7542	145	13·4701	185	17·1858
26	2·4153	66	6·1312	106	9·8471	146	13·5630	186	17·2788
27	2·5082	67	6·2241	107	9·9400	147	13·6559	187	17·3717
28	2·6011	68	6·3170	108	10·0329	148	13·7488	188	17·4646
29	2·6940	69	6·4099	109	10·1258	149	13·8417	189	17·5575
30	2·7869	70	6·5028	110	10·2187	150	13·9346	190	17·6504
31	2·8798	71	6·5957	111	10·3116	151	14·0274	191	17·7433
32	2·9727	72	6·6886	112	10·4045	152	14·1203	192	17·8362
33	3·0656	73	6·7815	113	10·4944	153	14·2132	193	17·9291
34	3·1585	74	6·8744	114	10·5903	154	14·3061	194	18·0220
35	3·2514	75	6·9673	115	10·6832	155	14·3990	195	18·1149
36	3·3443	76	7·0602	116	10·7761	156	14·4919	196	18·2078
37	3·4372	77	7·1531	117	10·8689	157	14·5848	197	18·3007
38	3·5301	78	7·2460	118	10·9618	158	14·6777	198	18·3936
39	3·6230	79	7·3389	119	11·0547	159	14·7706	199	18·4865
40	3·7159	80	7·4318	120	11·1476	160	14·8635	200	18·5794

Square feet into square metres—(*continued*).

Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)	Square feet (sq. ft.)	Metres² (m²)
201	18·6723	270	25·0824	480	44·5908	690	64·0991	900	83·6073
202	18·7652	280	26·0114	490	45·5198	700	65·0279	910	84·5363
203	18·8581	290	26·9404	500	46·4485	710	65·9569	920	85·4653
204	18·9510	300	27·8694	510	47·3775	720	66·8859	930	86·3943
205	19·0439	310	28·7984	520	48·3065	730	67·8149	940	87·3233
206	19·1368	320	29·7271	530	49·2355	740	68·7429	950	88·2522
207	19·2297	330	30·6561	540	50·1645	750	69·6729	960	89·1812
208	19·3226	340	31·5851	550	51·0935	760	70·6019	970	90·1102
209	19·4155	350	32·5141	560	52·0225	770	71·5309	980	91·0391
210	19·5084	360	33·4430	570	52·9515	780	72·4699	990	91·9681
211	19·6013	370	34·3720	580	53·8805	790	73·3878	1000	92·8970
212	19·6942	380	35·3010	590	54·8094	800	74·3176	1010	93·8260
213	19·7871	390	36·2300	600	55·7382	810	75·2466	1020	94·7550
214	19·8800	400	37·1588	610	56·6672	820	76·1756	1030	95·6839
215	19·9729	410	38·0878	620	57·5962	830	77·1046	1040	96·6129
216	20·0658	420	39·0168	630	58·5252	840	78·0336	1050	97·5419
220	20·4374	430	39·9458	640	59·4542	850	78·9625	1060	98·4709
230	21·3664	440	40·8748	650	60·3831	860	79·8915	1070	99·3998
240	22·2954	450	41·8038	660	61·3121	870	80·8205	1080	100·3288
250	23·2244	460	42·7328	670	62·2411	880	81·7495	1090	101·2578
260	24·1534	470	43·6618	680	63·1701	890	82·6785	1100	102·1867

Square metres into square feet

Metres²	Square feet	Metres²	Square feet	Metres²	Square feet	Metres²	Square feet	Metres²	Square feet
1	10·7758	21	226·292	41	441·808	61	657·3238	81	872·840
2	21·5516	22	237·068	42	452·584	62	668·0996	82	883·616
3	32·3274	23	247·843	43	463·359	63	678·8754	83	894·391
4	43·1032	24	258·619	44	474·135	64	689·6512	84	905·167
5	53·8790	25	269·395	45	484·911	65	700·4270	85	915·943
6	64·6548	26	280·171	46	495·687	66	711·2028	86	926·719
7	75·4306	27	290·947	47	506·463	67	721·9786	87	937·495
8	86·2064	28	301·722	48	517·238	68	732·7544	88	948·270
9	96·9822	29	312·498	49	528·014	69	743·5302	89	959·046
10	107·758	30	323·274	50	538·790	70	754·306	90	969·822
11	118·5338	31	334·050	51	549·566	71	765·082	91	980·598
12	129·3096	32	344·826	52	560·342	72	775·858	92	991·374
13	140·0854	33	355·601	53	571·117	73	786·633	93	1002·149
14	150·8614	34	366·377	54	581·893	74	797·409	94	1012·925
15	161·6370	35	377·153	55	592·669	75	808·185	95	1023·701
16	172·4128	36	387·929	56	603·445	76	818·961	96	1034·477
17	183·1886	37	398·705	57	614·221	77	829·737	97	1045·253
18	193·9644	38	409·680	58	624·996	78	840·512	98	1056·028
19	204·7402	39	420·256	59	635·772	79	851·288	99	1066·804
20	215·516	40	431·032	60	646·548	80	862·064	100	1077·580

CUBIC VALUES

CUBIC INCH = 16·386 cm³. CUBIC FOOT = 28·315 dm³ or 0³·028. PINT = 0·5679 litres.
GALLON = 8 Pints = 4·5435 litres or 0m³·004543.

CUBIC VALUES AND CAPACITY MEASURES.

Gallons in litres.

Galls.	Litres
1	4·55
2	9·09
3	13·64
4	18·18
5	22·73
6	27·28
7	31·82
8	36·37
9	40·91
10	45·46
11	50·01
12	54·55
13	59·10
14	63·64
15	68·19
16	72·74
17	77·28
18	81·83
19	86·37
20	90·92
21	95·47
22	100·01
23	104·56
24	109·10
25	113·65
26	118·20
27	122·74
28	127·29
29	131·83
30	136·38
31	140·92
32	145·47
33	150·02
34	154·56
35	159·11
36	163·65
37	168·20
38	172·75
39	177·29
40	181·84
41	186·38
42	190·93
43	195·48
44	200·02
45	204·57
46	209·11
47	213·66
48	218·21
49	222·75
50	227·30
51	231·84
52	236·39
53	240·94
54	245·48
55	250·03
56	254·57
57	259·12
58	263·67
59	268·21
60	272·76
61	277·30
62	281·85
63	286·40
64	290·94
65	295·49
66	300·03
67	304·58
68	309·13
69	313·67
70	318·22
71	322·76
72	327·31
73	331·86
74	336·40
75	340·95
76	345·49
77	350·04
78	354·59
79	359·13
80	363·68
81	368·22
82	372·77
83	377·31
84	381·86
85	386·41
86	390·95
87	395·50
88	400·04
89	404·59
90	409·14
91	413·68
92	418·23
93	422·77
94	427·32
95	431·87
96	436·41
97	440·96
98	445·50
99	450·05
100	454·60
105	477·33
108	490·96
110	500·06
115	522·79
120	545·52
125	568·25
130	590·98
135	613·71
140	636·43
150	681·89
160	727·35
170	772·81
180	818·27
190	863·73
200	909·19

Litres in gallons.

Litres	Galls.	Pints
1		1·76
2		3·52
3		5·28
4		7·04
5	1+	0·80
6	1	2·56
7	1	4·32
8	1	6·08
9	1	7·84
10	2	1·60
11	2	3·36
12	2	5·12
13	2	6·88
14	3	0·64
15	3	2·40
16	3	4·16
17	3	5·92
18	3	7·68
19	4	1·44
20	4	3·20
21	4	4·96
22	4	6·72
23	5	0·48
24	5	2·24
25	5	4·0
26	5	5·75
27	5	7·51
28	6	1·27
29	6	3·03
30	6	4·79
31	6	6·55
32	7	0·31
33	7	2·07
34	7	3·83
35	7	5·59
36	7	7·35
37	8	1·11
38	8	2·87
39	8	4·63
40	8	6·39
41	9	0·15
42	9	1·91
43	9	3·67
44	9	5·43
45	9	7·09
46	10	0·95
47	10	2·71
48	10	4·47
49	10	6·23
50	10	7·99
51	11	1·75
52	11	3·51
53	11	5·27
54	11	7·03
55	12	0·79
56	12	2·55
57	12	4·31
58	12	6·07
59	12	7·83
60	13	1·59
61	13	3·35
62	13	5·11
63	13	6·87
64	14	0·63
65	14	2·39
66	14	2·39
67	14	5·91
68	14	7·67
69	15	1·43
70	15	3·19
71	15	4·95
72	15	6·71
73	16	0·47
74	16	2·23
75	16	3·99
76	16	5·74
77	16	7·50
78	17	1·26
79	17	3·02
80	17	4·78
81	17	6·54
82	18	0·30
83	18	2·06
84	18	3·82
85	18	5·58
86	18	7·34
87	19	1·10
88	19	2·86
89	19	4·62
90	19	6·38
91	20	0·14
92	20	1·90
93	20	3·66
94	20	5·42
95	20	7·18
96	21	0·94
97	21	2·70
98	21	4·46
99	21	6·22
100	21	7·98
125	27	3·98
150	32	7·97
200	43	7·96
300	65	7·94
400	87	7·92
500	109	7·90

WEIGHTS

OUNCE (oz.) Ozs. 8 = ·227 kg.; 10 Ozs. = ·284 kg.; 12 Ozs: = ·340 kg.; 14 Ozs. = ·397 kg. = 28·34 gr.
POUND (lb.) = 0kg·453 gr. STONE (14 pounds) = 6·343 kg.
QUARTERS (qrs.) = 12·7 kg. HUNDREDWEIGHT (cwt.) (112 pounds) = 50·782 kg. TON (20 cwt.) = 1016·648 kg.

Pounds into kilogrammes.

Pounds (lb.)	Kilogr. (kg.)
1	0·454
2	0·907
3	1·361
4	1·814
5	2·268
6	2·722
7	3·175
8	3·629
9	4·082
10	4·536
11	4·990
12	5·443
13	5·897
14	6·350
15	6·804
16	7·257
17	7·711
18	8·165
19	8·618
20	9·072
21	9·525
22	9·979
23	10·433
24	10·886
25	11·340
26	11·793
27	12·247
28	12·701
29	13·154
30	13·608
31	14·061
32	14·515
33	14·969
34	15·422
35	15·876
36	16·329
37	16·783
38	17·237
39	17·690
40	18·144
41	18·597
42	19·051
43	19·504
44	19·958
45	20·412
46	20·865
47	21·319
48	21·772
49	22·226
50	22·680
51	23·133
52	23·589
53	24·040
54	24·494
55	24·948
56	25·401
57	25·855
58	26·308
59	26·762
60	27·216
61	27·669
62	28·123
63	28·576
64	29·030
65	29·484
66	29·937
67	30·391
68	30·844
69	31·298
70	31·758
71	32·205
72	32·659
73	33·112
74	33·566
75	34·019

VICKERS AVIATION LIMITED

Pounds into kilogrammes—*continued*

Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)
76	34·473	126	57·153	176	79·832	226	102·512	276	125·192
77	34·927	127	57·606	177	80·286	227	102·966	277	125·645
78	35·380	128	58·060	178	80·740	228	103·419	278	126·099
79	35·834	129	58·513	179	81·193	229	103·873	279	126·552
80	36·287	130	58·967	180	81·647	230	104·326	280	127·006
81	36·741	131	59·421	181	82·100	231	104·780	281	127·460
82	37·195	132	59·874	182	82·554	232	105·234	282	127·913
83	37·648	133	60·328	183	83·008	233	105·687	283	128·367
84	38·102	134	60·781	184	83·461	234	106·141	284	128·820
85	38·555	135	61·235	185	83·915	235	106·594	285	129·274
86	39·009	136	61·689	186	84·368	236	107·048	286	129·728
87	39·463	137	62·142	187	84·822	237	107·502	287	130·181
88	39·916	138	62·596	188	85·275	238	107·955	288	130·635
89	40·370	139	63·049	189	85·729	239	108·409	289	131·088
90	40·823	140	63·503	190	86·183	240	108·862	290	131·542
91	41·277	141	63·957	191	86·636	241	109·316	291	131·996
92	41·731	142	64·410	192	87·090	242	109·770	292	132·449
93	42·184	143	64·864	193	87·543	243	110·223	293	132·903
94	42·638	144	65·317	194	87·997	244	110·677	294	133·306
95	43·091	145	65·771	195	88·851	245	111·130	295	133·810
96	43·545	146	66·225	196	88·904	246	111·584	296	134·264
97	43·999	147	66·678	197	89·358	247	112·037	297	134·717
98	44·452	148	67·132	198	89·811	248	112·491	298	135·171
99	44·906	149	67·585	199	90·265	249	112·945	299	135·624
100	45·359	150	68·039	200	90·719	250	113·398	300	136·078
101	45·813	151	68·493	201	91·172	251	113·852	301	136·531
102	46·266	152	68·946	202	91·626	252	114·305	302	136·985
103	46·720	153	69·400	203	92·079	253	114·759	303	137·439
104	47·174	154	69·853	204	92·533	254	115·213	304	137·892
105	47·627	155	70·307	205	92·987	255	115·666	305	138·346
106	48·081	156	70·761	206	93·440	256	116·120	306	138·799
107	48·534	157	71·214	207	93·894	257	116·573	307	139·253
108	48·988	158	71·668	208	94·347	258	117·027	308	139·707
109	49·442	159	72·121	209	94·801	259	117·481	309	140·160
110	49·895	160	72·575	210	95·255	260	117·934	310	140·614
111	50·349	161	73·028	211	95·708	261	118·388	311	141·067
112	50·802	162	73·482	212	96·162	262	118·841	312	141·521
113	51·256	163	73·936	213	96·615	263	119·295	313	141·975
114	51·710	164	74·389	214	97·069	264	119·749	314	142·428
115	52·163	165	74·843	215	97·522	265	120·202	315	142·882
116	52·617	166	75·296	216	97·976	266	120·656	316	143·335
117	53·070	167	75·750	217	98·430	267	121·109	317	143·789
118	53·524	168	76·204	218	98·883	268	121·563	318	144·243
119	53·978	169	76·657	219	99·337	269	122·017	319	144·696
120	54·431	170	77·111	220	99·790	270	122·470	320	145·150
121	54·885	171	77·564	221	100·244	271	122·924	321	145·603
122	55·338	172	78·018	222	100·608	272	123·377	322	146·057
123	55·792	173	78·472	223	101·151	273	123·831	323	146·511
124	56·246	174	78·925	224	101·605	274	124·284	324	146·964
125	56·699	175	79·379	225	102·058	275	124·738	325	147·418

VICKERS AVIATION LIMITED

Pounds into kilogrammes—*continued*

Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb).	Kilogr. (kg.)
326	147·871	376	170·551	426	193·131	476	215·910	526	238·590
327	148·325	377	171·005	427	193·584	477	216·364	527	239·044
328	148·779	378	171·458	428	194·038	478	216·817	528	239·497
329	149·231	379	171·912	429	194·591	479	217·271	529	239·951
330	149·686	380	172·365	430	195·045	480	217·725	530	240·404
331	150·139	381	172·819	431	195·499	481	218·178	531	240·858
332	150·593	382	173·273	432	195·952	482	218·632	532	241·311
333	151·046	383	173·726	433	196·406	483	219·085	533	241·765
334	151·500	384	174·180	434	196·859	484	219·539	534	242·219
335	151·954	385	174·633	435	197·313	485	219·993	535	242·672
336	152·407	386	175·087	436	197·767	486	220·446	536	243·126
337	152·861	387	175·540	437	198·220	487	220·900	537	243·579
338	153·314	388	175·994	438	198·674	488	221·353	538	244·033
339	153·768	389	176·448	439	199·127	489	221·807	539	244·487
340	154·222	390	176·901	440	199·581	490	222·261	540	244·940
341	154·675	391	177·355	441	200·035	491	222·714	541	245·394
342	155·129	392	177·808	442	200·488	492	223·168	542	245·847
343	155·582	393	178·262	443	200·942	493	223·621	543	246·301
344	156·036	394	178·716	444	201·395	494	224·075	544	246·755
345	156·490	395	179·169	445	201·849	495	224·529	545	247·208
346	156·943	396	179·623	446	202·302	496	224·982	546	247·662
347	157·397	397	180·076	447	202·756	497	225·436	547	248·115
348	157·850	398	180·530	448	203·210	498	225·889	548	248·569
349	158·304	399	180·984	449	203·663	499	226·343	549	249·023
350	158·758	400	181·437	450	204·177	500	226·797	550	249·476
351	159·211	401	181·891	451	204·570	501	227·250	551	249·930
352	159·665	402	182·344	452	205·024	502	227·704	552	250·383
353	160·118	403	182·798	453	205·478	503	228·157	553	250·837
354	160·572	404	183·252	454	205·931	504	228·611	554	251·291
355	161·026	405	183·705	455	206·385	505	229·064	555	251·744
356	161·479	406	184·159	456	206·838	506	229·518	556	252·198
357	161·933	407	184·612	457	207·292	507	229·972	557	252·651
358	162·386	408	185·066	458	207·746	508	230·425	558	253·105
359	162·840	409	185·520	459	208·199	509	230·879	559	253·558
360	163·293	410	185·973	460	208·653	510	231·332	560	254·012
361	163·747	411	186·427	461	209·106	511	231·786	561	254·466
362	164·201	412	186·880	462	209·560	512	232·240	562	254·919
363	164·654	413	187·334	463	210·014	513	232·693	563	255·373
364	165·108	414	187·788	464	210·467	514	233·147	564	255·826
365	165·561	415	188·241	465	210·921	515	233·600	565	256·280
366	166·015	416	188·695	466	211·374	516	234·054	566	256·734
367	166·469	417	189·148	467	211·828	517	234·508	567	257·187
368	166·922	418	189·602	468	212·282	518	234·961	568	257·641
369	167·376	419	190·055	469	212·735	519	235·415	569	258·094
370	167·829	420	190·509	470	213·189	520	235·868	570	258·548
371	168·283	421	190·963	471	213·642	521	236·322	571	259·002
372	168·737	422	191·416	472	214·096	522	236·776	572	259·455
373	169·190	423	191·870	473	214·549	523	237·229	573	259·909
374	169·644	424	192·323	474	215·003	524	237·688	574	260·362
375	170·097	425	192·777	475	215·457	525	238·136	575	260·816

Pounds into kilogrammes—*continued*

Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)	Pounds (lb.)	Kilogr. (kg.)
576	261·270	626	283·949	676	306·629	726	329·309	776	351·988
577	261·723	627	284·403	677	307·082	727	329·762	777	352·442
578	262·177	628	284·856	678	307·536	728	330·216	778	352·895
579	262·650	629	285·310	679	307·990	729	330·669	779	353·349
580	263·084	630	285·764	680	308·443	730	331·123	780	353·803
581	263·538	631	286·217	681	308·897	731	331·576	781	354·256
582	263·991	632	286·671	682	309·350	732	332·030	782	354·710
583	264·445	633	287·124	683	309·804	733	332·484	783	355·163
584	264·898	634	287·578	684	310·258	734	332·937	784	355·617
585	265·352	635	288·032	685	310·711	735	333·391	785	356·071
586	265·805	636	288·485	686	311·165	736	333·844	786	356·524
587	266·259	637	288·939	687	311·618	737	334·298	787	356·978
588	266·713	638	289·392	688	312·072	738	334·752	788	357·431
589	267·166	639	289·846	689	312·526	739	335·205	789	357·885
590	267·620	640	290·300	690	312·979	740	335·659	790	358·338
591	268·073	641	290·753	691	313·433	741	336·112	791	358·792
592	268·527	642	291·207	692	313·886	742	336·566	792	359·246
593	268·981	643	291·660	693	314·340	743	337·020	793	359·699
594	269·434	644	292·114	694	314·794	744	337·473	794	360·153
595	269·888	645	292·567	695	315·247	745	337·927	795	360·606
596	270·341	646	293·021	696	315·701	746	338·380	796	361·060
597	270·795	647	293·475	697	316·154	747	338·834	797	361·514
598	271·249	648	293·928	698	316·608	748	339·288	798	361·967
599	271·702	649	294·382	699	317·062	749	339·741	799	362·421
600	272·156	650	294·835	700	317·515	750	340·195	800	362·764
601	272·609	651	295·289	701	317·969	751	340·648	850	387·369
602	273·063	652	295·743	702	318·422	752	341·102	900	410·089
603	273·517	653	296·196	703	318·876	753	341·556	950	430·800
604	273·970	654	296·650	704	319·329	754	342·009	1000	453·594
605	274·424	655	297·103	705	319·783	755	342·463		
606	274·877	656	297·557	706	320·237	756	342·916	1500	680·391
607	275·331	657	298·011	707	320·690	757	343·370	2000	907·188
608	275·785	658	298·464	708	321·144	758	343·823	2500	1133·985
609	276·238	659	298·918	709	321·597	759	344·277	3000	1360·782
610	276·692	660	299·371	710	322·051	760	344·731	3500	1587·58
611	277·145	661	299·825	711	322·505	761	345·184	4000	1814·376
612	277·599	662	300·279	712	322·958	762	345·638	4500	2040·873
613	278·053	663	300·732	713	323·412	763	346·091	5000	2267·470
614	278·506	664	301·186	714	323·865	764	346·545		
615	278·960	665	301·639	715	324·319	765	346·999	5500	2494·067
616	279·413	666	302·093	716	324·773	766	347·452	6000	2720·664
617	279·867	667	302·547	717	325·226	767	347·906	6500	2947·261
618	280·320	668	303·000	718	325·680	768	348·359	7000	3173·858
619	280·774	669	303·454	719	326·133	769	348·813	7500	3400·455
620	281·228	670	303·907	720	326·587	770	349·267	8000	3268·752
621	281·681	671	304·361	721	327·041	771	349·720	8500	3853·649
622	282·135	672	304·814	722	327·494	772	350·174	9000	4080·246
623	282·588	673	305·268	723	327·948	773	350·627		
624	283·042	674	305·722	724	328·401	774	351·081	9500	4306·843
625	283·496	675	306·175	725	328·855	775	351·535	10000	4533·440

2240 lbs. = 1016·048 kg. = 1 ton. = 20 cwt.

Kilogrammes into pounds.

Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds
1	2·20462	51	112·435	101	222·667	151	332·898	201	443·129
2	4·409	52	114·639	102	224·871	152	335·102	202	445·333
3	6·614	53	116·844	103	227·076	153	337·307	203	447·538
4	8·813	54	119·048	104	229·281	154	339·511	204	449·743
5	11·023	55	121·253	105	231·485	155	341·716	205	451·947
6	13·228	56	123·458	106	233·690	156	343·921	206	454·153
7	15·432	57	125·662	107	235·894	157	346·125	207	456·357
8	17·637	58	127·867	108	238·099	158	348·330	208	458·552
9	19·841	59	130·071	109	240·304	159	350·534	209	460·757
10	22·046	60	132·277	110	242·508	160	352·739	210	462·970
11	24·251	61	134·482	111	244·713	161	354·944	211	465·175
12	26·455	62	136·686	112	246·917	162	357·148	212	467·379
13	28·660	63	138·891	113	249·122	163	359·353	213	469·584
14	30·865	64	141·096	114	251·327	164	361·558	214	471·789
15	33·069	65	143·300	115	253·531	165	363·762	215	473·998
16	35·274	66	145·505	116	255·736	166	365·967	216	476·198
17	37·478	67	147·709	117	257·940	167	368·171	217	478·402
18	39·683	68	149·914	118	260·145	168	370·376	218	480·607
19	41·888	69	152·119	119	262·350	169	372·581	219	482·812
20	44·092	70	154·323	120	264·555	170	374·785	220	485·016
21	46·29[illegible]	71	156·528	121	266·760	171	376·990	221	487·221
22	48·501	72	158·733	122	268·964	172	379·195	222	489·426
23	50·706	73	160·937	123	271·168	173	381·399	223	491·630
24	52·910	74	163·142	124	273·373	174	383·604	224	493·835
25	55·115	75	165·347	125	275·578	175	385·808	225	496·039
26	57·320	76	167·551	126	277·782	176	388·013	226	498·244
27	59·524	77	169·756	127	279·987	177	390·218	227	500·449
28	61·729	78	171·960	128	282·191	178	392·422	228	502·653
29	63·934	79	174·165	129	284·396	179	394·621	229	504·858
30	66·139	80	176·370	130	286·601	180	396·832	230	507·063
31	68·343	81	178·573	131	281·805	181	399·036	231	509·267
32	70·548	82	180·778	132	298·010	182	401·241	232	511·472
33	72·753	83	182·982	133	293·214	183	403·445	233	513·676
34	74·957	84	185·187	134	295·419	184	405·650	234	515·881
35	77·162	85	187·392	135	297·624	185	407·855	235	518·086
36	79·366	86	189·596	136	299·828	186	410·059	236	520·290
37	81·571	87	191·801	137	302·033	187	412·264	237	522·495
38	83·776	88	194·005	138	304·237	188	414·468	238	524·699
39	85·980	89	196·210	139	306·442	189	416·878	239	526·904
40	88·184	90	198·416	140	308·647	190	418·878	240	529·109
41	90·389	91	200·620	141	310·851	191	421·082	241	531·313
42	92·593	92	202·825	142	313·056	192	423·287	242	533·519
43	94·798	93	205·030	143	315·261	193	425·492	243	535·723
44	97·002	94	207·284	144	317·465	194	427·696	244	578·927
45	99·207	95	209·439	145	319·670	195	429·901	245	540·132
46	101·412	96	211·643	146	321·874	196	432·105	246	542·336
47	103·616	97	213·848	147	324·079	197	434·310	247	544·541
48	105·821	98	216·053	148	326·283	198	436·515	248	546·746
49	108·025	99	218·257	149	328·488	199	438·719	249	548·950
50	110·230	100	220·462	150	330·693	200	440·924	250	551·156

Kilogrammes into pounds—*continued*

Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds	Kilogr.	Pounds
251	553·360	271	597·452	291	641·544	1400	3086·471	3400	7495·7
252	555·564	272	599·657	292	643·749	1500	3306·933	3500	7716·177
253	557·769	273	601·861	293	645·948	1600	3527·395	3600	7936·639
254	559·973	274	604·066	294	648·252	1700	3747·857	3700	8157·002
255	562·178	275	606·270	295	650·457	1800	3968·320	3800	8377·464
256	564·383	276	608·475	296	652·662	1900	4188·781	3900	8597·926
257	566·587	277	610·672	297	654·866	2000	4409·2446	4000	8818·4892
258	568·792	278	612·875	298	657·071	2100	4629·709	4100	9038·951
259	570·996	279	615·080	299	659·275	2200	4850·170	4200	9259·413
260	573·201	280	617·294	300	661·480	2300	5070·632	4300	9479·875
261	575·406	281	619·498	400	881·848	2400	5291·094	4400	9700·338
262	577·610	282	621·703	500	1102·310	2500	5511·557	4500	9920·799
263	579·815	283	623·907	600	1322·773	2600	5732·019	4600	10141·262
264	582·020	284	626·112	700	1543·237	2700	5952·481	4700	10361·724
265	584·224	285	628·317	800	1763·697	2800	6172·943	4800	10582·186
266	586·429	286	630·521	900	1984·159	2900	6293·405	4900	10802·6481
267	588·633	287	632·726	1000	2204·6223	3000	6613·8669	5000	11023·1
268	590·830	288	634·930	1100	2425·084	3100	6834·329		
269	593·043	289	637·135	1200	2645·546	3200	7054·791		
270	595·247	290	639·340	1300	2866·009	3300	7275·253		

Pounds per square foot into kilogrammes per square metre.

Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²
1·0	4·883	3·5	17·089	6·0	29·296	8·5	41·502	11·0	53·713
1·1	5·371	3·6	17·578	6·1	29·784	8·6	41·991	11·1	54·197
1·2	5·859	3·7	18·066	6·2	30·273	8·7	42·479	11·2	54·686
1·3	6·347	3·8	18·554	6·3	30·761	8·8	42·967	11·3	55·174
1·4	6·835	3·9	19·043	6·4	31·249	8·9	43·456	11·4	55·662
1·5	7·323	4·0	19·530	6·5	31·737	9·0	43·943	11·5	56·150
1·6	7·811	4·1	20·018	6·6	32·226	9·1	44·431	11·6	56·639
1·7	8·299	4·2	20·506	6·7	32·714	9·2	44·919	11·7	57·127
1·8	8·787	4·3	20·995	6·8	33·202	9·3	45·408	11·8	57·615
1·9	9·275	4·4	21·483	6·9	33·690	9·4	45·896	11·9	58·104
2·0	9·765	4·5	21·971	7·0	34·178	9·5	46·384	12·0	58·591
2·1	10·253	4·6	22·460	7·1	34·666	9·6	46·873	12·1	59·080
2·2	10·742	4·7	22·948	7·2	35·155	9·7	47·361	12·2	59·569
2·3	11·229	4·8	23·436	7·3	35·643	9·8	47·849	12·3	60·057
2·4	11·718	4·9	23·925	7·4	36·131	9·9	48·338	12·4	60·545
2·5	12·206	5·0	24·413	7·5	36·619	10·0	48·826	12·5	61·033
2·6	12·695	5·1	24·901	7·6	37·108	10·1	49·314	12·6	61·522
2·7	13·183	5·2	25·389	7·7	37·596	10·2	49·802	12·7	62·010
2·8	13·671	5·3	25·878	7·8	38·084	10·3	50·291	12·8	62·498
2·9	14·160	5·4	26·366	7·9	38·573	10·4	50·779	12·9	62·987
3·0	14·648	5·5	26·854	8·0	39·061	10·5	51·267		
3·1	15·136	5·6	27·343	8·1	39·549	10·6	51·756		
3·2	15·625	5·7	27·831	8·2	40·038	10·7	52·244		
3·3	16·113	5·8	28·319	8·3	40·526	10·8	52·732		
3·4	16·601	5·9	28·808	8·4	41·014	10·9	53·207		

Kilogrammes per square metre into pounds per square foot.

Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot	Kilogr. per m²	Pounds per sq. foot
0·1	0·02047	14	2·866	36	7·369	58	11·8726	80	16·376
0·2	0·04094	15	3·070	37	7·574	59	12·0773	81	16·5807
0·3	0·06141	16	3·275	38	7·779	60	12·282	82	16·7854
0·4	0·08188	17	3·48	39	7·983	61	12·487	83	16·9901
0·5	0·10235	18	3·685	40	8·188	62	12·6914	84	17·1948
0·6	0·12285	19	3·889	41	8·393	63	12·896	85	17·310
0·7	0·14329	20	4·094	42	8·597	64	13·1008	86	17·604
0·8	0·16376	21	4·299	43	8·802	65	13·305	87	17·809
0·9	0·18423	22	4·503	44	9·007	66	13·510	88	18·014
1	0·2047	23	4·708	45	9·211	67	13·715	89	18·218
2	0·4094	24	4·913	46	9·416	68	13·920	90	18·423
3	0·6141	25	5·117	47	9·621	69	14·124	91	18·628
4	0·8188	26	5·322	48	9·826	70	14·329	92	18·832
5	1·0235	27	5·527	49	10·030	71	14·5337	93	19·037
6	1·2282	28	5·732	50	10·235	72	14·7384	94	19·242
7	1·4329	29	5·936	51	10·4397	73	14·9431	95	19·446
8	1·6376	30	6·141	52	10·6444	74	15·1478	96	19·651
9	1·8423	31	6·346	53	10·8491	75	15·352	97	19·856
10	2·047	32	6·5504	54	11·0538	76	15·557	98	20·061
11	2·252	33	6·755	55	11·2585	77	15·762	99	20·265
12	2·456	34	6·960	56	11·4632	78	15·967	100	20·47
13	2·661	35	7·164	57	11·6679	79	16·171		

Tons per square inch into kilogrammes per square millimetre.

Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²
1	1·575	16	25·198	31	48·821	46	72·444	61	96·067
2	3·150	17	26·773	32	50·396	47	74·019	62	97·642
3	4·725	18	28·348	33	51·971	48	75·594	63	99·217
4	6·299	19	29·923	34	53·546	49	77·169	64	100·792
5	7·874	20	31·497	35	55·120	50	78·743	65	102·367
6	9·449	21	33·072	36	56·695	51	80·318	66	103·941
7	11·024	22	34·647	37	58·270	52	81·893	67	105·516
8	12·599	23	36·222	38	59·845	53	83·468	68	107·091
9	14·174	24	37·797	39	61·420	54	86·043	69	108·666
10	15·749	25	39·372	40	62·995	55	86·618	70	110·241
11	17·324	26	40·947	41	64·570	56	88·193	71	111·816
12	18·898	27	42·521	42	66·145	57	89·768	72	114·391
13	20·473	28	44·096	43	67·719	58	91·342	73	114·966
14	22·048	29	45·671	44	69·294	59	92·917	74	116·540
15	23·623	30	47·246	45	70·869	60	94·492	75	118·125

VICKERS AVIATION LIMITED

Tons per square inch into kilogrammes per square millimetre—*continued*

Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²
76	119·690	91	143·313	106	166·936	121	190·559	136	214·182
77	121·265	92	144·888	107	168·511	122	192·134	137	215·757
78	122·840	93	141·738	108	170·086	123	193·709	138	217·332
79	124·425	94	148·038	109	171·661	124	195·284	139	218·907
80	125·989	95	149·613	110	173·236	125	196·859	140	220·482
81	127·564	96	151·187	111	174·811	126	198·434	141	222·057
82	129·139	97	152·762	112	176·385	127	200·000	142	223·632
83	130·714	98	154·337	113	177·960	128	201·583	143	225·206
84	132·289	99	155·912	114	179·535	129	203·168	144	226·781
85	133·864	100	157·487	115	181·110	130	204·733	145	228·356
86	135·439	101	159·062	116	182·685	131	206·308	146	229·931
87	130·714	102	160·637	117	184·260	132	207·884	147	231·506
88	138·588	103	162·212	118	185·835	133	209·458	148	233·081
89	140·163	104	163·786	119	187·410	134	211·033	149	234·656
90	141·738	105	165·361	120	188·984	135	212·607	150	236·230

Kilogrammes per square millimetre into tons per square inch.

Kilogr. per mm²	Tons per sq. inch.	Kilogr. per mm²	Tons per sq. inch.	Kilogr. per mm²	Tons per sq. inch.	Kilogr. per mm²	Tons per sq. inch.	Kilogr. per mm²	Tons per sq. inch.
1	0·634973	26	16·4996	51	32·309	76	48·193	101	63·128
2	1·2698	27	17·1346	52	32·944	77	48·829	102	63·762
3	1·9047	28	17·7696	53	33·580	78	49·463	103	64·398
4	2·5396	29	18·4045	54	34·214	79	50·099	104	65·032
5	3·1745	30	19·0347	55	34·848	80	50·733	105	65·668
6	3·8098	31	19·6697	56	35·484	81	51·369	106	66·302
7	4·4448	32	20·3046	57	36·130	82	52·003	107	66·937
8	5·0797	33	20·3996	58	37·754	83	52·639	108	67·572
9	5·7147	34	21·5746	59	37·390	84	53·273	109	68·207
10	6·3449	35	22·2095	60	38·024	85	53·909	110	68·842
11	6·9799	36	22·8445	61	38·660	86	54·543	111	69·478
12	7·6148	37	23·4795	62	39·293	87	55·179	112	70·112
13	8·2498	38	24·1145	63	39·929	88	55·813	113	70·748
14	8·8848	39	24·7494	64	40·563	89	55·449	114	71·382
15	9·5197	40	25·3796	65	42·199	90	56·083	115	72·018
16	10·1547	41	26·0146	66	41·833	91	56·719	116	72·652
17	10·7897	42	26·6495	67	42·469	92	57·353	117	73·288
18	11·4247	43	27·2845	68	43·103	93	57·988	118	73·922
19	12·0596	44	27·9195	69	43·749	94	58·622	119	74·558
20	12·6898	45	28·5544	70	44·383	95	59·257	120	75·192
21	13·3248	46	29·1894	71	45·018	96	59·893	121	75·823
22	13·9597	47	29·8244	72	45·653	97	60·529	122	76·462
23	14·5947	48	30·4594	73	46·299	98	61·162	123	77·097
24	15·2297	49	31·0394	74	46·923	99	61·858	124	77·731
25	15·8646	50	31·674	75	47·559	100	62·492	125	78·367

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Kilogrammes per square millimetre into tons per square inch—*continued*

Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.	Kilogr. per mm²	Tons per sq. in.
126	79·002	141	88·527	156	98·501	171	107·575	186	117·100
127	79·638	142	89·161	157	98·687	172	108·210	187	117·735
128	80·272	143	89·797	158	99·321	173	108·845	188	118·370
129	80·907	144	90·431	159	99·957	174	109·480	189	119·005
130	81·542	145	91·067	160	100·591	175	110·115	190	119·640
131	82·177	146	91·701	161	101·227	176	110·750	191	120·275
132	82·811	147	92·337	162	101·860	177	111·385	192	120·910
133	83·447	148	92·971	163	102·495	178	112·020	193	121·544
134	84·081	149	93·607	164	103·130	179	112·655	194	122·180
135	84·717	150	94·241	165	103·765	180	113·290	195	122·714
136	85·351	151	94·877	166	104·400	181	113·925	196	123·450
137	85·987	152	95·511	167	105·035	182	114·560	197	124·085
138	86·621	153	96·147	168	105·670	183	115·195	198	124·720
139	87·257	154	96·781	169	106·305	184	115·830	199	125·354
140	87·891	155	97·415	170	106·940	185	116·465	200	125·990

THERMOMETER

Fahrenheit 32 degrees (freezing point)=0° centigrade. Fahrenheit 212 degrees (boiling water)=100° centigrade

Number of Fahrenheit less 32 $\times \frac{5}{9} =$ degrees centigrade.

Comparison of Centigrade and Fahrenheit Thermometers.

Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit
—40	—40·0	+ 1	33·8	21	69·8	41	105·8	61	141·8
—38	—36·4	2	35·6	22	71·6	42	107·6	62	143·6
—36	—32·8	3	37·4	23	73·4	43	109·4	63	145·4
—34	—29·2	4	39·2	24	75·2	44	111·2	64	147·2
—32	—25·6	5	41·0	25	77·0	45	113·0	65	149·0
—30	—22·0	6	42·8	26	78·8	46	114·8	66	150·8
—28	—18·4	7	44·6	27	80·6	47	116·6	67	152·6
—26	—14·8	8	46·4	28	82·4	48	118·4	68	154·4
—24	—11·2	9	48·2	29	84·2	49	120·2	69	156·2
—22	— 7·6	10	50·0	30	86·0	50	122·0	70	158·0
—20	— 4·0	11	51·8	31	87·8	51	123·8	71	159·8
—18	— 0·4	12	53·6	32	89·6	52	125·6	72	161·6
—16	+ 3·2	13	55·5	33	91·4	53	127·4	73	163·4
—14	6·8	14	57·2	34	93·2	54	129·2	74	165·2
—12	10·4	15	59·0	35	95·0	55	131·0	75	167·0
—10	14·0	16	60·8	36	96·8	56	132·8	76	168·8
— 8	17·6	17	62·6	37	98·6	57	134·6	77	170·6
— 6	21·2	18	64·4	38	100·4	58	136·3	78	172·4
— 4	24·8	19	66·2	39	102·2	59	138·2	79	174·2
— 2	28·4	20	68·0	40	104·0	60	140·0	80	176·0
0	32·0								

Comparison of Centigrade and Fahrenheit Thermometers—*continued*

Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit	Centigr.	Fahrenheit
81	177·8	340	644·0	760	1400·0	1190	2174·0	1600	2912·0
82	179·6	350	662·0	770	1418·0	1200	2192·0	1610	2930·0
83	181·4	360	680·0	780	1436·0	1210	2210·0	1620	2948·0
84	183·2	370	698·0	790	1454·0	1220	2228·0	1630	2966·0
85	185·0	380	716·0	800	1472·0	1230	2246·0	1640	2984·0
86	186·8	390	734·0	810	1490·0	1240	2264·0	1650	3002·0
87	188·6	400	752·0	820	1508·0	1250	2282·0	1660	3020·0
88	190·4	410	770·0	830	1526·0	1260	2300·0	1670	3038·0
89	192·2	420	788·0	840	1544·0	1270	2318·0	1680	3056·0
90	194·0	430	806·0	850	1562·0	1280	2336·0	1690	3074·0
91	195·8	440	824·0	860	1580·0	1290	2354·0	1700	3092·0
92	197·6	450	842·0	870	1598·0	1300	2372·0	1710	3110·0
93	199·4	460	860·0	880	1616·0	1310	2390·0	1720	3128·0
94	201·2	470	878·0	890	1634·0	1320	2408·0	1730	3146·0
95	203·0	480	896·0	900	1652·0	1330	2426·0	1740	3164·0
96	204·7	490	914·0	910	1670·0	1340	2444·0	1750	3182·0
97	206·6	500	932·0	920	1688·0	1350	2462·0	1760	3200·0
98	208·4	510	950·0	930	1706·0	1360	2480·0	1770	3218·0
99	210·2	520	968·0	940	1724·0	1370	2498·0	1780	3236·0
100	212·0	530	986·0	950	1742·0	1380	2516·0	1790	3254·0
110	230·0	540	1004·0	960	1760·0	1390	2534·0	1800	3272·0
120	248·0	550	1022·0	970	1778·0	1400	2552·0	1810	3290·0
130	266·0	560	1040·0	980	1796·0	1410	2570·0	1820	3308·0
140	284·0	570	1058·0	990	1814·0	1420	2588·0	1830	3326·0
150	302·0	580	1076·0	1000	1832·0	1430	2606·0	1840	3344·0
160	320·0	590	1094·0	1010	1850·0	1440	2624·0	1850	3362·0
170	338·0	600	1112·0	1020	1868·0	1450	2642·0	1860	3380·0
180	356·0	610	1130·0	1030	1886·0	1460	2660·0	1870	3398·0
190	374·0	620	1148·0	1040	1904·0	1470	2678·0	1880	3416·0
200	392·0	630	1166·0	1050	1922·0	1480	2696·0	1890	3434·0
210	410·0	640	1184·0	1060	1940·0	1490	2714·0	1900	3452·0
220	428·0	650	1202·0	1070	1958·0	1500	2732·0	1910	3470·0
230	446·0	660	1220·0	1080	1976·0	1510	2750·0	1920	3488·0
240	464·0	670	1238·0	1090	1994·0	1520	2768·0	1930	3506·0
250	482·0	680	1256·0	1100	2012·0	1530	2786·0	1940	3524·0
260	500·0	690	1274·0	1110	2030·0	1540	2804·0	1950	3542·0
270	518·0	700	1292·0	1120	2048·0	1550	2822·0	1960	3560·0
280	536·0	710	1310·0	1130	2066·0	1560	2840·0	1970	3578·0
290	554·0	720	1328·0	1140	2084·0	1570	2858·0	1980	3596·0
300	572·0	730	1346·0	1150	2102·0	1580	2876·0	1990	3614·0
310	590·0	740	1364·0	1160	2120·0	1590	2894·0	2000	3632·0
320	608·0	750	1382·0	1170	2138·0				
330	626·0			1180	2156·0				

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