ABSTRACTS AND NOTICES

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Aircraft Design

Breguet All-Steel Construction. (R. J. de Marolles, Airc. Eng., Vol. II, No. 19, Sept., 1930, pp. 219-222.) (5.1/13501 France.)

Twelve photographs illustrate a descriptive account of the methods of construction and assembly of wings, body, landing-carriage, etc.

" Wapiti " Steel Wings. (B. Martin, J. Roy. Aer. Soc., Vol. XXXIV, No. 237, Sept., 1930, pp. 789-793.) (5.102/13502 Great Britain.)

A description is given of many of the methods employed by the Steel Wing Company in designing and assembling steel wings.

Construction of Aircraft in Steel. (F. M. Green, Airc. Eng., Vol. II, No. 20, Oct., 1930, pp. 249-251.) (5.11/13503 Great Britain.)

A descriptive account is given of the reasons for adopting steel construction. Reference only is made to the underlying mathematical work. Reasons for the selection of the corrugated sheet and built-up tube in use are given and are illustrated by four dimensional sketches accompanied by specifications. Methods of building up wing ribs and of their attachment to the spar are described. Heat treatment is applied after forming and some account is given of the process. The completed wing is dipped in an enamel bath for protection against corrosion.

Greater reliability is claimed for steel wings as compared with wooden wings, and the cost of production is stated to have been reduced to comparable figures.

Design of Seaplanes. (A. Gouge, Airc. Eng., Vol. II, No. 18, Aug., 1930, pp. 202-206.) (5.14/13504 Great Britain.)

A general survey is made of the problems of design, construction and performance of seaplanes and flying boats which may be taken as embodying the experience of Short Bros. The author is in favour of very large flying boats

and apparently admits no limit as yet in sight, but possibly under-estimates the real mechanical limitations. In estimating seaworthiness the value of tank tests on floats and hulls is continually made apparent.

The results of a number of tank tests are reproduced graphically. A comparison is made with land plane performance and is held to compare favourably on a weight basis.

Limitations to the Size of Flying Creatures. (Schw. Aero. Rev., Vol. V, No. 5, May, 1930, pp. 125 and 126.) (5.14/13505 Switzerland.)

A general conclusion is reached that there is a definite limit to size imposed by limitations of muscular power and the strength of animal tissues. An analogous conclusion is drawn for flying machines.

Calculation of Natural Frequency of a Cantilever Monoplane Wing. (S. R. Carpenter, Air Corps Information Circular No. 649, 1/3/30, 12 pp.) (5.21/13506 U.S.A.)

A numerical example is worked out of the methods of calculating the natural frequencies in bending of monoplane wings described in Air Corps Information Circular No. 618 and Airplane Department Memoranda Nos. 1062 and 1066. The calculated frequency in bending is 4.37 cycles per second compared with the observed frequency of 3.95 cycles per second.

The shear moment slope and deflection are given graphically. Various quantities are tabulated for numerical integration. The results are plotted to calculate the frequency in torsion and the calculated value is found to be 9.8 cycles per second as compared with an observed value of 12 cycles per second.

Span Load Distribution on Two Monoplane Wing Models with Twist and Sweep-back. (M. Knight and R. W. Noyes, N.A.C.A. Tech. Note, No. 346, July, 1930, 17 pp.) (5.21/13507 U.S.A.)

The maximum lift is obtained with a washout of about 5°, which gives approximately elliptical distribution. Sweep-back diminishes the wing-tip pressures; sweep-forward increases them.

Extensive data are given numerically in tables and graphically in charts.

Design of Aeroplanes: Determination of External Forces. (E. Carafoli, L'Aeronautique, No. 133, June, 1930, pp. 213-220; No. 134, July, 1930, pp. 265-270.) (5.26/13508 France.)

The author discusses briefly the definitions of factor of safety and load factor, and the coefficients of lift, drag and moment on the wing. The stresses on the tail unit are considered and the equations for steady flight are established. The stresses on the wing spars are considered for the cases of one, two or more spars. The effect of the choice of profiles is discussed with a numerical example. A method for the calculation of stresses on wing ribs is outlined.

Methods of calculating the stresses in the body material and the tail units, both horizontal and vertical, are developed, and a numerical illustration is given.

The Buckling Load in Aeroplane Frames. (A. Teichmann, 183rd D.V.L. Rept., Z.F.M., Vol. XXI, No. 10, 28/5/30, pp. 249-254.) (5.26/13509 Germany.)

When a frame with rigid joints is on the point of collapse by buckling the natural buckling load of an individual strut may be exceeded. This condition is termed " the built-in effectiveness of the strut."

The work follows the general lines of the methods in use but differs in details. The functions introduced by Berry into English aeronautics appear in a less convenient form. A numerical example is worked out.

Twelve references are given.

Practical Aircraft Performance Calculations. (M. Watter, A.S.M.E. Paper, May, 1930.) (5.3/13510 U.S.A.)

Wing calculations are carried out with the aid of Prandtl's theory of induced drag, and curves are plotted to permit of the selection of the best span for monoplanes, biplanes and triplanes. The form drag of the aeroplane as a whole is analysed and estimated by parts, and interference is considered. Curves are plotted for varying span and gap in accordance with the systematic methods worked out by Munk. Airscrew efficiencies are discussed systematically with curves of performance under different conditions of angular and axial speed. Free use is made of logarithmic and polar diagrams in following the variations of the different elements of design. Take-off and landing runs, range and endurance are dealt with by empirical formulæ and by graphical representation.

Nineteen references are given, mostly American.

Calculation of the Performance of Aeroplanes. (E. Carafoli, L'Aerophile, No. 11/12, 15/6/30, pp. 173-179.) (5.3/13511 France.)

The logarithmic method of Rith used in Eiffel's work is stated to be laborious.

An alternative method of determining relations between engine power and airscrew performance is given which depends upon approximate assumptions as to density. The resulting equations are of a simple linear or factorial type.

The performance of engine and airscrew having been determined the speed/power relations of the aeroplane itself are worked out on familiar lines from polar curves of the whole aeroplane. Combining the two results, maximum speed, load, climb, etc., are determined.

Aerodynamics and Hydrodynamics

Measurement of Air Forces on Wings held Obliquely. (F. Budig, Z.F.M., Vol. XXI, No. 10, 28/5/30, pp. 245 to 249.) (5.3/13512 Germany.)

The application is to sailing boats, in which the heeling over of the boat sets the sail obliquely to the surface of the water. In the photograph of a wing, mounted on a wheeled carriage for setting it at different angles to the wind, the wing appears to be inclined to the ground in an opposite sense to the sail of a boat, with the greater camber on the upper surface. A battery of fourteen manometers is connected to different points of the wing surface, and by means of these the normal pressures are readily plotted.

Results are given for a full wing in a natural wind and for a model in a tunnel. Exceptionally high suction pressures appear round the leading edge, and more so for a full size wing than for a model. This explains certain apparent anomalies in the aerodynamic qualities of an inclined sail.

Forces on a Yacht's Sails. (T. Tanner, J.R. Aer. Soc., Vol. XXXIV, No. 238, Oct., 1930, pp. 880-888.) (5.3/13513 Great Britain.)

The results of measurements are expressed in coefficients of lift and drag which are tabulated and plotted as polar curves. As might be expected they resemble wing polars. The results are used to analyse the performance of a sailing boat.

Characteristics of Aerofoils as Tested in Variable Density Wind Tunnel. (E. N. Jacobs and R. F. Anderson, N.A.C.A. Rept., No. 352, Sept., 1930, 32 pp. Collected results.) (5.31/13514 U.S.A.)

Forty-five standard airfoils were tested at full-scale Reynolds number. Dimensions were 5in. by 30in., the pressure 20 atmospheres, Reynolds number 3,500,000, equivalent to 3.6 foot chord, at 100 m.p.h. in standard atmosphere. The lift, drag, centre of pressure and L/D curves are plotted for the actual aspect ratio

6:1, and also transformed to infinite aspect ratio by the usual methods. The minimum drag coefficient, the maximum lift coefficient, slope of the lift curve, and C.L. max./C.D.max. are plotted against thickness as a percentage of the chord. All results are corrected for channel interference.

Practical Experiences with the Automatic Wing Slot. (G. Lachmann, Z.F.M., Vol. XXI, No. 16, 28/8/30, pp. 409-418, and No. 17, 15/9/30, pp. 440-448.) (5.313/13515 Germany.)

The external appearance of the slots is shown in eight photographs of three aeroplanes. Diagrams show the mechanical arrangements. Lift-incidence curves exhibit the postponement of the stalling point from 16° to 20° incidence. Other diagrams show the resultant forces on the auxiliary wing with open and closed slots. Further diagrams show the lift coefficients for the wing ends and the corresponding resistance coefficients. The effects of (1) rudder control slot, (2) of the automatic slot, (3) of the automatic slot with interrupter control from aileron, are shown graphically.

The pitch moment on the model of a civil transport aeroplane is shown for different fin and elevator settings.

A descriptive diagram illustrates recovery from stalled flight.

The reduction of the landing run by the increase of the head resistance and diminution of the gliding angle is shown graphically.

Dr. Ing. W. Pleines contributes to the paper a large number of full scale readings plotted for rate of vertical descent with open and closed slots, also for gliding angle, elevator position, incidence, resistance coefficient, polar diagram and pitch moment, and rolling moment.

In the discussion H. Focke gives a number of technical details of the Focke-Wulf, and makes considerable claims with particular reference to lateral stability.

Device for Preventing diversion of Flow Stream from Lifting Surfaces. (Flugsport, Vol. XXII, No. 15, 23/7/30, pp. 101-102.) (5.316/13516 Germany.)

The device (German patent No. 501548) is an application of Prandtl's principle that the diversion of the flow stream from a solid boundary at a position of decreasing velocity and increasing pressure in the outer region of potential flow is due to the presence of the retarded boundary layer and may be prevented by sucking away the boundary layer at suitable points. In the present patent the suction is obtained over the nose area of the glider body where there is a large region of reduced pressure. This region is connected by a pipe with the interior of the wing. The upper surface of the wing is perforated at a number of points. If the fall in pressure in the nose region of the body is sufficient some or all of the boundary layer may be sucked in through the perforations in the upper surface of the wing.

Other applications are considered.

A Method of Measuring Turbulence in the Atmosphere. (E. Huguenard, A. Magnan and A. Plamiol, C.R., Vol. CXC, No. 24, 16/6/30, pp. 1437-1439.) (5.316/13517 France.)

The instantaneous velocity of the wind and the angle made with the mean direction are recorded by means of a hot wire anemometer. By analysing the resulting curves it is possible to determine the turbulence of the air. Turbulence has been defined as the apparent motion of the air to an observer travelling with the mean velocity. It appears that the air undergoes certain periodic motions which could be explained by the presence of large vortices.

The Wake in Fluid Flow Past a Solid. (H. Jeffreys, Proc. Roy. Soc., Vol. CXXVIII, No. 808, 5/8/30, pp 376-393.) (5.316/13518 Great Britain.)

The author considers the gap between rational hydrodynamics as expounded, say, in the older editions of Lamb's text book, and the actual phenomena which present themselves to the physicist and engineer.

The partial results obtained in the circulation theory of lift and induced drag, and Karman's mathematical discussion of the alternate vortices shed by an obstacle in two-dimensional flow, are considered. An attempt to extend these partial results to three dimension leads to the conclusion that there is no analogue in the form of a series of closed vortex rings as such a system is unstable and produces general turbulence in the wake.

Modern Aerodynamical Research in Germany. (J. W. Maccoll, J. Roy. Aer. Soc., Vol. XXXIV, No. 236, Aug., 1930, pp. 649-689.) (5.316/13519 Germany.)

A useful survey is given of recent German work. The work of Prandtl, Von Karman, Schiller, Blasius and others on the boundary layer is reviewed. Experimental determinations of the critical Reynolds number are given. Prandtl's statistical methods applied to turbulent flow are reproduced. Inevitably empirical results and coefficients are introduced and the so-called theory depends on empirical relations.

47 references are given. A discussion follows.

Flow behind Circular Cylinders in Channels of Different Breadths. (B. Rosenhead, Proc. Roy. Soc., Vol. CXXIX, No. A.809, 3/9/30. With Appendix by M. Schwabe, pp. 115-134.) (5.32/13520 Great Britain.)

The experiments were carried out by M. Schwabe, at the Kaiser Wilhelm Institute, Göttingen, and they establish in the first place the fact that within a considerable range of velocities the spacing of alternate eddies shed by an obstacle do approach closely v. Karman's theoretical distribution. A number of excellent photographs are reproduced illustrating second order effects which are discussed in some detail, in particular the dying out of the vortices below the critical value. The effects of channel walls are also discussed and the results are given graphically showing the ratio of vortex velocity to cylinder velocity, horizontal spacing, and the distance between two rows for different Reynolds numbers. The tendency for two rows of vortices to diverge is taken as evidence of instability. An account of the experiments, apparatus and methods of Fage and Johansen is given.

Motion of Vortices in a Perfect Fluid under the Influence of Boundaries. (W. Müller, Z.A.M.M., Vol. X, Part 3, June, 1930, pp. 227-243.) (5.32/13521 Germany.)

Consideration is restricted to two-dimensional problems and more particularly to rectangular compartments, with a long channel between parallel walls as a limiting case.

In the case of the rectangular compartment the phenomenon is clearly doubly periodic and the solution is to be sought in terms of elliptic functions, which may degenerate into elementary function in the limiting case. Expressions of this nature are constructed for a number of problems, such as the path of a single vortex in a rectangle, a vortex pair of opposite sign and equal intensity, on the centre line of a long parallel channel, the path of equal vortices of the same sign symmetrically in a rectangle and in a channel. The problem of two vortex pairs alternately overtaking and passing through each other is also solved.

Some of the problems are old, but the discussion is original.

Relations between Mass Transfer and Fluid Friction. (A. P. Colburn, Ind. and Eng. Chem., Vol. XXII, No. 9, Sept., 1930, pp. 967-970.) (5.32/13522 U.S.A.)

The equation obtained is of the same form as that of Prandtl and Taylor in obtaining a relation between viscosity and heat transfer. By selecting suitable coefficients straight line curves are obtained in logarithmic co-ordinates. In the case of de-humidification the experimental points are well grouped on the straight line. In the case of absorption the agreement is less convincing. Sixteen references are given.

Proof of the Theorem of Lift Distribution for Minimum Induced Drag. (W. F. Durand, N.A.C.A. Rept., No. 349, 1930, 11 pp.) (5.336/13523 U.S.A.)

Proofs so far published are not very satisfactory from the point of view either of the mathematician or the student. The present proof, which is in effect an elementary application of the calculus of variations, should help the student to follow the ideas underlying the analysis without the distractions of mathematical rigour.

Pressure Distribution Over a Douglas Wing Tip in Flight. (R. V. Rhode and E. E. Lundquist, N.A.C.A., Tech. Note, No. 347, Aug., 1930, 32 pp.) (5.336/13524 U.S.A.)

The deflection of the wing tip in flight was observed by direct reading on a surveyor's level attached to the struts, and was found to be slight.

A multiple manometer was connected to orifices distributed along the chord at various positions, and the observed results are shown graphically and tabulated numerically. The accuracy of the readings is considered to be high.

Aerofoil Pressure Distribution, Wind Tunnel Investigation. (E. N. Jacobs, J. Stack and R. M. Pinkerton, N.A.C.A. Rept., No. 353, Sept., 1930, 15 pp.) (5.336/13525 U.S.A.)

The distribution of pressure over one section of each of six aerofoils was measured. Pressure distribution diagrams as well as the integrated characteristics of the aerofoils are given for both a high and a low Reynolds number, for comparison with flight and other wind-tunnel tests. It is concluded that the scale effect is important only near stalling incidence. The distribution of pressure over a Joukowski section is compared with the calculated distribution.

Wing Bracing

Aeroplane Wing Bracing. (R. M. Mock, A.S.M.E. Paper, May, 1930.) (5.337/13526 U.S.A.)

Methods of wing bracing are discussed in general terms. Two illustrations of internal wing bracing and sketches of twenty-four types of monoplane and biplane wing bracing are given.

Seaplanes

Seaplane Hulls and Floats. (H. M. Garner and L. P. Coombes, Airc. Eng., Vol. II, No. 18, Aug., 1930, pp. 193-196, and No. 19, Sept., 1930, pp. 223-225.) (5.34/13527 Great Britain.)

The authors summarise the present state of knowledge and suggest lines of further research, in particular for experimental tank work to amplify the sparse information available. The correlation of model and full-scale experiments is discussed at some length on familiar lines.

A survey is given of method of design for seaworthiness and for strength requirements of hulls and floats. The available theoretical and experimental

methods of investigation are described and are considered inadequate. Methods devised at Felixstowe for measuring forces on floats are described at some length. For flying boats only indirect methods are practicable at the moment. A number of take-off tests are analysed and smooth curves are plotted, showing the relation between speed, air drag, water resistance and thrust. The tendency towards deeper V of the hull is discussed and the necessary compromise between seaworthiness and low resistance is pointed out.

Water-Pressure Distribution on a Flying Boat Hull. (F. L. Thompson, N.A.C.A. Rept., No. 346, 1930, 18 pp.) (5.34/13528 U.S.A.)

The apparatus and methods of carrying out the tests on the Curtiss' H.16 flying boat are illustrated and described. The numerical results are tabulated. Among the results are :—

Maximum pressure 15lbs. per sq. in. near keel at mainstep in landing.
11lbs. per sq. in during take-off in rough water. 8lbs. per sq. in. on almost any part of the hull bottom.

For extreme observed vertical acceleration 4.7g. average 3g. for rough water take-offs and landings.

Maximum observed longitudinal acceleration 0.9g. in rough water; average 0.7g.

Maximum lateral acceleration 0.5g. with risk of submerging wing tip.

Seven references are given.

Tank Tests for Seaplane Models. (R. J. Mitchell, Airc. Eng., Vol. II, No. 20, Oct., 1930, pp. 255-259.) (5.34/13529 Great Britain.)

The elementary principles of dynamic similarity are discussed. Contour lines are given for two types of float and a flying boat hull. A number of practical restrictions to design are given and the inevitable compromise is illustrated in S.5 and S.6 racing seaplanes. Resistance curves for varying attitudes are given along with some account of behaviour on actual trial.

A brief specification is given of the performance of a three-engined monoplane boat of 14 tons flying weight, and a number of characteristics are given graphically.

The Pearson Rotatable Aileron. (Airc. Eng., Vol. II, No. 19, Sept., 1930, p. 226.) (5.36/13530 Great Britain.)

An aileron of circular plan and considerably cambered median profile giving cylindrical curvature is mounted on a vertical spindle which in turn is mounted at right angles, approximately vertically, to a cantilever arm, parallel to the spars, projecting from the wing tip. The vertical lever and aileron are rotatable, so as to decrease the effect of incidence, which is a maximum in the symmetrical position.

Model test results are given graphically and indicate an increase of moment of 150 per cent. between 2° and 80° rotation from the symmetrical position. Certain advantages and disadvantages are discussed.

Racing Seaplanes. (J. S. Kean, Aviation, Vol. XXIX, No. 1, 5/7/30, p. 25.) (5.39/13531 U.S.A.)

The third of a series of three articles, giving a summary of the cost of running a team of seaplanes for competition in the Schneider Cup Race. Of three alternative schemes the most ambitious costs £400,000.

See also Vol. XXVIII., No. 25, 21/6/30, p. 1208, and No. 26, 28/6/30, p. 1267.

Airscrews

Airscrew with Minimum Loss of Energy. (E. Pistolesi, A.S.M.E. Paper, May, 1930.) (5.41/13532 U.S.A.)

The problem is attacked mathematically with the usual type of simplification and correction for inflow. The author makes no reference to Goldstein's complete solution of the velocity field round the airscrew. See abstract No. 10/10941.

Device for Investigation of the Deformations of Airscrews. (Ch. Ledoux, C.R., Vol. CXCI, No. 16, 20/10/30, pp. 651-653.) (5.461/13533 France.)

With an electric motor drive, beams of light reflected from mirrors attached at points on the blade measure the departure from uniform rotaion and determine free periods with accuracy. This enables the designer to avoid resonance in a combination of engine and airscrew.

The method has applications to engine parts.

Selection of Aluminium Alloy Airscrews. (F. E. Weick, N.A.C.A. Rept., No. 350, 1930, 14 pp.) (5.49/13534 U.S.A.)

Author's Summary.—Working charts are given for the convenient selection of aluminium alloy airscrews of a standard form, to operate in connection with six different engine-fuselage combinations. The charts have been prepared from full-scale test data obtained in the 20-foot airscrew research tunnel of the N.A.C.A. An example is given showing the use of the charts.

Reduction Gears

Patent Two-Speed Planet Reduction Gear. (Barbarou, Flugsport, Vol. XXII, No. 14, 9/7/30, pp. 98-99.) (5.451/13535 Germany.)

An epicyclic reduction gear has a central gear wheel free to rotate on the driven shaft which can be meshed by a movable clutch either with an internal gearing of the case or with a gear attached to a driving shaft, giving two different ratios.

Epicyclic Reduction Gear for Aero Engines. (German Patent No. 498713, Siemens and Halske Works, Berlin.) (5.451/13536 Germany.)

A spherical mounting of the sun wheel permits small displacements without disturbing the meshing of the planet teeth.

Epicyclic Reduction Gear for Aero Engines. (German Patent No. 496894, B.M.W. Works, Munich.) (5.451/13537 Germany.)

The sun wheel is mounted so that certain small displacements during running are possible. It is not driven direct from the engine crankshaft but through the agency of a dog clutch possessing a large number of internal teeth.

Struts, Mutual Interference

Mutual Interference of Struts in Model Tests. (R. Pris, L'Aeronautique, No. 136, Sept., 1930, pp. 333-336.) (5.56/13538 France.)

A model biplane was tested with a number of struts varying from one to ten pairs-in-tandem, and the coefficients of resistance were determined. Struts of faired shape and of various inclinations to the spars were also mounted. The results are given graphically.

Acoustics

Measurement of Sound Transmission. (A. E. Knowler, Phil. Mag., Vol. X, No. 63, August, 1930, pp. 342-344.) (6.26/13539 Great Britain.)

Elementary formulæ are developed for the intensity of sound produced by the loud speaker source and the reduction of intensity on passing through a partition. These are applied to two sets of experiments and the numerical results found agree reasonably well with those of other experiments and with each other.

A Chronographic Method of Measuring Reverberation Time. (E. C. Wente and E. H. Bedell, Bell Tele., No. B-500, July, 1930, 6 pp.) (6.26/13540 U.S.A.)

The method of measuring reverberation time by ear and stop watch devised by Professor Wallace Sabine is rendered more controllable by substituting for the ear an electric acoustical apparatus of controllable "threshold" sensibility containing a microphone and an amplifier. The reverberation maintains a current in a circuit and when the sound intensity and the current fall below a certain value a contact is released and a spark passes from a point to a rotating drum.

The gain of the amplifier is changed by successive steps, and the corresponding reading of the time of decay of the standard sound is indicated in each case by a dot on the drum. Each set of dots thus obtained lies approximately on a straight line, the slope of which, determining the time of reverberation, remains remarkably steady.

The Acoustical Conductance of Orifices. (A. E. Bate, Phil. Mag., Vol. X, No. 65, Oct., 1930, pp. 617-632.) (6.265/13541 Great Britain.)

Rayleigh's simple formula for the conductance of a short cylindrical pipe with large flanges at the ends is quoted and given in a simplified form. End corrections for orifices of different diameters at the end of a long tube are tabulated. End corrections for square and rectangular orifices are also tabulated and plotted graphically.

(The results should have applications to the amount of noise admitted to a cabin by portholes of different sizes and shapes).

Instruments—Navigational

Air Navigation. (C. R. McMullin, Airc. Eng., Vol. II, No. 19, Sept., 1930, pp. 232-233.) (6.3/13542 Great Britain.)

A descriptive account is given of the instruments available and of their application to course and position fixing.

The Gyrorector. (L'Aeron., Vol. XII, No. 130, March, 1930, p. 106.) (6.32/13543 France.)

A brief account is given with technical details of this instrument, manufactured by a Berlin company, which gives the pilot visually the angles of pitch, yaw and bank relatively to three fixed axes. The instrument weighs $5\frac{1}{2}$kg. and the driving fan and generator $1\frac{1}{2}$kg.

Northerly Turning Error. (H. Maurer, Z.F.M., Vol. XXI, No. 13, 14/7/30, pp. 333-335.) (6.341/13544 Germany.)

Under certain conditions in high latitudes the inertia forces arising from the banking of an aeroplane in a curve may produce a compass error greater than the course error, so that not merely the magnitude but even the sign of the error is doubtful. An elementary trigonometrical discussion is given, and tables of corrections are worked out.

Determination of Longitude by Sun Compass. (V. Theimer, Z.f. Instrum., Vol. L, No. 8, Aug., 1930, pp. 477-479.) (6.345/13545 Germany.)

A brief account of the theory and application of the sun compass with a statement of its limitations in high and low latitudes.

Photogrammetric Determination of Position and Speed of "Graf Zeppelin." 184th D.V.L. Rept., O. Lachmann and W. Block, Z.F.M., Vol. XXI, No. 11, 14/6/30, pp. 269-278.) (6.38/13546 Germany.)

A description is given of the double mechanical cameras installed by Karl Zeiss with chronographic record. The airship flew over surveyed ground, and by reduction of the photographs by a stereo-planograph instrument the position of the airship at each instant was determined. The numerical results are tabulated and shown graphically.

Errors in Measurement of Flying Speed from Faulty Placing of the Pressure Head. (H. Belart, Schw. Aero. Rev., Vol. V, No. 5, May, 1930, pp. 131-133.) (6.381/13547 Switzerland.)

A graphical record is given of the reading with the pitot head placed in seven different positions. Four positions give low readings and three give high readings.

An elementary theory is given.

Notes on Engineless Flight. (A. Lafay, Tech. Aeron., Vol. XXI, No. 103, May, 1930, pp. 105-108.) (6.43/13548 France.)

A carbon microphone is built into the upper surface of the wing and the stalling point is indicated by a change in note. The apparatus may be of use in finding up-currents during gliding flight.

Sensitive Vacuum Thermopiles. (Rev. Sci. Insts., Vol I, No. 10, Oct., 1930, pp. 592-593.) (6.45/13549 U.S.A.)

The theory and practical design of sensitive vacuum theormopiles for measuring the radiation of energy of different wave lengths of light is discussed. Assuming the Wiedenmann-Franz law, comparatively simple formulæ are obtained which are stated to hold for all the thermopiles constructed and tested on the assumption of reasonable values of the physical constants involved. A photograph shows the type of construction found most sensitive for small radiation. Less than one microvolt could be recorded indicating $1/10^8$ gram-calories per second at room temperature. The sensitivity in vacuum was twenty to forty times the sensitivity in air, and was further increased at the temperature of liquid oxygen.

The Cineclinograph. (L'Aeron., Vol. XII, No. 130, March, 1930, pp. 89-95.) (6.48/13550 France.)

A streamlined case towed behind and below an aeroplane at a distance sufficient to eliminate interference, records photographicallly the temperature, pressure, engine revolutions, air speed and relative incidence, with time markings in minutes.

General arrangement drawings and photographs give many details of the mechanism.

Instruments—Miscellaneous

Measurement of Short Time Intervals. (G. R. Town, Rev. Sci. Insts., Vol. I, No. 8, Aug., 1930, pp. 449-465.) (6.48/13551 U.S.A.)

A photograph and general arrangement diagram are given of the apparatus. Typical photographic records are reproduced and a set of numerical values from

observations is tabulated. One scale division corresponds to 75.8 micro-seconds, and readings can be made to one-fifth of a division, giving a minimum difference of about 15 micro-seconds. Periods up to 10 seconds or even longer can be measured.

Micromanometer of High Sensitivity. (E. Ower, Phil. Mag., Vol. X, No. 65, Oct., 1930, pp. 544-551.) (6.57/13552 Great Britain.)

The author applied proposals by J. P. Roberts (Proc. Roy. Soc. A.78, p.410, 1906) and A. Henry (C. R. 150, p. 1078, 1912) to connect the U-tube limbs by a horizontal capillary containing an air bubble, the motion of which indicates small changes of level. Various difficulties were overcome and an instrument constructed which can read to about 2.45×10^{-5} cm. water or 2.5×10^{-2} dynes/cm.^{2}. This gives an accuracy of 1 per cent. in measuring a velocity of 64 cms./sec., with a pitot tube, the effective head being about 2.53 dynes/cm.^{2}.

Night Beacons for Night Flying. (W. M. Hampton, Airc. Eng., Vol. II, No. 18, Aug., 1930, p. 211.) (6.62/13553 Great Britain.)

A comparison is made between the modified searchlight type preferred in America and the optical systems used in Europe. Elementary calculations are carried out for both types.

Optical Device for Measuring Profile of Airscrew Models. (Luftwacht, No. 7, July, 1930, p. 337.) (6.71/13554 Germany.)

Professor Betz has developed a new method of profile measurement for airscrew models. The propeller is illuminated progressively by means of a thin plane beam of light, complete sections being obtained by simply reversing the model. The resulting photographs are measured in a special apparatus.

Temperature Effect on Instrument Diaphragms and Spring Materials. (W. G. Bromacher and E. R. Melton, N.A.C.A. Rept., No. 358, Sept., 1930, 16 pp.) (6.9/13555 U.S.A.)

The following metals were tested :—Duralumin, monel metal, brass, phosphor bronze, silver alloy, 1.3 per cent., carbon steel, oil-tempered steel, piano wire, chromium vanadium steel, chromium molybdenum steel, stainless steel. The results are tabulated and plotted graphically, and enable designers to estimate the temperature effect on the elastic constants of the material. Eleven references are given.

Stability and Control

Spins. (T. E. Joyce, " U.S. Air Services," Vol. XV, No. 10, Oct., 1930, pp. 44-46.) (7.14/13556 U.S.A.)

A descriptive account is given of phenomena as observed by the pilot during spins of different types on a variety of types of aircraft.

Longitudinal Stability of an Aeroplane with Free Elevator. (H. Blenk, 180th D.V.L. Report, Z.F.M., Vol. XXI, No. 8, 28/4/30, pp. 189-196.) (7.21/13557 Germany.)

The usual equations of stability are formed and the special values of force and moment coefficients arising from the free elevator are inserted. A solution is worked out and a numerical example is given.

Moments of Inertia and Directional Stability. (A. Lapresle, L'Aerophile, Vol. XXXVIII, No. 7/8, 15/4/30, pp. 115-117.) (7.21/13558 France.)

The author discusses the experimental measurement of moments producing autogyration in a wing with and without a constant angle of yaw. Graphical

representation shows the marked effects due to yaw. The conclusion is drawn that directional instability may aggravate the dangers of spin considerably, especially by starting premature spin near the ground during take-off.

Aerodynamical Gymbal Frame for Wind Channel Model Tests: Systematic Tests on a Glider, etc.; Moments of Gyration and Directional Stability. (A. Lapresle, Bull. Tech., No. 66, Feb., 1930, 81 pp.) (7.21/13559 France.)

From systematic tests on an S.T.Ae. glider model fitted with different wings in high, normal and low settings, pitching moments are plotted for different conditions, and the contributory moments of the different parts, wing, body and tail unit, are plotted separately.

The yawing moments of directional stability are considered and the experimental values are plotted for different yawing angles. Further, the influence of ailerons in different positions is considered.

The autorotation round a fixed axis in a wind channel is observed and the angular velocity is plotted against the incidence for the wing only and for the complete model. The results are analogous to those obtained elsewhere, but a number of interesting special cases are given.

The application to spinning is briefly considered, and high directional stability is considered advantageous.

Flight without Natural Horizon. (E. Offermann, Z.F.M., Vol. XXI, No. 7, 14/4/30, pp. 161-164.) (7.4/13560 Germany.)

The Boykow automatic pilot is not yet in such general use as to establish its efficacy under service conditions. In principle the pilot should be relieved as much as possible of " internal navigation " (stability of machine) leaving him free for " external navigation " (position in space).

Engine Design

Aircraft Engine Installation. (A. Nutt, S.A.E., XXVII., No. 3, Sept., 1930, pp. 268-273.) (8/13561 U.S.A.)

The paper is somewhat critical of current practice and advocates a closer co-operation between engine and aeroplane designers. Eight photographs illustrate criticisms of inaccessibility, of badly placed exhausts, leading to overheating, and of a poorly placed oil cooler and air heater. A ninth photograph illustrates a neat installation of a hexagon type of engine. A discussion follows.

Dynamical Analysis of Machines. (R. Eksergain, J. Franklin Inst., Vol. CCIX, Nos. 1 to 6, Jan.-June, 1930, Vol. CCX, No. 2, Aug. and Sept., 1930, and to be continued.) (8/13562 U.S.A.)

The series of articles is a concise treatise on the rational mechanics of mechanisms.

A systematic investigation is made of the forces due to steam, explosion, etc., pressures, and to inertia forces arising from rotary and reciprocating motions, balancing of engines, disappearing gun-carriage mechanism, etc.

General dynamical equations are formed for systems of two or more degrees of freedom. Various transformations are written down and applications are made to the double pendulum and to co-axial cylinders on rolling inside the other, etc.

World Power Conference. (Autom. Eng., Vol. XX, No. 271, Sept., 1930, pp. 337-338.) (8/13563 Great Britain.)

A resumé is given of papers relating to aircraft and automobile engines, research work, mechanical transmission and fuels.

The Argus AS.8 and the B.M.W. X Light Aeroplane Engines. (Luftwacht No. 9, Sept., 1930, pp. 427-433.) (8.14/13564 Germany.)

The Argus AS.8 is rated at 80 and the B.M.W. at 50 h.p. The former is a four-cylinder-in-line, air-cooled inverted, the latter a five-cylinder air-cooled radial engine.

In the Argus the light alloy cylinder head is screwed on to the periphery of the steel liner, a copper washer being interposed, and has a neat cowling. The B.M.W. engine has the American Hornet design of cylinder head reduced to motor-cycle dimensions.

The Argus Aero Engine AS. 8. (W. Kamm, Z.V.D.I., Vol. LXXIV, No. 41, 11/10/30, pp. 1409-1412.) (8.14/13565 Germany.)

The engine has a substantial crankshaft and a rigid electron crankcase. The normal speed is 1,400 r.p.m., and up to 1,700 r.p.m resonance appears only with the eighth, tenth and higher harmonics, the deflection of the free end of the crankshaft not exceeding one degree. The bearing pressures are below normal aircraft figures. The aluminium cylinder heads are attached to the liners by means of six screws and have bronze seatings for valves and sparking plug.

A three-jet S.U.M. carburettor is fitted.

A rotating test bench subjects the crankcase to gyroscopic forces.

Forced Torsional Oscillations in Multiple Mass Systems. (H. Berens, Z.F.M., Vol. XXI, No. 12, 28/6/30, pp. 297-305.) (8.22/13572 Germany.)

Systems of a number of masses and applied moments are reduced to a system of a single equivalent mass and a single applied moment. General formulæ of reduction to a single equivalent mass and moment are developed for a system with an arbitrary number of masses and moments and for these the particular expressions are written down for systems of two, three, four and five masses. Numerical example is worked out for the case of five masses.

In part II. simplifications are introduced for various types of symmetry, e.g., equal masses and equal elastic couplings. A numerical example is worked out for a ten-cylinder engine and the results of the numerical computations are given graphically. Comparison of calculated with observed critical speeds is made to first and second approximations, the latter showing reasonable accuracy of prediction.

Note on Damping of Oscillations. (Z.V.D.I., Vol. LXXIV, No. 32, 9/8/30, p. 1122.) (8.22/13573 Germany.)

The Junkers vibration damper has become standard for other engines including the B.M.W.4. It weighs approximately 15lbs. and reduces the deflection of the crankshaft to half. Oil is the damping medium and in a new arrangement the lubricating oil flows freely through the damper, which it lubricates and cools.

Cooling

The Heat Transferred between a Heated Plate and a Current of Air. F. Elias, Z.V.D.I., Vol. LXXIV, No. 31, 2/8/30, p. 1096.) (8.3/13574 Germany.)

A hollow flat plate was filled with oil, heated electrically, and placed parallel to the direction of airflow in a wind tunnel, the air speed being varied from 10 to 35 metres per second. For two constant temperatures of the plate, the temperature and the velocity distributions were measured in the boundary layer and for perpendicular distances up to 15 millimetres. The results show close similarity of the two fields, from which it is inferred somewhat boldly that problems of air resistance and heat transfer can be attacked by similar mathematical analysis.

The Heating of Fluids Flowing through Narrow Pipes. (A. Kneschke, Ann. d. Phys., Vol. V, No. 5, July, 1930, pp. 670-676.) (8.36/13575 Germany.)

The author quotes v. Mise's equation for the flow of heat from a pipe, which he solves compactly in the form of a complex integral for special numerical assumptions. The results are given graphically for various speeds.

Osborne Reynolds' Theory of Heat Transfer: Application to Flow through a Pipe. (G. I. Taylor, Proc. Roy. Soc., Vol. CXXIX, No. A.809, 3/9/30, pp. 25-30.) (8.36/13576 Great Britain.)

The extensive measurements of Messrs. Eagle and Ferguson were used by them to check Osborne Reynolds' theory of heat transfer. The underlying assumption is that of a complete analogy between transfer of heat and transfer of momentum. Two possible sources of error are suggested and certain of their assumption are criticised. An alternative assumption is made and the numerical conclusions are tabulated for comparison with Stanton's experiment. More than half the discrepancy is accounted for in this way.

Drag and Cowling

Resistance of Air-Cooled Engines. (F. M. Green, J.R. Aer. Soc., Vol. XXXIV, No. 238, Oct., 1930, pp. 803-812.) (8.38/13577 Great Britain.)

Some typical figures of engine drag are given, and the effect of the Townend ring is referred to. The subject is largely empirical and the particular experiences contributed are of value. The author invites publication of similar figures of the experiences of others.

The Townend Ring. (H. C. H. Townend, J.R. Aer. Soc., Vol. XXXIV, No. 238, Oct., 1930, pp. 813-833.) (8.38/13578 Great Britain.)

The evolution of the ring through a series of experiments is described. A two-dimensional experiment with visible stream lines shows the action of the ring in smoothing out the turbulent flow round the cylinders and setting up laminar flow along the body. Curves indicate the effect of the ring under various conditions and an elaborate table is given of drag readings for models under various conditions. The reduction of drag is remarkable. The experimental stream lines show clearly the radical change in type of flow, but no physical explanation is as yet forthcoming as to why this change should take place.

Lubrication

Lubrication of Aircraft Engines. (W. Lee, Airc. Eng., Vol. II, No. 18, Aug., 1930, pp. 212-213.) (8.41/13579 Great Britain.)

The article contains some critical comment on parts of Messrs. Thornycroft and Barton's previous article (See A. and N. No. 13/12356). The conditions of their engine tests are considered to be less severe than the tests in high power engines as to mechanical and chemical properties. The practical interpretation of the test results is also questioned. Alternative specifications are offered and a particular oil is suggested.

New Methods of Testing Lubricating Oils. (Aut. Tech. Zeit., Vol. XXXIII, No. 21, 31/7/30, p. 519.) (8.41/13580 Germany.)

The oil is diluted with toluol and its viscosity determined at room temperature, for various degrees of dilution. The changes of viscosity produced by the simpler laboratory method are similar to those produced by changes in temperature. The oil which possesses the most " body " generally has least reduction of viscosity on dilution.

Properties of Automotive Lubricants. Changing Design in Motors and Varying Operating Conditions Reflected in Quality of Oils. (H. C. Mougey, Oil and Gas, J. 28, No. 45, 41, 147-9 (1930). Chem. Abstr., Vol. XXIV, No. 10, 20/5/30, p. 2589.) (8.41/13581 U.S.A.)

The coefficient of friction is not a measure of the tendency to seize. Lard oil gives a much lower coefficiency of friction than certain lubricants blended specially for transmission purposes, but will only stand approximately half the ultimate bearing pressure before seizing (13,000lbs. against 25,000lbs. per sq. in.). Stability tests are only of value if the changes affect the oil under working conditions in the engine.

Fuels

Action of Antioxidants on Oxidation of Unsaturated Fatty Oils. (B. Yamaguchi, Report of Aero. Res. Inst., Tokyo, No. 61, May, 1930, 33 pp.) (8.41/13582 Japan.)

Diphenyl hydrazine prolongs the incubation period at 100°C. necessary with castor oil before oxidation starts. The antioxidant does not influence the rate of oxidation once begun. The results are in agreement with Christiansen's chain theory of chemical oxidation.

The Effect of Weathering on Vapour-Locking Tendency of Fuels. (O. C. Bridgeman and Elizabeth W. Aldrich, S.A.E., Vol. XXVII, No. 3, Sept., 1930, pp. 344-351.) (8.51/13583 U.S.A.)

A large number of observations of the effect of temperature on weathering of gasolines is tabulated and plotted. The selected fuels are identified by their trade names and the main physical properties are given. The tendency to vapour-lock decreases with the loss of the lighter constituents. A discussion follows.

The Properties of Gasolines with Reference to Vapour Lock. (O. C. Bridgeman and E. W. Aldrich, S.A.E. Jrnl., Vol. XXVII, No. 1, July, 1930, pp. 93-110.) (8.51/13584 U.S.A.)

A method is described for determining the vapour pressure of petrol accurately free from air, on which the tendency to form vapour-lock depends. The presence of dissolved propane or air materially increases the tendency. The vapour-lock temperature decreases with height by approximately 2°F. per 1,000 feet.

Gum in Gasoline—How it Performs in the Automobile Engine. (E. B. Hunn, H. G. M. Fischer and A. J. Blackwood, Natl. Petroleum News, 21, No. 43, 65 (1929). Chem. Abstr., Vol. XXIV, No. 9, 10/5/30, p. 2280.) (8.51/13585 U.S.A.)

The copper dish method for estimating gum content is condemned. The Holley vaporiser adopted by the Ethyl Gasoline Corporation approximates closely to carburettor conditions. The maximum permissible dissolved gum content is approximately 10mg. per 100 c.c.

Resin Formation in Benzoles. (W. H. Hoffert and J. Claxton, Fuel, Vol. IX, No. 8, Aug., 1930, pp. 359-366.) (8.51/13586 Great Britain.)

Dissolved gum in benzole containing unsaturated hydrocarbons forms resinous deposits in induction pipe and on valve stems. The gum can be separated by distillation and the freshly distilled fuel is satisfactory. On storage more gum will generally form. The extent of resinification depends on a variety of factors, chiefly the nature and extent of unsaturated compounds present and the presence or absence of traces of positive or negative catalysts.

References are made to the fundamental work of Moureau and Dufraisse.

Determination of Hydro-Carbons from Petroleum. (E. W. Washburn, Ind. and Eng. Chem., Vol. XXII, No. 9, Sept., 1930, pp. 985-987.) (8.51/13587 U.S.A.)

Measurements of refractive index, density, boiling point, freezing point and halogenation are recommended for identification of petroleum fractions.

The determinations of viscosity, surface tension, thermal conductivity, heat capacity, latent heat, di-electric characteristics, absorption spectra and X-ray fraction patterns may be more distinctive and sensitive but are less easily obtained with ordinary laboratory equipment.

Eight references are given.

Coal Dust Injection Engine. (F. E. Bielefeld, Autom. Tech. Zeit., Vol. XXXIII, No. 12, 30/4/30, p. 295, No. 14, 20/5/30, p. 348.) (8.51/13588 Germany.)

References are given to 38 patents from 1891 to 1930 covering the development of the injection engine utilising solid fuel. The difficulties are very great. Coal dust in an extremely fine state of subdivision has to be obtained and metered consistently, and all traces of ash or other residues should be removed from the engine as soon as formed to prevent rapid wear, but this problem has by no means been solved. In the most recent development the coal dust is kept in continual circulation by means of air pressure, metered amounts being admitted into the engine by an injection valve. The pre-combustion chamber has been invariably adopted, the injection timing being relatively early so as to make up for a lag in the ignition. Attempts to compress a mixture of coal dust and air in the cylinder itself have failed through collection of the dust in the oil film. Considering these difficulties along with the high cost of preparing the fuel the economic prospects are not good.

Combustion Efficiency of Coal. (P. Rosin and R. Fehling, Z.V.D.I., Vol. LXXIV, No. 13, 29/3/30, p. 395.) (8.51/13589 Germany.)

The quantity of dust admitted to the combustion space is strictly limited by the size of the plant. If too much dust is admitted, the particles will leave the combustion space before they have time to burn. So far no method of increasing the reaction velocity has been discovered. The rate of burning is limited by the diffusion of oxygen through the boundary layer surrounding the particle of coal.

The problem of burning liquid fuel in a Diesel engine is in some respects similar and this renders the above article of interest.

The Study of Industrial Dust, with Special Reference to Coal Dust. (Dr. H. W. Gonell, Z.V.D.I., Vol. LXXIV, No. 26, 28/6/30, pp. 916-920.) (8.51/13590 Germany.)

The dust is embedded in a resin compound and polished with clay, giving a relief surface depending on the hardness of the various dust grains. This is studied under the microscope with oblique illumination, and enables a rapid determination to be made of the suitability for industrial firing. The so-called brown coal yields a dust having a large ratio of surface to volume characterised by rapid ignition, and by remaining readily in suspension in the air, which gives the best results with engines using solid fuel.

Aviation Fuels and Their Development. (A. E. Dunstan and F. B. Thole, Petroleum Times, 22, No. 565, 929; No. 567, 1029 (1929). Chem. Abstr., Vol. XXIV, No. 9, 10/5/30, p. 2280.) (8.512/13591 U.S.A.)

Cracked petrol is coming into use as an aviation fuel because it has less tendency to pre-ignite than benzol or petrols rich in paraffin.

Cracking of Hydro-Carbons at Temperatures Higher than Critical Temperatures. (R. H. McKee and A. Szayna, Ind. and Eng. Chem., Vol. XXII, No. 9, Sept., 1930, pp. 953-956.) (8.512/13592 U.S.A.)

Cracking of hydro-carbons is investigated by observing changes in critical temperatures. The cracking rates of gasolenes, saturated hydro-carbons, unsaturated hydro-carbons, taken in this order increase. Some of the commonly accepted details of the mechanism of cracking are criticised. Numerical examples are tabulated, with three charts. Ten references are given.

Hydrogenation Process Adopted for American Fuel Production. (Autom. Ind., Vol. LXIII, No. 6, 9/8/30, pp. 197-198.) (8.512/13593 U.S.A.)

The Bergius hydrogenation process, applied in Germany to certain types of coal, has produced synthetic petrol in large quantities. The same process applied to crude oil converts practically the whole into motor spirit, as compared with 40 per cent. to 50 per cent. by older methods. The process has been taken up by the leading refineries in America in conjunction with the I.G. Company of Germany.

Standard Test Basis for Anti-Knock Rating of Fuels. (S. D. Rubenz, Naval Aircraft Factory, Philadelphia, Autom. Ind., Vol. LXIII, No. 8, 23/8/30, pp. 260-263.) (8.514/13594 U.S.A.)

A single cylinder liquid or vapour-cooled engine is used in which the first appearance of the knock is observed, either with variable compression ratio and full throttle opening or with a fixed compression ratio and variable throttle. The latter method is much cheaper and simpler and gives equally accurate results. All knock rating is based on a reference fuel. The fuel proposed for this purpose by the Naval authorities is a mixture of normal heptane and an octane prepared from tertiary butyl alcohol. The fuel is rated in terms of the percentage of octane in heptane required to match it so that both just produce perceptible detonation.

The Measurement of Detonation Characteristics of Fuels. (L. Auer, Autom. Tech. Zeit., Vol. XXXIII, No. 22, 10/8/30, pp. 538-539.) (8.514/13595 Germany.)

Following the work of Brown and Watkins in America (J. of I. & E.E. 1927, pp. 280 and 366), the knocking tendency of a fuel is measured by the self-ignition temperature and the rate of pressure rise, determined readily in the laboratory, the former by the Moore ignition apparatus and the latter by bomb and indicator.

Propagation of Combustion in Carburated Mixtures. (M. Aubert and R. Duchene, C.R., Vol. CXCI, No. 3, 21/7/30, pp. 123-125.) (8.514/13596 France.)

The phenomenon of knocking in an internal combustion engine is considered as due to a rapid completion of combustion after the first flame has passed through the mixture. The experimental work appears to confirm that of Wheeler in England.

Progress in Knock Testing. (E. Bartholomew, Natl. Petroleum News, 21, No. 43, 57 (1929). Chem. Abstr., Vol. XXIV, No. 9, 10/5/30, p. 2280.) (8.514/13597 U.S.A.)

The Ethyl Gasoline Corporation uses 12 engines for knock testing with an average agreement of 3 per cent. The engines are run at 600 r.p.m. and have low compression ratio, high volumetric efficiency, overhead valves and no hot spots. By matching fuels comparable results can be obtained with any design

of engine under suitable conditions, but the characteristics of the Ethyl Corporation engines allow more latitude in the conditions of test and give greater accuracy.

The Influence of Cylinder Design on Pinking. (G. B. Maxwell and R. V. Wheeler, Fuel in Sc. and Prac., Vol. IX, No. 5, May, 1930.) (8.514/13598 Great Britain.)

Knock is due to the formation of a stationary pressure wave followed by a maintained shock wave. The nature of the reflecting surfaces affects the setting up of the stationary wave and by placing either a gauze or a ring obstruction in the combustion space in a suitable position relatively to the ingnition point it is possible to reduce the tendency to pink materially. The experiments so far carried out with bombs are shortly to be extended to internal combustion engines.

Compression Pressure the Controlling Factor in Inducing Engine Knock. (S. D. Rubenz, Autom. Ind., Vol. LXIII, No. 1, 5/7/30, pp. 20-23.) (8.514/13599 U.S.A.)

The American Naval Bureau of Aeronautics determines the knock value of a fuel by measuring the maximum amount of throttle opening or depression in the induction manifold which the fuel will stand without knocking when utilised in an engine running under standard conditions. The readings extended over a series of mixture strength, maximum knocking generally occurring near complete combustion. The method gives consistent results, the fuel under test being matched against a benzol mixture. The knock value is expressed as the equivalent benzol content of the comparison mixture.

Reducing "Knocking" of Internal Combustion Engine Fuels. (Imperial Chemical Industries, Ltd., and S. Coffey, Brit. Patent 323,463, June, 26, 1928.) (8.514/13600 Great Britain.)

A list of substances is given which act as anti-knock compounds with or without the addition of metal dopes or aniline. The most important is triphenylmethyl.

Atmospheric Conditions and Knock Testing. (D. B. Brooks, N. R. White and H. H. Allen, S.A.E. Journal, Vol. XXVII, No. 1, July, 1930, pp. 56-68.) (8.514/13601 U.S.A.)

The effects of humidity and barometric pressure are generally small in testing fuels by matching. Humidity decreases the absolute value of the knock, especially in dope fuels, but temperature has less effect on dope fuels than on those containing benzol, for which the anti-knock value falls off appreciably with rising temperature. There is some evidence that the design of the sparking plug and the electrical characteristics of the circuit have an effect on the knock value.

Natural and Synthetic Oils. (Engineering, Vol. CXXX, No. 3366, pp. 91-92.) (8.516/13602 Great Britain.)

Summaries are given of the more important papers read at the World Power Conference, Berlin.

Significance of Tests for Motor Fuels. (R. E. Wilson, S.A.E. Jrnl., Vol. XXVII, No. 1, July, 1930, pp. 33-44.) (8.52/13603 U.S.A.)

The tendency to form vapour locks is receiving increasing attention. The only satisfactory test of anti-knock quality is by use in an engine under standardised conditions. Careful design of the engine and general fuel installation may decrease the need for a rigid fuel specification, where low sulphur and gum content and high volatility and anti-knock value are aimed at. With

steel tanks and tinned fuel pipes corrosion and gum formation are considerably reduced. Crankcase ventilation and uniform cooling of the engine lower the permissible standard without unsatisfactory results. Forty-seven references are given.

Screw Union Pipe Joints. (Aut. Tech. Zeit., Vol. XXXIII, No. 21, 31/7/30, 514-516.) (8.541/13604 Germany.)

Eleven different types of pipe joints are illustrated, among them the British Air Ministry " Olive " type joint. It is stated that no entirely satisfactory type of pipe joint has yet been evolved.

Aircraft Fuels, Corrosion of Tanks, etc. (Dr. A. Philippovitch, Autom. Tech. Zeit., Vol. XXXIII, No. 19, 10/7/30, pp. 468-470.) (8.545/13605 Germany.)

Considerable trouble has been experienced with corrosion of tanks and fuel lines by separation of the water contained in the fuel, especially marked with benzol. This is partially prevented by adding small quantities of methyl alcohol to the fuel.

Combustion, Carburettors, and Feed Systems

Graphical Recording of Valve Lifts. (F. Jehle, Autom. Ind., Vol. LXII, No. 17, 26/4/30, pp. 654-658.) (8.56/13606 U.S.A.)

A photographic record is made by means of a mirror mounted on the moving part. A set of three photographs shows the lift of the valve at three speeds, 1,370, 1,400 and 1,430 r.p.m. superposed on a record at 200 r.p.m. At 1,370 and 1,430, but not at 1,400 r.p.m. the appearance of harmonics is visible, from which it is inferred that the two former show resonance. The instrument was modified to record spring vibrations directly. A set of three comparative diagrams at 250, 1,000 and 1,850 r.p.m. shows no indication of harmonics arising from spring vibration. A further set of three photographs shows apparently fifth harmonics due to spring vibration.

Following Combustion in the Gasoline Engine by Chemical Means. (Ll. Withrow, W. G. Lovell and T. A. Boyd, Ind. Eng. Chem., 22, 945-51 (1930). Chem. Abstr., Vol. XXIV, No. 20, 20/10/30, p. 5144.) (8.57/13607 U.S.A.)

By means of a sampling valve the products of combustion could be withdrawn, cooled, and immediately analysed for oxygen and C.O.2. The results indicate a zone of combustion travelling from the sparking plug with a velocity proportional to engine speed.

Specific Heat of Gases at High Pressures. Results for Nitrogen to 150°C. and 700 Atmospheres. (B. H. Mackay and N. W. Krase, I. and E. Chem., Vol. XXII, No. 10, Oct., 1930, pp. 1060-1062.) (8.57/13608 U.S.A.)

The molecular heat of nitrogen at room temperature increases about 15 per cent. between 1 and 100 atmospheres and becomes nearly steady at about 500 atmospheres. At atmospheric pressure a rise in temperature to 150°C. produces a small increase in molecular heat. At higher pressures the molecular heat decreases appreciably with temperature.

Effect of Pre-Heating Gas and Air on Flame Temperature and Rate of Flame Propagation. (H. Passauer, Gas. u. Wasserfach, 73, 313-9, 343-8, 369-72, 392-7 (1930). Chem. Abstr., Vol. XXIV, No. 13, 10/7/30, p. 3371.) (8.57/13609 Germany.)

The flame temperatures were measured by means of thermocouples and the readings extrapolated to zero diameter of thermocouple. The highest flame

temperatures were always reached with the theoretical mixture of complete combustion. Highest rate of flame propagation was however reached with richer mixtures, the displacement towards the rich side increasing with the preheating of the charge.

Thermodynamics of Real Gases. (J. A. Beattie, Phys. Rev., Vol. XXXVI, No. 1, 1/7/30, pp. 132-145.) (8.57/13610 U.S.A.)

By means of the introduction of two empirical relations Gibbs' treatment of mixtures of ideal gases is generalised and made applicable to real gases. At very low pressures the generalisations of the law of Boyle and Avogadro and the additive relations of Gibbs become nearly exact.

Following Combustion in the Petrol Engine. (L. Withrow, W. G. Lovell and T. A. Boyd, Ind. and Eng. Chem., Vol. XXII, No. 9, Sept, 1930, pp. 945-951.) (8.57/13611 U.S.A.)

An improved sampling valve can be fitted at different points in the combustion chamber and opened at different times during combustion. Combustion takes place in a narrow combustion wave proceeding from the spark, the combustion zone having a greater velocity in the middle of the chamber than along the walls.

The average speed of combustion increases with engine speed over the test range, and is unaffected by timing and by addition of lead tetra ethyl over the greater portion of the combustion chamber. Knock is confined to the part of the charge which burns last, but the phenomenon as a whole requires further investigation.

Photographs and sectional drawings are given of the engine, sampling apparatus, and sampling valve control. Diagrams and tables give the results of the investigation. The conclusions of a previous report are considerably modified. Five references are given.

Oil-Driven Engines

The Clerget 100 *h.p. Heavy Oil Engine.* (L'Aeron., No. 138, Nov., 1930, pp. 391-396.) (8.59/13612 France.)

The radial crankcase is of steel and the heavily dished pistons are of aluminium. The fuel pumps, one for each cylinder, are totally immersed and a single cam operates the pump plungers, even in case of spring failure. The exhaust valves of the lower cylinders can be lifted so as to drain the engine of oil before starting.

Investigations on Diesel Engines. (K. Neumann, Z.V.D.I., Vol. LXXIV, No. 32, 9/8/30, pp. 1109-1112.) (8.59/13613 Germany.)

The tests were carried out on an opposed piston Junkers type engine, 8 h.p. at 1,000 r.p.m. Curves show the effectiveness of the scavenge pump under various conditions. Clean exhaust could only be obtained with at least 25 per cent. excess air, giving a maximum b.m.e.p. of 110lbs.

Diesel Engines for Automobiles. (C. L. Cummins, S.A.E., Vol. XXVII, No. 3, Sept., 1930, pp. 285-289.) (8.59/13614 U.S.A.)

A description is given of the installation of a four-cylinder Diesel engine in an automobile which was driven 6,000 miles through traffic in January, 1930. Bore $4\frac{1}{2}$in., stroke 6in., r.p.m. 1,000. A speed of 88 m.p.h. at 2,200 r.p.m. was reached at Daytona Beach. Methods of fuel injection are described and illustrated by diagrams.

A discussion follows.

Diesel Lorry Engine of Linke-Hofman-Busch Works, Breslau. (L. Hausfelder, Autom. Tech. Zeit., Vol. XXXIII, No. 16, 10/6/30, pp. 329-395.) (8.59/13615 Germany.)

The combustion space is in the cylinder head displaced to one side. The fuel pumps are attached to the cylinder, so that injection delay due to length of pipe line is avoided, and operate with a governed suction valve. The needle injection valve is spring loaded and works with small lift. At full load of 85 h.p. a b.m.e.p. of 80lb. per sq. in. and a consumption .4lb. of gas oil per b.h.p./hour are claimed.

Small Diesel Engines. (H. D. Hill, S.A.E., Vol. XXVII, No. 3, Sept., 1930, pp. 283-284.) (8.59/13616 U.S.A.)

The author describes the principles on which he designed the Hill-Diesel engine, and illustrates the points with diagrams. The six-cylinder marine Diesel, 5in. bore, 7in. stroke, is rated at 75 h.p. at 1,000 r.p.m.

A discussion follows.

Oil Spray Research Suggests Basic Factors for Designing Diesel Engine Nozzles. (E. B. Neil. Autom. Ind., Vol. LXIII, No. 2, 12/7/30, pp. 56-61.) (8.595/13617 U.S.A.)

The nozzles should be shorter than four times the diameter in order to eliminate effects of temperature. High-pressure spray and low-pressure spray travel about the same distance in compressed air, but the former travels faster. In high speed engines rapid penetration is essential and this accounts for the beneficent effect of increased injection pressure. The spray is much wider and shorter in dense air than in atmospheric air.

Spray Distribution in Oil Engines—Multiple Orifices. (J. A. Spanogle and H. H. Foster, Autom. Ind., Vol. LXIII, No. 7, 16/8/30, pp. 220-223.) (8.595/13618 U.S.A.)

For effective combustion the fuel must be distributed uniformly through the air. Impingement of fuel spray on the chamber walls need not hinder combustion and may aid distribution. The test engine had a single cylinder, 5in. bore, 7in. stroke, compression ratio 13.6 and indicated m.e.p. 120lbs. per sq. in., fuel consumption 0.5lbs. per i.h.p.-hour.

Superchargers

Scavenging and Supercharging Blower Developed for Diesel Aircraft Engine. (Autom. Ind., Vol. LXIII, No. 2, 12/7/30, pp. 47-48.) (8.62/13619 U.S.A.)

The proposed blower is of the " flapping " type, two sets of internal paddle wheels alternately approaching and receding. No estimate is given of the inertia stresses at high speed.

Comparative Flight Performance, N.A.C.A. Roots and Turbo Centrifugal Superchargers. (O. W. Schey and A. W. Young, N.A.C.A. Rept., No. 355, Sept., 1930, 14 pp.) (8.62/13620 U.S.A.)

The mechanical installations are described, illustrated by photographs and the results are plotted and compared. The rates of climb and ceiling were substantially the same, but the speeds diverged with height, and at 21,000 feet the turbo supercharger showed an advantage of 20 m.p.h.

Gears and Clutches

A Novel Clutch. (Chem. and Met. Engin., Vol. XXVII, No. 7, July, 1930, p. 443.) (8.84/13621 U.S.A.)

The driven part of the clutch consists of a cylindrical casing the inner surface of which is corrugated. The driving member consists of a winged hub

which revolves inside the drum with a small clearance. Steel powder is loaded into the casing, the drive between the hub and the drum being due to the friction generated. Change in the type of powder used alters the acceleration characteristics of the clutch.

Magnetos and Shielding

Graham-Paige Sparking Plug. (F. F. Kishline, Autom. Ind., Vol. LXIII, No. 11, 13/9/30, p. 376-378.) (8.92/13622 U.S.A.)

The plug is designed to avoid pre-ignition under full throttle conditions with high compression ratio, and fouling in cold weather on a throttled engine. It has an insulator, extending $\frac{1}{4}$ of an inch beyond the skirt of the plug, a short central electrode, a thick wall shell, and a solid copper gasket. The cooling effect of the charge on the electrodes is increased by the long insulator.

Proposed Regulations for Ignition Shielding. (Autom. Ind., Vol. LXIII, No. 12, 20/9/30, pp. 409-410.) (8.93/13623 U.S.A.)

The new regulations are reprinted from Air Commerce Bulletin 2/9/30, and are in six sections. The entire electrical system of the engine ignition must be completely encased in high-conductivity metallic shielding. Specifications are given as to clearances, insulation, ventilation, accessibility, etc. The leads are to be shielded by metallic braiding.

Auxiliary electric apparatus requires consideration. The best test for shielding is actual use with the shielding assembly mounted. If the shielding is complete no ignition noise should be heard in the ear-phones of the test set for any engine speed.

Bomb Dropping, Etc.

Smoke Emitting Projectile. (Rev. F. Aer., No. 11, June, 1930, p. 730.) (9.35/13624 France.)

The Swedish Army is provided with two types of smoke projectile, hand grenades weighing 800 grammes and smoke bombs weighing 4kg. The filling consists of zinc and ethane hexachloride, which produces a very persistent smoke.

Probable Error in Aerial Bombing. (F. Marie, Rev. F. Aer., No. 11, June, 1930, pp. 714-719.) (9.52/13625 France.)

The accuracy of aerial bombing is determined by (1) the dispersion factor of the particular bomb used; (2) the accuracy of aim, which depends on the instruments available and the skill in their employ. The aim may be considered to be correct when the mean trajectory passes through the target. The French Army trials of 1929 showed that on the average, for bombing heights between 1,000 and 2,000 metres, 50 per cent. of the hits were obtained within a radius of 90 metres from the target.

Materials—General, Strength, Etc.

Materials for Aircraft Purposes. (W. Rosenhain, J.R. Aer. Soc., Vol. XXXIV, No. 236, Aug., 1930, pp. 631-648.) (10.0/13626 Great Britain.)

The author surveys the general problem of advance in ferrous and non-ferrous materials, and compares alloy steel with aluminium alloys and other light alloys. Present methods may not promise any revolutionary advances, but when the molecular physics of materials is better understood a new era of advance may possibly open. The question of development of beryllium alloys is considered briefly, though this is considered to be a question of future development, not of immediate application. Problems of fatigue, corrosion and resistance to high temperatures are discussed and two graphical charts exhibit time effects. Problems of welding are outlined. A discussion follows.

Ferrous Metals

Use of Nickel Steel. (J. B. Hoblyn, Autom. Eng., Vol. XX, No. 271, Sept., 1930, pp. 339-340.) (10.11/13627 Great Britain.)

Specifications are given of types of nickel steel appropriate to different requirements, and a numerical comparison with chromium steel is shown in tabular form.

Identification of Aircraft Tubing by Rockwell Test. (H. Knerr, N.A.C.A. Tech. Note, No. 342, 11 pp.) (10.121/13628 U.S.A.)

Seamless steel tubing is the principal material for the construction of aircraft in U.S.A. and two qualities appear to have been largely standardised: carbon steel, with an ultimate tensile strength of 55,000lbs. per sq. inch and chrome molybdenum steel of 95,000lbs. per sq. inch ultimate tensile strength. It is of importance to make sure that these qualities are not interchanged in construction, and a rapid method of applying the Rockwell test for hardness is described and is considered to meet all requirements.

X-Ray Tests of Welds. (H. H. Lester, Army Ord., Vol. XI, No. 62, Sept.-Oct., 1930, pp. 124-127.) (10.18/13629 U.S.A.)

Eleven X-ray photographs are reproduced with interpretations. In particular, cavities due to the inclusion of gas are shown clearly, the quality of the weld falling off with increase of the number and volume of the cavities. Not only does the method show bad welds under inspection, but it enables the welder to improve his technique by avoiding the conditions associated with the formation of gas-filled cavities.

Light Alloys

Low Expansion Aluminium Alloy. (Autom. Ind., Vol. LXIII, No. 14, 4/10/30, p. 478.) (10.2101/13630 U.S.A.)

A new piston alloy, No. 132, of the Aluminium Company of America has nearly the same coefficient of expansion as Ni-Resist, a new cast iron of the International Nickel Company.

Pistons in aluminium alloy in engines with Ni-Resist liners may have the same small clearances as cast iron pistons and cylinders.

New Low Expansion Aluminium Piston Alloy. (U.S. Air Services, Vol. XV, No. 8, Aug., 1930, pp. 20-23.) (10.2101/13631 U.S.A.)

The new alloy contains about 14 per cent. silicon, and small quantities of nickel, copper and magnesium. It is stated that the coefficient of expansion is relatively small, while the thermal conductivity is good and the wearing qualities improved. The specific gravity is about the same as that of pure aluminium.

Aluminium Alloys for Aircraft Engine piston and Cylinder Heads. (J. A. Lyon, Paper read before the A.S.M.E., May, 1930.) (10.2101/13632 U.S.A.)

The results of investigations carried out by the Material Division of the Air Corps, War Department, U.S.A., are embodied in the paper. Two alloys in particular are recommended. The first, designated lynite 122, has the composition :—

Copper	...	10 per cent.
Mangesium	...	$\frac{1}{4}$ to $\frac{1}{2}$,,
Iron ..	...	$1\frac{1}{4}$ to $1\frac{1}{2}$,,
Aluminium	...	88 ,,

The second, Y alloy or magnalite, is composed of :—

Copper	...	...	4 per cent.
Nickel	...	...	2 ,,
Magnesium	...	...	1½ ,,
Aluminium	...	...	92½ ,,

The constitution of Y alloy, or " magnalite " is shown in triangular co-ordinates at 500°C. and at 200°C. The effects of nickel and iron on the strength and hardness are exhibited graphically. The effect of quenching temperature and ageing is exhibited in selected cases. The stability of the properties under temperature increase is shown graphically.

The report contains much information of value to designers.

Treatable Aluminium Alloys. (W. Geurtler, Z. Metallk., Vol. XXII, No. 3. March, 1930, pp. 78-84.) (10.2101/13633 Germany.)

Selecting an aluminium-copper alloy as a type, the relations between Brinnel hardness and copper content and the effects of the addition of Si and Fe are exhibited graphically along with the effects of heat treatment for varying periods and with phase diagrams. On the bases of these phenomena the theory of heat treatment is sketched and its extension to the less simple examples of important modern alloys is suggested.

Magnesium Alloy (Elektron) in Aircraft Construction. (J. Ruhrmann, Z. Metallk., Vol. XXII, No. 9, Sept., 1930, pp. 317-318.) (10.2102/13634 Germany.)

Some technical details are given of relative weights of tanks, chairs, tail-skids, wheels, and other component parts of aeroplanes. An over-all saving of weight of from 15 per cent. to 30 per cent. on such parts is considered feasible.

An illustration exhibits a specimen of girder construction.

Corrosion

Tests for Determining the Corrosion of Aluminium and its Alloys. (E. Maass, Z. Metallk., Vol. XXII, No. 8, Aug., 1930, pp. 280-283.) (10.27/13635 Germany.)

A German departmental committee has issued a standard set of tests for metal sheets subjected to corrosion, with instructions for the preparation of samples. Laboratory experiment should reproduce as nearly as possible the conditions in practice.

Study of the Mechanism of the Corrosion of Duralumin by Sea Water. (E. Herzog and G. Chaudron, C.R., Vol. CXC, No. 20, 19/5/30, pp. 1189-1191.) (10.27/13636 France.)

The duralumin was exposed to accelerated corrosion by immersion in water under an atmosphere of oxygen at high pressures (120 atmospheres). The addition of salts of magnesium, maganese and zinc among others was found to reduce the corrosion markedly in accordance with the observed fact that sea water in general has less corrosive effect than ordinary salt solution. It is also generally found in practice that the presence of magnesium or manganese in the aluminium alloy increases its resistance to corrosion.

Corrosion of Metals. (H. Sutton, Airc. Eng., Vol. II, No. 18, Aug., 1930, pp. 209-210.) (10.27/13637 Great Britain.)

The article continues the author's paper on light alloys in aircraft (J.R.Ae.S., Vol. XXXIII, pp. 38-74) and deals more fully with the problems of corrosion and its prevention.

Sprayed Molten Metal Coating Process. (R. L. Binder, J. Franklin Inst., Vol. CX, No. 2, Aug., 1930, pp. 173-217.) (10.27/10.15/13638 U.S.A.)

This article (somewhat in the nature of an advertisement for a particular process) gives a number of interesting applications. These include filling up porous castings, making up to size undersized parts, giving protective coatings, and in decorative work. Some details of the apparatus are given.

Cavitation as a Cause of Corrosion of Floats. (F. Weinig, Z.F.M., Vol. II, No. 11, 14/6/30, pp. 279-280.) (10.27/13639 Germany.)

The neglect of cavitation as a cause of corrosion, is underlined. Since 1914 Prof. Fottinger has given the first satisfactory account of the process of corrosion, taking into account the effect of variable flow. The explanation is that the collapse of a cavitation leads to a local hammer blow which may be repeated millions of times. The smallest crack is rapidly enlarged, and visible damage may be done in a few hours. A numerical estimation of the conditions for cavitation shows that it may readily occur near rivet heads, so that one would expect corrosion effects behind them. Two photographs illustrate the argument.

Strength of Welded Joints in Tubular Members. (H. L. Whittemore and W. C. Brueggeman, N.A.C.A. Rept., No. 348, 1930, 40 pp.) (10.28/13640 U.S.A.)

Following the programme prepared by manufacturers, forty joints were welded under specified procedure, and weight and time of manufacture were noted. Tests results are recorded in individual cases. The paper constitutes a treatise on shop practice and is very fully illustrated with photographs and diagrams.

Twenty-one references are given.

Dopes and Lacquers. (W. W. McCutcheon, S.A.E., Vol. XXVII, No. 3, Sept., 1930, pp. 263-267.) (10.42/13641 U.S.A.)

A description is given of processes of manufacture and application. The chemistry and physics of preparation and application are briefly surveyed. Seven recommendations are given as a guide in the choice of pigments for the making up of pigmented lacquers. A discussion follows which gives the experience of other users and elicits further observations from the author.

Prevention of Ice Hazard on Aeroplanes. (W. C. Geer and M. Scott, N.A.C.A., Tech Note, No. 345, July, 1930, 29 pp.) (10.46/13642 U.S.A.)

The conditions under which ice is formed are systematically examined. The distribution of a volume of liquid over a strut and its adhesion when frozen are discussed. For this purpose a small channel was set up, capable of meeting the nigh humidity and super-saturation occurring in practice. The means of preventing ice are recapitulated. Heating from exhaust involved the heating of the whole surface to at least 0°C., while the exhaust gases introduced dangers of corrosion. The use of anti-freezing substances was investigated, but in general the effect is only temporary.

Varnishes and oils were investigated, and those containing calcium stearate and oleate give the best results.

Lubrication was investigated. The oil used must have its freezing point below the atmospheric temperature and a high boiling point to prevent evaporation. Under certain circumstances this method would be successful with reapplication every four hours. A specification of such an oil is given.

Finally mechanical means of detaching ice after formation were considered. The most successful method consisted in the use of an expanding cover at the leading edge, which was inflated from time to time to break off the ice already formed.

Porosity of Electro Deposits. (D. J. Macnaughtan, Trans. Faraday Soc., Vol. XXVI, No. 8, Aug., 1930, pp. 465-481.) (10.541/13643 Great Britain.)

The paper discusses discontinuity in electro deposited coatings of various metals, suggests methods for detecting porosity, and considers the probable influence on the corrosion of the underlying metal. Among the factors considered are the relative electric potentials of the two metals, the amount and composition of electrolite, anode and cathode products and supply of oxygen.

The tests for corrosion were made by atmospheric exposure, by spray tests and by immersion tests.

A more sensitive method is the ferri-cyanide test, of which a number of photographs are given.

Buckling in Corrugated Sheet under Shear. (S. Bergmann and H. Reissner, Z.F.M., Vol. XX, No. 18, 28/9/29, pp. 475-481 (Pt. I), and Vol. XXI, No. 12, 28/6/30, pp. 306-310 (Pt. II).) (10.61/13644 Germany.)

Part I. The shearing forces are applied at right angles and parallel to the corrugations. The corrugated sheet is replaced by an ideal plain sheet with different rigidity parallel and perpendicular to the corrugations. A linear differential equation of the 4th order with constant coefficients is formed and solved by the usual methods, the analysis resembling that of Southwell, to which full reference is made. A numerical example is worked out and the results are given in numerical tables graphically and resemble Southwell's results.

Part II. The bending stiffness across the corrugations is neglected in Part I, but is taken into account in Part II. A more general differential equation is formed and solved, and the critical minimum value for buckling is found by graphic approximations.

Bulging of Stiffened Plates under Shearing Stresses. (E. Seydel, L.F.F., Vol. VIII, No. 3, 21/7/30, pp. 71-90.) (10.61/13645 Germany.)

It is shown that certain approximations can be introduced into the work of Bergmann and Reissner (see foregoing abstract) which give the critical shearing forces sought, in the form of a geometrical series, of which it is sufficient to take three terms. In this way a practical solution of the problem is obtained from which numerical results can be rapidly computed.

Measurement of Elastic Hysteresis in Materials. (W. Knackstedt, Z.V.D.I., Vol. LXXIV, No. 34, 23/8/30, pp. 1182-1184.) (10.62/13646 Germany.)

The energy per cm^3 per cycle was determined by measurements under static loading, by temperature measurements under continuous cyclic stresses and by observation of the logarithmic decrement of oscillation, corrected for friction and air resistance. The results are exhibited graphically and lie fairly well on a smooth curve.

Fatigue of Metals. (R. Cazaud, Bull. Tech., No. 68, June, 1930, 60 pp.) (10.621/13647 France.)

Chapter I. A brief historical note is given.

Chapter II. Photographs are given of a number of typical fractures of crankshafts, airscrew hubs, bracing wire, metal airscrews, etc.

Chapter III. The mechanism of rupture is developed on the basis of increased stresses round fissures and inclusions, illustrated by fifteen microphotographs.

Chapter IV. A scheme of systematic tests for fatigue is laid down, with dimensioned sketches of test pieces and a typical graphical record.

Chapter V. Fatigue test machines for the laboratory are described and illustrated by thirteen photographs and diagrams.

Chapter VI. A number of test results is collected and exhibited graphically and in tables.

Thirty-one references are given.

Testing Methods, Apparatus and Instruments

Phenomena of Noise in Open Jet Wind Channels. (O. Schrenk, Tech. Mech. Therm., Nos. 4 and 5, 1930; abstracted in Z.V.D.I., Vol. LXXIV, No. 27, p. 948.) (11.11/13648 Germany.)

An attempt was made to analyse the source of sound, for the most part without definite results. In model arrangements some of the phenomena were successfully isolated. In particular it was established that a free jet produced no sensible whistling or piping. The conditions for the production of a definitely musical tone were investigated more thoroughly, along with pulsations below the frequency of audible sound but they were not definitely recognised as partial sources of noise. To produce the resonance notes characteristic of the wind channel model a free jet impinged on a receiver of appropriate opening.

A free jet establishes in its neighbourhood a turbulent region of transition, and with periodic disturbances unsymmetrical about the axis throws off a regular series of vortex rings which were examined by struboscopic methods.

The possibility of suppressing such sources of sound was not clearly established. Further investigations will be made with particular reference to musical instruments.

New American Wind Tunnels. (R. McKinnon Wood, J.R. Ae. Soc., Vol. XXXIV, No. 235, July, 1930, pp. 559-576.) (11.11/13649 Great Britain.)

In describing the more recent wind tunnels constructed in America, one working at 20 atmospheres density with 1/10 scale models, the other with a 20 foot diameter enabling direct tests to be made on full-scale engines and cowlings, the relations between research and design were considered. In the subsequent discussion this point of view was considered by nearly every speaker. Mr. E. F. Relf stated that the new N.P.L. compressed air tunnel would have a jet diameter of 6 feet, power plants of 500 h.p., a velocity of 84 feet per second and a Reynolds number of 6,000,000, from which it is inferred that the pressure will be about 25 atmospheres.

Cleavage Tests of Timber. (E. G. Coker and G. P. Coleman, Proc. Roy. Soc., Vol. CXXVIII, No. 808, 5/8/30, pp. 418-431.) (11.24/13650 Great Britain.)

Reference is made to the report by Professor Jenkin on materials of construction used in aircraft and aircraft engines in which the nine coefficients of St. Venant's theory are determined for several timbers. Price attempted by instituting three new coefficients to bring calculation into better agreement with observation. In the present paper stress optical methods are applied to cleavage problems on the assumption that the material is isotropic. Examples of stress distribution on isotropic material are plotted graphically, and although the introduction of anisotropic conditions must complicate the results the authors believe that indications are given of the actual stress distributions.

Optical Photographic Measurement of Strains in Aircraft. (H. G. Kussner, 194th Rept. of D.V.L., Z.F.M., Vol. XXI, No. 17, 15/9/30, pp. 434-440.) (11.25/13651 Germany.)

A description is given with photographs and diagrams of an apparatus for measuring the actual deflections of spars and members of an aeroplane under known loads by measuring the deflection of a beam of light.

Where the deformation is elastic the beam describes damped oscillations for stable cases, and divergent oscillations for unstable cases of vibration under air forces.

High Altitude Chamber of the Bureau of Standards. (P. M. Heldt, Autom. Ind., Vol. LXIII, No. 8, 23/8/30, pp. 256-258.) (11.5/13652 U.S.A.)

To reproduce altitude conditions the rarefied air supplied to the altitude chamber is first cooled by means of an ammonia plant to approximately -50° Centigrade. The air, metred by a centuri, is electrically heated to the temperature of the test altitude. The exhaust of the engine is evacuated by separate pumps. The test readings are taken simultaneously. The main door is held in position solely by the pressure difference. In the case of an internal explosion the pressure in the chamber will rise above atmospheric and the door will open automatically.

Airships, Etc.

Airships. (C. Dollfus, L'Aeronautique, No. 136, Sept., 1930, pp. 343-347.) (12.0/13653 France.)

A photograph is given of the new hanger at Akron, U.S.A., of the Goodyear Zeppelin Corporation, in various stages of construction. The dimensions are: length, 300 metres; width, 99 metres; height, 55 metres. Brief details are given of the technical equipment; in particular 300,000 cubic metres of lifting gas can be stored under a pressure of 50 atmospheres.

For purposes of comparison photographs and some details are given of the dirigible airship sheds constructed in 1920 at Orly, France: 300 metres long, 90 metres wide and 54 metres high.

The Modern Dirigible. (D. S. Ingalls, U.S. Air Services Mag., Vol. XV, No. 9, Sept., 1930, pp. 35-36.) (12.1/13654 U.S.A.)

A highly optimistic survey of the practicability of the airship in war.

Wiesinger Airship Type of Construction. (Wiesinger, Z.F.M., Vol. XXI, No. 13, 14/7/30, pp. 335-338.) (12.13/13655 Germany.)

Only the lower part of the hull is rigid, the upper part consisting of a wire network containing the gas bags. At rest, the section of the hull is an oval with the major axis vertical. In flight the distribution of pressure deforms the section to a more nearly circular shape.

General data for the projected airship are:—

Length 210 m.	Range 6,000 km.
Width 33 m.	Duration 50 hours at 120 km. per hour.
Height 42 m.	Max. height 2,000 m.
Volume 105,000 $m.^3$	Max. speed 130 km. per hour.
Max. lift 120,000 kg.	Power 3,000 h.p.

Max. useful load, 40 tons at sea-level.

Cross-Section of the Semi-Rigid Airship. (F. G. Evans, J. Roy. Aer. Soc., Vol. XXXIV, No. 236, Aug., 1930, pp. 690-721.) (12.2/13656 Great Britain.)

A new scheme of laying out the work of computing stresses of the members of a semi-rigid dirigible is given. Different assumptions are made as to the distribution of load and air forces. A review is given of other methods of carrying out the calculations. Numerical examples are added in an appendix.

Mechanical Handling of Airships. (G. H. Scott, Airc. Eng., Vol. II, No. 19, Sept., 1930, pp. 235-237) (12.4/13657 Great Britain.

A descriptive account is given of the handling process at present in operation, and further developments are recommended. A table gives the lateral forces on the R.101 for different angles of yaw and wind speeds.

The Helium Question. (P. L. Teed, Airc. Eng., Vol. II, No. 19, Sept., 1930, p. 234.) (12.62/13658 Great Britain.)

A survey is given of the world sources of supply of helium. By far the greatest sources and output are in the United States of America, where thirty million cub. ft. are stored and available for filling purposes. Canada offers an available supply of five million cub. ft. per annum.

Thirteen references are given.

Comparison between Power Gas and Petrol as a fuel for Airship Engines. (D. Beelitz, Das Luftschift, 1930, No. 3 (Supplement to Luftfahrt, Vol. XXXIV, No. 3, March, 1930, page 17).) (12.84/13659 Germany.)

The use of power gas supersedes exhaust water recovery and increases greatly the range of the airship, but restricts the maximum height seriously.

Wireless

Developments in Communication Materials. (W. Fondiller, Bell Tele. Lab., B-490, June, 1930, 20 pp.) (13.1/13660 U.S.A.)

A study of chemical and physical properties of materials must be guided by a knowledge of operating requirements. A survey of the materials used in telephone manufacture is given and improvements due to research are quoted, such as phenol fibre with improved arcing resistance, a moulded plastic composition for terminal strips, textile materials with improved insulating quality, non-ferrous metals of uniform characteristics, powdered electrolytic iron cores, permalloy and perminvar.

Radio Telephone Service to Ships at Sea. (W. Wilson and L. Espenschied, Bell Tele. Lab., B-503, Aug., 1930, 22 pp.) (13.1/1366 U.S.A.)

Technical conditions are discussed and have an application to telephone communication with aircraft.

Wireless Apparatus for Aircraft. (C. B. Carr, J.R. Aer. Soc., Vol. XXXIV, No. 237, Sept., 1930, pp. 794-802.) (13.2/13662 Great Britain.)

A specification is given of the requirements for different types of aeroplane, long distance bombing and reconnaissance, tactical control, fleet spotter and reconnaissance. Abridged specifications of thirteen Marconi equipments are given.

Ultra-Sonic Waves in a Gas Rendered Visible by the Electro-Optical Method of Striæ. (E. P. Tawil, C.R., 191, No. 2, 16/7/30, pp. 92-95.) (13.21/13663 France.)

A piezo-electro crystal of quartz is excited at one of its natural frequencies by resonance to give an ultra-sonic beam of sound. The beam is reflected by a plane reflector.

The crystal is traversed by a beam of light which does not illumine it internally so long as it remains unstrained internally, and therefore homogeneous. The interference of the reflected ultra-sonic beam sets up a series of plane parallel stationary elastic waves of strain.

These produce visible optical effects in the form of luminous bands which appear in the field of the observing lens as parallel straight lines with the plane reflector, and produce a variety of figures when the reflector is inclined or curved.

Other phenomena are described, and three photographs give different views of the crystal and of the luminous bands. An application to television is suggested.

Some Developments of the Piezo-Electric Crystal as a Frequency Standard. (H. J. Lucas, J.I.E.E., Vol. LXVIII, No. 403, July, 1930, pp. 855-872.) (13.21/13664 Great Britain.)

Part (1) deals with observed errors due to (*a*) frictional loading and (*b*) losses arising from atmospheric humidity; and Part (2) with the use of the improved quartz crystal as control element in a valve-maintained source of oscillations.

Finally a complete calibration equipment consisting of a multivibrator system with a range of 1 to 6,000 kilocycles per sec. in steps of 1 kilocycle per sec., centrally controlled by a quartz crystal, is shown.

Radio Direction Beacons as an Aid to Air Navigation. (R. Schultz, Luftwacht, No. 9, Sept., 1930, pp. 417-424.) (13.4/13665 Germany.)

The " Reed " device developed by the American Bureau of Standards is described. A bibliography is given.

Reception of Directional Signals in Aircraft. (172nd Report, D.V.L., K. Kruger and H. Plendl, Z.H. Freq. Tech., Vol. XXXVI, No. 1, July, 1930, pp. 5-13.) (13.4/13666 Germany.)

A calibration curve of the measuring apparatus is given and a photograph exhibits the arrangement of the masts and receiving antennæ in the aeroplane. The calculated and experimental curves of intensity are exhibited in polar and rectangular co-ordinates, both for a reflecting and a non-reflecting earth surface. An elementary mathematical discussion is given in an appendix. Further experiments are being carried out with a directional system of 192 elements.

Factors Affecting the Gain of Directive Antennæ. (G. C. Southworth, Proc. Inst. Rad. Eng., Vol. XVIII, No. 9, Sept., 1930, pp. 1502-1536.) (13.5/13667 U.S.A.)

An elementary descriptive account is given with graphical diagrams of the intensity in different directions of groups of directive antennæ. Some experimental values are plotted in the illustration.

Antennæ are usually arranged linearly, but may also be " stacked " (superposed). Two diagrams of intensities of stacked antennæ are given. On combining stacking with linear order a new type of diagram is obtained.

A mathematical appendix gives the elementary theory. A list of 92 references are given.

Reciprocal Energy Theorem. (J. R. Carson, Bell Tele. Lab., B-492, June, 1930, 6 pp.) (13.5/13668 U.S.A.)

A discussion is given of Rayleigh's Reciprocal Theorem regarding complete transmission systems consisting of an emitting branch and a receiving branch, the functions of which may be interchanged. An application is made to the transmitting efficiencies of two antennæ systems, expressed in terms of their receiving efficiencies. A generalisation of the reciprocal theorem for variable magnetic induction in the field is quoted and a new proof given.

Radiation Distribution of Antennæ. (R. M. Wilmotte, J.I.E.E., Vol. LXVIII, No. 405, Sept., 1930, pp. 1174-1190.) (13.5/13669 Great Britain.)

Formulæ are obtained in trigonometrical functions and curves are drawn for radiation distribution, polarisation, current distribution, and image effect in the ground for a straight element of wire, and applied to evaluate the radiation distribution of a straight wire inclined at any angle to two equal horizontal antennæ in a straight line, to similar parallel antennæ spaced in any manner, and antennæ having symmetrical radiation about a vertical axis. An example of a beam system containing an equal vertical antennæ, equally spaced is worked out.

Nineteen references are given.

Radiation Distribution of Antennæ in Vertical Planes. (R. M. Wilmotte, J.I.E.E., Vol. LXVIII, No. 405, Sept., 1930, pp. 1191-1204.) (13.5/13670 Great Britain.)

From author's abstract:—The radiation distribution of an antenna in a vertical plane was obtained by measuring in an aeroplane the strength of a received signal from an excited antenna on the ground. The position of the aeroplane relative to the antenna was obtained by means of a theodolite on the ground, the signal strength being recorded on a cinematograph film.

The results showed very definite maxima and minima and the position of these could be ascertained accurately within a few degrees, but the difficulties of the experiment prevented an accurate value of the field strength being obtained. Substantial agreement was obtained between theory and experiment, the discrepancies increasing with the frequency.

Propagation of Signals in a Dispersive System. (H. G. Baerwald, Ann. d. Phys., Vol. V, No. 3, Sept., 1930, pp. 295-369.) (13.5/13671 Germany.)

It is shown that in a linearly homogeneous dispersive system the rate of propagation can be expressed as a complex function involving branching points only of the second order. The problem is discussed entirely by the methods of function theory, and a special type of contour integration, denoted here as "saddle point integration," is freely used in obtaining the results.

The group velocity is distinguished from the velocity of the leading wave, and determines the effective rate of transmission.

Propagation of Electro-Magnetic Waves Over a Plane Earth. (B. van der Pol and K. F. Neissen, Ann. d. Phys., Vol. V, No. 3, Sept., 1930, pp. 273-294.) (13.5/13672 Germany.)

Sommerfeld's general formula which involves an integral containing a Bessel function in the integrand, is transformed by the methods of the operational calculus into an expression depending on an integral with elementary functions only in the integrand. The whole problem has been discussed by operational methods through which Sommerfeld's solution can also be obtained.

Electrical Properties of the Soil at Radio Frequencies. (J. A. Ratcliffe, Phil. Mag., Vol. X, No. 65, Oct., 1930, pp. 667-680.) (13.5/13673 Great Britain.)

Author's Summary:—Laboratory experiments have been made at radio-frequencies to investigate the way in which the effective conductivity σ and the effective dielectric constant ϵ of the soil vary with frequency. The results are shown in diagrams. Their bearing on problems in the propagation of wireless waves is discussed, and the conclusion is reached that the only satisfactory way of measuring these quantities is to measure them *in situ* at the frequency required.

Radiation Measurements on Short Wave Directional Antennæ of the Nauen High Power Radio Station. (M. Baumber and others, Z.H. Freq. Tech., Vol. XXXVI, No. 1, July, 1930, pp. 1-4.) (13.7/13674 Germany.)

For trans-oceanic communication with short waves a system of antennæ with strongly directional radiation is required. The diagram of the directional radio installation at Nauen directed towards Japan with a wave-length of 60 or 70 metres was determined experimentally.

The system consists of 64 dipoles arranged in two perpendicular planes each containing 32 dipoles, disposed eight horizontally and four in height at a distance of half wave-length. One of the two planes is excited by the sender, the other at a distance of one-quarter wave-length is coupled by radiation and

acts as a reflector. The dipoles are excited in phase. Diagrams show the general arrangement of the system of antennæ and of the measuring apparatus. The calibration curve of the latter is given. The horizontal characteristics of the system at the earth's surface is given in polar co-ordinates and in rectilinear co-ordinates.

Problems in Short Wave Telephone Transmission. (J. C. Schelleng, Bell Tele. Lab., B-501, Aug., 1930, 26 pp.) (13.7/13675 U.S.A.)

By results of short-wave signals between U.S.A. and Great Britain are collected. The representation consists of lines of equal strength as functions of time of day and frequency, forming a contour map in which high regions represent high signal strength and low regions poor strength. Two diagrams are given, one for mid-summer and one for winter, and show completely different distributions of signal strength. The most suitable wave-length varies from 31 metres in winter to 16 metres in summer.

High Frequency Measurement. (Max Wien, Phys. Zeit., Vol. XXXI, No. 17, 1/9/30, pp. 793-797.) (13.7/13676 Germany.)

The development of wireless technique and research is in the direction of shorter wave-lengths. The measurement of frequency becomes increasingly difficult by direct methods, but the use of resonance methods increases sensitivity of observation almost indefinitely. Diagrams of circuits are given, with elementary mathematical relations.

Selenium Cells Specially Sensitive to Infra-Red Rays. (Telefunken Society (Germany), British Patent 311662, 3/5/29.) (13.8/13677 Great Britain.)

Extremely thin layers of selenium and other suitable metals are obtained by cathode sputtering on a support and then hermetically sealed.

The thickness of the layer is comparable to the depth penetration of the radiation.

Two-Way Television. (H. E. Ives, F. Gray and M. W. Baldwin, Bell Tele., B-504, Aug., 1930, 37 pp.) (13.8/13678 U.S.A.)

From authors' summary:—A two-way television system, in combination with a telephone circuit, had been developed and demonstrated. Scanning is by the beam method, using discs containing 72 holes. Blue light, to which the photo-electric cells are sensitive reduces the glare to the eyes. Water-cooled neon lamps give an image bright enough to be seen against the scanning beam. A frequency band of 40,000 cycles width is required for each of the two television circuits. Synchronisation is effected by synchronous motors. Speech transmission is by microphone and loud speaker.

Process control with Photo-Electric Cell. (I. and E. Chem., Vol. XXII, No. 10, pp. 1062-1069, C. A. Styer and E. H. Vedder.) (13.8/13679 U.S.A.)

Examples of photo-electric cell circuits with both valve amplifiers and glow relays are given.

They have been applied mostly as smoke density recorders.

Photo-Electric Cells in Chemical Technology. (pp. 1070-1073, A. J. McMaster.)

A partial bibliography of photo-electric applications is given.

A New Photo-Electric Cell. (Instrument World, Vol. III, No. 25, May, 1930, p. 7.) (13.8/13680 Great Britain.)

A brief description is given of a new Osram type photo-electric cell by the G.E.C. for which great superiority in many respects is claimed. A diagram of relative emission against wave-length shows a comparison with the potassium cell.

Photography and Survey

Aeronautical Maps. (L'Aerophile, Vol. XXXVIII, No. 7/8, 15/4/30, pp. 103-106.) (14/13681 France.)

The choice of map projection for aerial transport routes was discussed by the Scientific Committee of the Aero Club. The authors are M. L. Kahn, D. Costes and M. Bellonte. At the meeting of the Committee M. Kahn discussed the various projections and formulæ and M. Costes and Bellonte described the application of these methods in the flights across the Atlantic and to Manchuria and back.

A summary of their papers is given, with five reproductions of maps of different projections.

Gallus-Ferber Photographic Rectification Device. (P. Dupuy, Aero. Rev., Vol. V, No. 10, 15/9/30, pp. 209-210.) (14.31/13682 Switzerland.)

The country to be surveyed is photographed from two points of view separated by a sufficient distance. The negatives so obtained are projected optically, the axis of projection agreeing exactly with that existing in the aircraft when the photographs were first taken. A screen is placed in the plane of intersection of the two beams, and adjusted till the two images corresponding to any particular landmark coincide. This point is transferred to the map. To facilitate the plotting of the points the illumination of the two negatives is intermittent.

Cinematograph Cameras for Special Scientific Purposes. (F. Isermann, Z.V.D.I., Vol. LXXIV, No. 39, 27/9/30, pp. 1363-1366.) (14.6/13683 Germany.)

A system of rotating lenses gives 100,000 illuminations per second. Five photographs and six diagrams illustrate the apparatus. Four film strips of a wire rope in motion are reproduced. A number of applications is suggested.

(See Abstract No. 15/13259).

Anti-Aircraft Ranging and Gunnery

Searchlights and Sound Locators. (R. E. Gillmor and P. R. Bassett, Army Ord., Vol. XI, No. 61, July-Aug., 1930, pp. 41-47.) (15.12/13684 U.S.A.)

Portable sound ranging sets are described and illustrated. The problem of co-ordinating searchlight spotting with sound ranging is discussed in general terms.

Modern Thought in Division Artillery. (E. C. Goebert, Army Ord., Vol. XI, No. 61, July-Aug., 1930, pp. 33-37.) (15.21/13685 U.S.A.)

The influence of anti-aircraft requirements is shown in an all-duty type of mounting, permitting elevation up to 80°. See previous Abstract No. 15/13261.

Accidents

The Clavié Flame Stop. (L. Martin, L'Air, Vol. XII, No. 252, 1/5/30.) (16.12/13686 France.)

The flame stop consists of a series of concentric tubes of thin copper alternately ribbed and plain placed inside the induction pipe and forming a large number of copper ducts in parallel, through which the mixture flows. The resistance to flow is small and the cooling surface sufficient to cool and extinguish any flame blown back.

Fire Prevention Problems. (C. G. McCord, A.S.M.E. Paper, May, 1930.) (16.12/13687 U.S.A.)

From author's summary:—This paper gives a few general principles and points out the trend of investigations that have been made along the lines of fire prevention and the design of fire extinguishers. Prevention in the case of aircraft is a relative term as there are no thoroughly satisfactory fire extinguishers, although the improvements are encouraging as more thought is being given to the subject.

There is at present no basis for a hard and fast regulation regarding the nature of equipment to be prescribed for installation in military or commercial aeroplanes.

Aircraft Accidents. (Report prepared by Committee on Aircraft Accidents, N.A.C.A. Rept., No. 357, Sept., 1928, 17 pp.) (16.2/13688 U.S.A.)

Accidents are divided:—

(i) under some fourteen general headings by causes which include collisions, spins, forced landings, bad landings, take-off, taxying, fire, starting, launching, structural failure and miscellaneous;

(ii) into four classes according to injury to personnel, (1) death within 90 days, (2) serious injury, (3) minor injury, (4) no injury;

(iii) into six classes according to damage to material, (1) complete destruction, (2) need for complete overhaul, (3) replacement of important part, wing, engine, etc., (4) replacement of minor part, (5) no damage to material, (6) failures not leading to further damage.

The causes of accidents are also analysed under errors by personnel, material failure, and weather. A printed schedule is given in which each contributory cause is entered, weighted by an estimated percentage; e.g., error of judgment 35 per cent., poor technique 40 per cent., faulty ignition 25 per cent., for accidents caused by tail spin, following engine failures. The table gives the analysis on these lines for the accidents occurring in the United States before January, 1929. The list includes 1432 Service accidents and 1400 civil accidents, which came under the jurisdiction of the Aeronautics Branch of the Department of Commerce.

The Report is considered to be subject to modification in the light of experience.

Helicopters

The Autogyro Analysed. (W. L. Le Page, S.A.E., Vol. XXVII, No. 3, Sept., 1930, pp. 257-262.) (17.3/13689 U.S.A.)

An elementary account of the underlying principles is given along lines already published in this country.

A rough estimate was formed in the development stage that the auto-gyro required less horse power than the corresponding aeroplane at high speed. This has not been sustained, but the author still quotes it as authoritative.

Two photographs are given of the U.S.A. Pitcairn-Cierva autogyro with a 225 h.p. whirlwind engine in flight, and one of the 100 h.p. Armstrong Siddeley auto-gyro.

A photograph shows the universal joint at the blade root.

Miscellaneous

Height Flying. (L. D. Webb, U.S. Air Services Mag., Vol. XV, No. 9, Sept., 1930, pp. 19-21.) (19.11/13690 U.S.A.)

A survey is given of high flying and the prospects of further advance on the present record of 43,166 feet, at which height air pressure was only 2.2 pounds per square inch.

Interesting descriptive technical and physiological details are given in connection with individual attempts on the record.

Grebel Ground Lights. (L'Air, Vol. XII, No. 259, 15/8/30.) (20.5/13691 France.)

A special optical system gives a flat beam of constant intensity over an angle of 210°, with a sharp boundary and little marginal glare which might blind the pilot.

Unclassified

Analysis of the Colours Observed in Photo-Elastic Experiments. (R. N. Band and W. D. Wright, Jrnl. Opt. Soc. Am., Vol. XX, No. 7, July, 1930, pp. 381-395.) (13692 U.S.A.)

Light is analysed into three primary colours for various retardations. The results are directed toward the more detailed account of the underlying photo-elastic phenomena by supplying quantitative analysis of the fringes produced.

Aerial Acrobatics and Military Flying. (Lt.M. B. Gardner, U.S. Air Services, Vol. XV, No. 8, Aug., 1930, pp. 20-23.) (13693 U.S.A.)

The author, himself an aerobat, discusses the subject colloquially.

German Commercial Air Transport. (Major M. Wronsky, Gen. Manager, Luft Hansa A.G., J.R. Aer. Soc., Vol. XXXIV, No. 238, Oct., 1930, 849-871.) (13694 Germany.)

A large amount of general and detailed information is given as to the scope and aims of German Commercial Air Services, covering nearly every aspect of civil aviation.

International Round Europe Light Aeroplane Competition—Machines, Engines, Instruments, Technical and Practical Tests, 1930. (Z.F.M., Vol. XXI, No. 19, 14/10/30, pp. 489-528.) (13695 Germany.)

The objection to the gyroscope is disappearing. Most of the instrument boards were overloaded and insufficiently protected against vibration, especially for the compass, many competitors having an additional compass slung on wires. A comparative table of engines is given. The Argus engine using magnesium extensively (stroke volume 6.3 litres, 1400 r.p.m.) weighs 1.45 kg./h.p., the English Gypsy I (stroke volume 5¼ litres, 1900 r.p.m.) weighs 1.52 kg./h.p.

The Practice of Research. (J. F. Alcock and H. S. Glyde, Airc. Eng., Vol. II, No. 19, Sept., 1930, pp. 227-231, and No. 20, Oct., 1930, pp. 263-264.) (13696 Great Britain.)

The lay-out and equipment of the Ricardo Research Works is described, and illustrated by fourteen photographs and diagrams.