ABSTRACTS AND NOTICES

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(Prepared by R.T.P.)

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Aircraft Design

Configuration of Air Flow Round an Aeroplane in Flight. (A. Magnan and A. Sainte-Laguë, Pub. Sci. et Tech. du Ministère de l'Air, No. 12, 1932.) (5.1/24801 France.)

A Venturi tube was mounted in a variety of positions, fully shown by diagrams and photographs.

The velocity of the aeroplane was determined by cinematograph records taken through a fixed grid. (Abstract No. 19/21309.) The results are tabulated and plotted and the model wing results of Bryant and Williams (Abstract No. 3/5316) are reproduced for comparison. The general agreement is satisfactory.

Kinematograph Record of Aeroplane Movements. (A. Magnan and A. Sainte-Laguë, Pub. Sci. et Tech. du Ministère de l'Air, No. 9, 1932.) (5.1/24802 France.)

The aeroplane is equipped with a kinematograph, and periodic exposures are taken of marks on the ground. These marks may be ruled squares or triangles, or a polar network of radii and circles, or other geometrical forms of known dimensions. Alternatively records may be made of the landscape for comparison with an ordinary map.

The methods of projective geometry are then applied to deduce the position and altitude of the aeroplane with respect to the known system of reference at regulated intervals of time.

The method is evidently an extremely general one, and the reduction of the aeroplane trajectory in each case depends on the methods of projective geometry. Numerous examples of records are reproduced.

Design of Racing Seaplanes. (G. Pegna, Riv. Aeron., No. 6, June, 1932, pp. 461-516.) (5.13/24803 Italy.)

The various possibilities of reducing head resistance and increasing speed of a rising seaplane are considered comprehensively. A number of original devices are suggested. These are illustrated by sketches for designs and by photographs of experimental machines actually constructed. In one design the wings are directly attached to the hull, while a swivelling airscrew mounting permits the raising of the screw above the surface of the water during the start and its lowering into alignment with the hull axis during flight.

Higher Air Speeds at Less Cost. (S.A.E. Jrnl., Vol. 31, No. 3, Sept., 1932, p. 384.) (5.14/24804 U.S.A.)

Faired lines and a retractable landing carriage improved the cruising speed of a commercial aeroplane by 50 per cent. for the same load and power. The saving per ton/mile is proportional to the increase of speed on a running cost of 25 dollars per hour for both old and improved types.

Factors which Influence Insurance Rates. (J. Lederer, Aeron. Eng., July-Sept., 1932, pp. 117-122.) (5.14/24805 U.S.A.)

The principal factors are grouped under headings:—

1. The design of the aircraft.
2. Operation and management.
3. Pilot.
4. Geographical location.
5. Nature of operations.

Under these headings the usual structural and performance items of aircraft and power plant are briefly discussed in a series of paragraphs under appropriate headings, such as " Landing Speed," " Climb," etc., " Fire Extinguishers and Screens," etc. An increase in structural failures from 1929 to 1930 is attributed to the rapid output of untried designs during the boom.

Civil Aviation in Turkey. (Luftwacht, No. 4, April, 1932, p. 122.) (5.14/24806 Germany.)

The Curtiss Corporation of America has acquired the former Junkers factory at Kaisserije and is organising civil aviation in Turkey. The contract with the Government is for a period of five years and was obtained in the face of active European competition by the financial strength of the American concern.

Air Transport in all Countries. (M. Wronsky, Z.F.M., Vol. 23, No. 12, 24/6/32, pp. 334-341.) (5.14/24807 Germany.)

A general survey is given of the development of air transport, including inter-Continental schemes. Two maps of the world show (*a*) existing and principal projected air routes, (*b*) air routes lighted for night flying. The latter map shows the predominance of the United States services in this direction. European lighted routes are mostly in Northern France and Germany. Two considerable stretches along the trans-Siberian Railway are indicated on the Moscow, Kasan, Omsk sectors. Graphical methods are used to exhibit the volume of traffic in various countries.

A table gives details of the aeroplanes and engines used on the principal routes.

Aeroplane Production for America. (Autom. Absts., Vol. 10, No. 9, Sept., 1932, p. 365.) (5.14/24808 U.S.A.)

The figures of aeroplane production in the United States for the first six months of 1932 are:—

351 civil, 325 military, 46 for export.

Classification of civil aeroplanes shows:—

264 monoplanes, 71 biplanes, 16 autogiros.

The Value of Weight Saving in Aeroplanes and Engines. (E. P. Warner, Aviation, Sept., 1932, pp. 382-384. See also Airc. Eng., No. 45, Nov., 1932, pp. 289-290.) (5.14/24809 U.S.A.)

The average overall value of weight saving in commercial aircraft is stated to be 8 dollars per lb. for the engine and 11 dollars per lb. for the aeroplane structure under present conditions.

The method of analysis is necessarily rough, but the line of argument is worth consideration.

Bombers and Civil Transport. (Sci. Am., Vol. 147, No. 4, Oct., 1932, p. 236.) (5.14/24810 U.S.A.)

The interchangeability of bombing and civil transport aircraft is illustrated by the ready conversion of the Boeing bomber into a high-speed trans-continental passenger aeroplane. The following figures are given:—

Total weight, 12,000 lbs.	Max. speed, 175 m.p.h.
Cruising speed, 155 m.p.h.	Ceiling, 18,000 ft.
10 passengers.	500 lbs. mail.

Blériot Multi-Seater Fighter. (L'Aeron., No. 158, July, 1932, pp. 199-204.) (5.15/24811 France.)

Photographs exhibit the arrangement, and sketches give a number of details, of construction of wings and frame of the Blériot 5½-ton multi-fighter.

The field of fire is delimited by a pencil of rays touching the obstructing surfaces and forming an irregular cone. The intersections of this cone with the sides of a cube are reproduced as a representation of the field of fire. This representation gives serious distortion in size and shape. (See Abstract No. 20/22151.)

Distribution of Pressure on Biplane Wings. (R. W. Noyes, N.A.C.A. Rept., No. 417, 1932.) (5.2/24812 U.S.A.)

The biplane wings were mounted on a rotating circular disc sunk in a plane surface forming a complete chord of the tunnel section. Leads from 120 orifices were taken to a multiple manometer, from which records were made on sensitised paper by a beam of light. Lift-incidence curves were measured for different staggers, gaps and angular settings.

The rolling moment due to roll was recorded for different gaps and staggers. The effect of stagger, gap, angular setting and dihedral and sweep-back on the pitch moment were observed. A mass of results is recorded. Forty tables and 53 diagrams are given.

Diminution of Lift of Aerofoils by Resistance. (A. Betz and J. Lotz, Z.F.M., Vol. 23, No. 10, 28/5/32, pp. 277-279.) (5.2/24813 Germany.)

The author notes that in the two-dimensional problem in a perfect fluid a wing of appropriate circulation develops a lift (proportional to the product of velocity and circulation) and no drag. He proposes to imitate the phenomena by a distribution of sources on the back of the wing towards the trailing edge with a corresponding distribution of sources on the circle from which the wing is derived by conformal transformation. The falling off of theoretical lift in a perfect fluid is compared with the increase of resistance for variations of the usual parameters in the Joukowski transformation and with experimental curves obtained by Wieselsberger. (The fit is not very satisfactory and it is difficult to see how the introduction of additional sources can be the basis of a satisfactory physical theory, in spite of the fact that it produces head resistance and a decrease in the circulation required to give smooth flow at the tail.)

Estimation of Profile Drag. (W. R. Andrews, Flight, Vol. 24, No. 25, 17/6/32, pp. 530a to 530d.) (5.2/24814 Great Britain.)

The author uses chiefly N.A.C.A. data obtained in the high density channel to separate induced drag from total drag. Curves of lift at minimum profile drag are prepared for the use of designers.

Nine references are given in Part I.

The Hall High-Lift Wing. (F. E. Weick and R. Sanders, N.A.C.A. Tech. Note, No. 417, May, 1932.) (5.2/24815 U.S.A.)

The Hall high-lift wing is an application of the same principle as in the succeeding abstract. Similar results are obtained, namely, a large increase in maximum lift and a shift backwards of the centre of pressure.

A photograph of the model exhibits a gap along the whole span in the forward part of the under surface and a flap fitting into the after part of the under surface and mould downward, on hinges pivoted forward of the leading edge of the flap, so that a species of slot is formed. Eighty per cent. increase of maximum lift is obtained, with a shift backward of the centre of pressure. Structural difficulties are not discussed.

Theory of Wings with Cut-Away Portions. (J. Lotz, Z.F.M., Vol. 23, No. 14, 28/7/32, pp. 410-413.) (5.2/24816 Germany.)

Measurements by Ackeret and Muttray show the unfavourable influence of cut-away parts of the wing plan. A cut-away forward increases the induced resistance, and a cut-away aft increases the profile resistance. Muttray has also shown that by adopting suitable high-lift profile, where the chord is decreased by the cut-away, the unfavourable effect can be reduced to small proportions. Starting with an elliptical contour for an uncut wing the cut-away produces a dip in the curve of lift distribution. A new elliptical lift distribution is drawn touching the bottom of the dip and leaving by subtraction two small approximately elliptical distributions of lift separated by a gap. A somewhat elaborate analysis is introduced for dealing with the lift thus resolved. Approximate formulæ of transformation are developed and plotted for rapid numerical use, and the results are applied to three wing profiles. The measured and calculated changes of lift are compared graphically and show the same general run. The discrepancy in magnitude does not exceed what might be expected.

Characteristics of a Wing with a Movable Aileron. (F. E. Weick and T. A. Harris, N.A.C.A. Tech. Note, No. 422, May, 1932.) (5.2/24817 U.S.A.)

The hinge of the aileron is mounted so as to be slidable towards the rear edge of the fixed plane, thus in effect increasing the chord of the wing. The hinged aileron or flap extends along the whole span of the wing. The dimensions of the wing were 60 ins. span by 10 ins. chord, and the maximum chord width of the flap was 4 ins. The maximum lift was increased and the centre of pressure shifted backwards, but the increase of lift, over 100 per cent. in the extreme case, is perhaps larger than might have been expected. Extensive data are given graphically and in diagrams for three values of flap width—20, 30 and 40 per cent. of the chord—and for six angular settings increasing from 0° to 60°, by uniform steps, and for main plane incidence from $-15°$ to $+30°$.

Development of Aeroplane Wing Construction. (C. Topfer, Z.V.D.I., Vol. 76, No. 12, 19/3/32, pp. 281-286.) (5.25/24818 Germany.)

A lucid summary is given of the mechanical problems common to all types of wing structure and the advantages and disadvantages are considered for each case.

The monoplane has a comparatively small girder depth and high spar moments which is partially met by use of deep profiles and clean construction. In large aeroplanes full use must be made of every available device, to offset the increase of weight with linear dimensions for similar structures—such as utilisation of the interior space of the wings, allotment of a share of the linear stresses to the wing covering, design of wing nose for torsional stiffness, etc.

Approximate Calculation of Multi-Spar Wings. E. Sanger, Z.F.M., Vol. 23, No. 9, 14/5/32, pp. 245-250.) (5.25/24819 Germany.)

The author indicates a systematic method of determining the stresses in multi-spar wings. The framework of the wings is indicated graphically along with assumptions made as to the distribution of the loads. The method can be applied to wings pivoted at the centre and cantilever wings with directly or indirectly loaded ribs.

Account can be taken of the systematic errors introduced by the arbitrary assumptions. No numerical example is worked out, but influence lines are reproduced for the last case considered.

Calculation of Strength of Wing Struts under Air Forces. (E. Amstutz, Z.F.M., Vol. 23, No. 13, 14/7/32, pp. 374-376.) (5.3/24820 Germany.)

The lift and drag curves are resolved into tangential and normal force curves. Graphical methods are developed to facilitate the rapid calculation of the air force bending moment and fixing moment of the strut. A numerical example is worked out.

Five references are given.

Experiments on Ailerons Rigged 10° *up in the Symmetrical Position.* (F. E. Weick and C. J. Wenzinger, N.A.C.A. Rept., No. 423, 1932.) (5.31/24821 U.S.A.)

Ailerons thus rigged increase the drag and decrease the lift of the wing. When operated, upward motion further increases the drag and decreases the lift, while downward motion increases the lift and decreases the drag. In this way the rolling moment is increased by the yaw set up by the concomitant yawing moment.

A number of measurements were carried out on ailerons of three different sizes with the usual equal and opposite motion and with three differential motions. The results are tabulated and shown graphically.

Streamline Wires; Effects of Corrosion. (H. E. Haven, Aeron. Eng., July-Sept., 1932, pp. 109-115.) (5.42/24822 U.S.A.)

It is considered that the most serious excess stresses imposed on streamline wires are due to torsional oscillations set up by the relative air stream. A number of sections of streamline wire were submitted to alternating torsional stresses. Tables give the chemical composition of the materials used and the results of simple tensile tests and of fatigue tests. The latter are also shown graphically. Twenty-eight photographs of test specimens after failure are shown.

Undercarriages, Floats and Hulls

Stresses in a Wire Wheel with Non-Radial Spokes. (A. J. Sutton-Pippard and Miss M. J. White, Phil. Mag., No. 90, Aug., 1932, pp. 210-233, and No. 91, Sept., 1932, pp. 436-445.) (5.5/24823 Great Britain.)

The wheel is constructed so that the spokes are tangential to hubs of appreciable dimensions compared with the wheel itself. Differential equations are formed in terms of the radial and tangential strain with the polar angle as

independent variable. The tangential strain is eliminated, leaving a differential equation of the sixth order with constant coefficients soluble in terms of elementary functions. Numerical examples are worked out fully and the results are exhibited in tables and in graphical diagrams showing the spoke tensions, bending moments on the rim, maximum stress and position of maximum. A correcting term is introduced for the case in which the spokes are not in the plane of the rim but are splayed outward at a small angle.

In Part 2, expressions are worked out for stresses imposed by side loads on the rim, and numerical results are exhibited graphically and in tables.

Shock and Gliding Stresses on Hydroplane Surfaces. (H. Wagner, Z.A.M.M., Vol. 12, No. 4, Aug., 1932, pp. 193-215.) (5.51/24824 Germany.)

The author deals systematically with problems scattered through a number of previous papers. The methods of mathematical hydrodynamics are applied with assumption as to boundary conditions set up by the displacement of the water surface, which are probably good approximations to the actual facts. Applications are made to typical float surfaces under various landing conditions, and analytical expressions are obtained in a form suitable for application. No numerical examples are worked out.

Forty-two references are given.

Dimensions of Pneumatic Tyres for Aircraft. (F. Michael, Z.F.M., Vol. 23, No. 13, 14/7/32, pp. 377-390, 280th Rept. D.V.L.) (5.55/24825 Germany.)

The introduction of balloon tyres in America has increased greatly the number of stock sizes required.

An elementary theory is developed, and numerous test results are reproduced showing the relation between pressure increase and deformation of tyre. Photographs show the deformation caused by passing over obstructions in the shape of bars 20 and 40 mm. in height and the corresponding measurements are plotted graphically for different positions of wheel in relation to the obstructions. A number of secondary influences are also considered in some detail, including the application of brakes. A scheme of standardisation is suggested, specifications being given in a table and in dimensioned sketches for eight sizes of balloon tyres.

Landing Tests on Aeroplanes. (G. A. Guglielmetti, Riv. Aeron., No. 7, July, 1932, pp. 26-60.) (5.55/24826 Italy.)

The methods of suspending and dropping aeroplanes are shown in diagrammatic sketches. An aeroplane is shown mounted in an ingenious suspension whereby alternating loads may be imposed approximating to those met with in operation. The object of the system of tests proposed is to establish a basis for granting certificates of structural strength.

Airscrews

Experiments on Airscrews of Different Pitch. (A. Faraboschi, Aeron. Lab., R. School of Engineering, Turin, L'Aerotecnica.) (5.6/24827 Italy.)

Measurements were carried out from large negative to large positive ratios of rotation to axial motion. The characteristic curves are of interest to designers —particularly for small negative ratios.

Airscrews and their Adaptation to Aircraft. (R. Pris, L'Aérophile, June, 1932, pp. 177-181.) (5.6/24828 France.)

Reference is made to six American and two British Government publications. The author points out that the design of airscrews remains semi-empirical and that further study of air flow round airscrew blades is required before a physical theory can be developed. He does not make it clear that the real difficulty lies in the intractable nature of the problems of turbulent flow.

Effect of Position of Airscrew and Fairing with Reference to Thick Wings. (D. H. Wood, N.A.C.A. Rept., No. 415, 1932.) (5.61/24829 U.S.A.)

Full-scale tests were carried out on the effect of airscrew position on performance. Nine positions are shown with the engine above the wing, three with the fairing of the engine running into the wing, and nine with the engine below the wing.

The tests were carried out at full scale in the large wind channel, dimensions and positions being specified numerically. The formulæ of reduction are stated, and a mass of results is given in twelve tables.

In a diagram the 21 positions are shown in the plane of symmetry and iso-efficiency curves are drawn showing a maximum of 80 per cent. with the engine and nacelle in the extreme position below and in front of the wing nose and 79 per cent. for the extreme position above and in front. Iso curves of equal drag factors and net efficiencies at different speeds are drawn.

The best location for airscrew and fairing is in line with the centre of the wing at 25 per cent. of the chord forward.

Six references are given.

Airscrew Vibrations. (F. Liebers, Z.F.M., Vol. 23, No. 9, 14/5/32, pp. 251-259, *274th D.V.L. Report.) (5.63/24830 Germany.)*

Rayleigh's principle is applied to reduce the numerous parameters of the airscrew to two, *viz.*, the observed static bending frequency and the ratio of the rigid hub diameter to the airscrew diameter. An empirical formula is given which expresses the natural frequency in rotation as a function of the angular velocity. Numerical values are shown graphically for a range of hub diameters and angular velocities. The boundary and the influence of curvature are discussed. Experimental apparatus is described and illustrated by a diagram. A photograph shows the stroboscopic mirror, and stroboscopic photographs are reproduced from the film camera. The vibrations observed by this method are plotted graphically and exhibit generally damped oscillations, but in one case the amplitude appears to be increasing. The empirical equation is compared graphically with the observed results and excellent fits are obtained.

Eight references are given.

The Study and Design of Airscrews. (M. Volpert, Revue Générale de l'Aéronautique, No. 14, 1932, pp. 151-156.) (5.658/24831 France.)

Various metal designs are described, including the Ratier and Blériot. Variable pitch is of advantage during the start to flying boats, since the resistance passes through a maximum value and a relatively small increase in thrust may determine successful lift.

Wind Power Stations. (Z.V.D.I., Vol. 76, No. 38, 17/9/32, p. 923.) (5.67/24832 Germany.)

An ambitious proposal is made for wind-driven electric generating stations of 100,000 kw. output, the units being A.C. generators driven by airscrew of 160 m. diameter and 15 r.p.m. maximum speed, mounted on towers 240 m. high.

Instruments

Engine Synchroniser. (Aero Digest, Vol. 21, No. 1, July, 1932, p. 54.) (6.48/24833 U.S.A.)

Objectionable sound beats are set up on multi-engined planes unless the engine revolutions are closely synchronised. A convex mirror on the cowling of each outboard engine enables the pilot to look through the outboard airscrews to the centre airscrew. A stroboscope effect is obtained and exact synchronisation is shown by a stationary range.

Elementary Theory of the Gyroscope. (P. L. Tea, Jrnl. Franklin Inst., Vol. 214, No. 3, Sept., 1932, pp. 299-325.) (6.52/24834 U.S.A.)

A useful summary is given of the elementary mechanics of the subject illustrated by clear diagrams. The analysis is reduced to the simplest terms in the examples considered.

Double Horizon Sextant. (Z.F.M., Vol. 23, No. 9, 14/5/32, p. 273.) (6.52/24835 Germany.)

A note is given on a double horizon sextant. Both horizons are brought into the field of the telescope and remain in the same relative position when the sextant is moved.

Types of Acoustic Sounding Apparatus. (Z.V.D.I., Vol. 76, No. 35, 27/8/32, pp. 847-849.) (6.62/24836 Germany.)

Types of shipboard sounding apparatus are described, including the Behm apparatus.

The echometer records depths by a pointer set on a dial at 15-second intervals, in correspondence with the number of impulses emitted.

The British Admiralty apparatus gives a graphical record at 4-second intervals.

The effective range is from 3 metres to 1,000 metres, the latter depending on the feasible amplification. The best results are obtained at about 160 metres.

For small depths a sinker, with substantially constant rate of descent, is dropped overboard and on its striking bottom a small charge is detonated. The depth is estimated from stop-watch readings of the time of descent. The method is simple and accurate.

Echo Sounding from Aircraft. (C. Florisson, Comptes Rendus, 194, 4/4/32, pp. 1149-1150.) (6.62/24837 France.)

A high speed chronometer pointer completes a revolution in 1/5 sec. A magnetically controlled air valve emits very short sounds of high pitch at intervals corresponding to about 7 or 8 turns of the pointer.

The sound is directed towards the earth by a conical reflector and the echo is received by a similar reflector. The time interval is estimated by eye on the chronometer dial. Aeroplane heights have been determined in this way from 10 m. to 240 m.

Stability and Control

The German Airworthiness Test. (Luftwacht, No. 8, August, 1932, p. 317.) (7.10/24838 Germany.)

The German rules give latitude to the manufacturer with the object of fostering new designs. There are special regulations for gliders, of which there are 1,500 in Germany against 900 power aeroplanes.

Stability of an Aeroplane Running on the Ground. (E. Anderlik, Z.F.M., Vol. 23, No. 10, 28/5/32, pp. 280-285.) (7.2/24839 Germany.)

A diagram shows the air forces and the reactions at the point of contact of the wheel with the ground in equilibrium with the weight and the thrust of the screw. The equations of motion are formed in a manner quite analogous to the ordinary equations of fore and aft stability in the air and the solution proceeds along similar lines. Five criteria of stability are obtained in appropriate form. A numerical example is worked out for specified aeroplane data, and the results are plotted for different values of the coefficient of rolling friction and of various parameters.

D.V.L. Gliding-Angle Control. (B. W. Hubner, Z.F.M., Vol. 23, No. 15, 12/8/32, pp. 455-459, 283rd D.V.L. Rept.) (7.30/24840 Germany.)

The control consists of two vertical fins of symmetrical profile fitted in the upper surface and rotatable about vertical axes in opposite directions. The profile is normally parallel to the direction of flight, but in gliding the fins can be rotated outwards across the line of flight and destroy the smooth flow over the upper surface. A decrease of the lift coefficient and an increase of the gliding angle are obtained. Test results are given graphically and show that the range of descent from 100 m. at a speed of 90 km. per hour can be reduced from 735 m. to 440 m. The pilot gains a corresponding flexibility in selecting his landing point without increasing his flying speed.

Landing Speeds, Monoplanes—Effect of Airscrews and Nacelles. (R. Windler, N.A.C. Tech. Note, No. 420, May, 1932.) (7.3/24841 U.S.A.)

The positions of engine and nacelle affect both lift and drag. The relevant results are contained in diagrams showing the effect of position on the lift coefficient. In the most unfavourable position the lift coefficient is seriously reduced and the landing speed is correspondingly raised. The changes in drag coefficient have a negligible effect on landing speed.

Automatic Stability. (Fr. Haus, L'Aéron., No. 159, August, 1932, pp. 243-251.) (7.50/24842 France.)

From author's abstract.—In the first part the author discusses longitudinal stability in the usual manner and shows that the stabilisation of all motion simultaneously is impossible.

In the second part derived types of partial automatic stability are discussed, each based on a particular motion of stability:—

(*a*) Etévé, stabiliser depending on variations in flying speed;
(*b*) Etévé, Constantin, depending on change of instruments;
(*c*) Sperry, depending on general angular position;
(*d*) Lucas, Girardville, depending on angular velocity.

The author proposes to use the apparent direction and magnitude of gravity.

A brief discussion of more complex types of stabiliser is given.

Spinning of Aircraft. (G. G. Budwig, Aeron. Eng., July-Sept., 1932, pp. 79-81.) (7.62/24843 U.S.A.)

The author, who has had extensive test experience, discusses the introduction of spin tests into airworthiness requirements. Test data and adjustments are given, such as times of spirals in irregular spins, shifting of engines and wings, placing of weights, etc. Statistics are given from 1927 to 1930 of accidents due to spinning, with the percentage falling from 3.5 to 2. Four conditions are laid down for satisfactory spin characteristics:—

(*a*) Stability about all three axes.
(*b*) C.g. well forward of c.p.
(*c*) Wing loading kept below the appropriate maximum.
(*d*) Concentration of weights near c.g.

Airflow about the Tail in a Spin. (N. F. Scudder and M. P. Miller, N.A.C.A. Tech. Note, No. 421, May, 1932.) (7.62/24844 U.S.A.)

A description is given of the aeroplane used and of the titanium tetrachloride smoke generator installed. Fourteen photographs exhibit the flow of the smoke in a spin.

Ordinary Spin and Flat Spin. (Delbègue, Rev. F. Aer., No. 35, June, 1932, pp. 655-702.) (7.62/24845 France.)

A careful summary is given of the present position of knowledge on the subject of the spinning of aeroplanes. The methods applied and the results obtained in various countries are briefly referred to.

Twenty-four references are given.

Investigation of the Spinning Properties of the Focke-Wulf A.32 "Buzzard." (H. D. Knoetzsch, Z.F.M., Vol. 23, No. 12, 24/6/32, pp. 356-357, 285th D.V.L. Report.) (7.62/24846 Germany.)

A specification is given of the aeroplane and a description of the instrument installation. A descriptive account is given of the forced motion with the c.g. at 30, 32.4, 34.6, 37, 38.8 per cent. of the chord behind the leading edge. The positions in front of the ailerons are also specified. It was only with the c.g. at the farthest back position (38.8 per cent.) that a spin could be developed, which lasted for three turns only. A graphical diagram shows the turning angle as a function of time. The spin was developed in about $5\frac{1}{2}$ seconds, the time of a complete turn of 360° being about 3.4 secs. The vertical descent was 25 m. per sec.; the inclination of the longitudinal axis was estimated at $-70°$ to $-80°$.

Suggestions for further systematic tests are added.

Handley Page Ailerons with Automatic Slots; Flight Measurements. (W. Pleines, Z.F.M., Vol. 23, No. 10, 28/5/32, pp. 287-296, 279th D.V.L. Report.) (7.72/24847 Germany.)

Dimensioned sketches show the details of plan form and section of the ailerons and slots and a photograph shows the Albatross L. 75 thus fitted. Details are also given of wing tip water ballast tanks capable of rapid discharge and correspondingly rapid setting up of a rolling moment. Records made in flight are given graphically and show lift as a function of incidence for full power and for a throttled engine, polar curves with and without slots opened, and incidence as a function of dynamic pressure.

The flow of the air over the lower wing is indicated by trailing threads and three groups of twelve photographs are reproduced showing the direction of the threads and approximately of the wind. Observed rolling moments are recorded graphically against time.

Without slots all tests exhibited a sudden drop of one wing beyond a definite incidence accompanied by loss of damping of the rolling motion. In every case the resulting attitude was dangerous. Accompanying phenomena are also described.

With slotted ailerons the incidence of maximum lift was increased by about 8°, and sufficient damping of the rolling was maintained. No tendency of the wing to drop was observed. The satisfactory results appear to be entirely due to the effectiveness of the slotted ailerons.

In certain cases a periodic rolling motion followed the initial disturbance, and in these cases a satisfactory stabilising effect was observed and was ascribed to the slotted ailerons.

Blind Landing. (M. H. Gloeckner, Z.F.M., Vol. 23, No. 12, 24/6/32, pp. 347-356, 284th D.V.L. Report.) (7.8/24848 Germany.)

The author states fully the special problems of blind landing and surveys the extensive development, particularly in radio beacons.

Long-range directional beacons are applied to give the general direction of the aerodrome sought, special code signals designating each station.

Having reached the neighbourhood of the aerodrome, short-range beacons are applied to give the exact landing direction and the angle with the horizontal at which the aircraft should approach the actual landing ground.

Other methods of determining the height above the ground are discussed, giving micro-barograph observations, determination of height by reflection of sound, by alteration of electrical capacity and by the strength of the magnetic field of a leading-in cable.

Brief descriptions are given of apparatus applied with diagrams of field direction and intensities, examples of signal strengths, diagrams of connection and photographs of ground and aeroplane apparatus.

Thirty-one references are given.

Engines—Thermodynamics

Combustion of Hydro Carbons. (W. A. Bone, Proc. Roy. Soc., Vol. 137, No. A.832, 2/8/32, pp. 243-274.) (8.13/24849 Great Britain.)

A satisfactory theory of combustion should deal adequately with the whole range, from slow combustion through high pressure flames, and explosions to detonation.

The hydroxylation theory developed by the author receives quantitative confirmation from the isolation of intermediate products. The peroxide theory advanced by workers mainly concerned with slow combustion phenomena is considered to lack sufficient experimental confirmation. Inferences drawn from observed pressure time records, or from response to potassium iodide solution under condition of slow combustion, are found unreliable and misleading when compared with authenticated explosion and detonation phenomena.

New Thermo Couple for High Temperature. (Z. Metallk., Vol. 24, No. 6, June, 1932, p. 126.) (8.14/24850 Germany.)

An alloy of platinum with 4.5 per cent. rhenium and 5 per cent. rhodium gives a thermo-electric potential of 20 millivolts at 1,000° and shows greater metallurgical stability up to 1,600°C. than the alloy of platinum with 8 per cent. Re.

Application of Rare Metal to Thermo-Electric Pyrometers. (Z. Metallk., Vol. 24, No. 6, June, 1932, p. 126.) (8.14/24851 Germany.)

The le Chatelier thermo couple platinum against platinum + 10 per cent. rhodium has long held its place in pyrometric measurements up to 1,600°C. (m.p. of platinum 1,750°C.). The recently-discovered rare metal rhenium (*Nature*, 1930, *et fol. seq.*) finds similar application.

Platinum alloys containing 8 per cent. rhenium, or 4.5 per cent. rhenium and 5 per cent. rhodium, have suitable physical properties and are more stable at high temperatures.

The thermo couples rhodium against a platinum-rhenium alloy, and rhodium against a rhodium-rhenium alloy, are effective up to 1800°, at which temperature they show 20 millivolts and 7 millivots respectively.

Design

Future Aero Engine Development. (C. L. Lawrence, S.A.E. Vice-President, S.A.E. Jrnl., September, 1932, p. 15.) (8.20/24852 U.S.A.)

The four-stroke spark ignition engine with volatile fuel holds the field at present, with possible further developments in scavenging and supercharging by auxiliary blowers and in fuel pump injection into the induction pipe or directly into the engine cylinder. The oil injection engine is still too heavy for aircraft, though the Junkers two-stroke opposed piston engine shows a substantial reduction of weight.

Indicators as a Means of Improving Aircraft Engine Performances. (F. L. Prescott, S.A.E. Jrnl., September, 1932, pp. 361-370.) (8.22/24853 U.S.A.)

A modification of the Juhasz sleeve valve sampling indicator has a mushroom valve, spring loaded and pressure balanced, operated by cam and rocker arm. The design details given are insufficient for critical judgment.

Diesels, etc., and Accessories

A New 4-Stroke Ship's Diesel Engine. (H. Rohwer, Z.V.D.I., Vol. 76, No. 28, 9/7/32, pp. 677-678.) (8.25/24854 Germany.)

The engine has four cylinders with direct injection, 280 mm. bore, 420 mm. stroke and is rated 265 h.p. at 428 r.p.m. The fuel valve needle is lubricated by a small fuel leak along the stem, the excess fuel being returnd to waste. The r.p.m. can be varied through a wide range by hand control of the quantity of fuel and the beginning of injection. A servo-motor controlled by oil pressure ensures response. Mean fuel consumption is 170 gm. per b.h.p. hour at B.M.E.P. 80 lbs. per sq. in. The exhaust remains clear up to B.M.E.P. 100 lbs. per sq. in.

Diesel Engine—Exhaust Gas Temperatures. (Autom. Eng., Vol. 22, No. 297, Sept., 1932, p. 420.) (8.25/24855 Great Britain.)

A pyrometer fitted to each cylinder exhaust renders possible the equalisation of exhaust temperatures, which gives smoother and more reliable running. Failure of the cooling water supply is indicated immediately, and consequent damage to valves is avoided. The error in any pyrometer should not exceed $\pm 5^{\circ}$C.

The New Michel Engine. (A. Nagel and O. Holfelder, Z.V.D.I., Vol. 76, No. 35, August 27, 1932, p. 839.) (8.292/24856 Germany.)

This engine has no relation to the Michel swash-plate engine.

It is an opposed piston engine which differs from the well-known Junkers two-piston design by possessing three pistons radiating symmetrically from a common combustion chamber of star shape.

The pistons operate three crankshafts placed at the outer extremities of the star and are intergeared by a link plate. Like the Junkers, the two-stroke cycle is adopted, two pistons governing the scavenging ports placed in two of the cylinders whilst the third piston controls the exhaust port in the third cylinder. A positive scavenging pump is fitted. It is claimed that with the three pistons more latitude in the port operation is given without sacrificing working stroke. The published results of fuel consumption and B.M.E.P. are, however, not very different from that of an engine of orthodox design. The maximum pressure employed exceeds 1,000lbs. per square inch. Neither the compression ratio not the weight of the two test engines (40 and 60 h.p. output at 2,000 r.p.m.) is given. It appears essential to employ small cylinders to prevent overheating of the pistons. The h.p. per " star " is limited to approximately 30, larger output being obtained by using a number of " stars " placed one behind the other and operating on the same three crankshafts. On account of the uneven distribution of power between the three pistons, a flywheel has to be fitted. This necessarily entails a considerable number of working parts and must produce high manufacturing costs.

Gas Turbines. (Z.V.D.I., Vol. 76, No. 37, Sept. 10, 1932, p. 895.) (8.296/24857 Germany.)

An application of the gas turbine is proposed in conjunction with steam power. The combustion chamber becomes the boiler of the steam plant, the

high pressure and temperature of combustion giving high thermal efficiency and compact design. The partially cooled gases should present less severe difficulties in the design of gas turbines to be run as auxiliaries.

Torsional Oscillations of a 1,500 h.p. Diesel Engine. (H. Baer, Z.V.D.I., Vol. 76, No. 28, 9/7/32, pp. 689-690.) (8.36/24858 Germany.)

The engine has six cylinders and two flywheels, one coupled direct, the other through an elastic leather coupling at the same end of the shaft and driving a dynamo and water brake respectively through leather belts and pulleys. Torsional vibration was measured at the free shaft end of the engine, as the engine came to rest from full speed. Experiments with and without belts and with the coupling disconnected showed that the vibration characteristics of the engine were practically unaffected by the presence of the second flywheel, which was completely isolated by the leather belt and pulley.

Changes in Internal Damping. (P. Ludwik and R. Schenk, Z.V.D.I., Vol. 76, No. 28, 9/7/32, pp. 683-686.) (8.36/24859 Germany.)

The Schenk torsional fatigue testing machine records the hysteresis loops optically during the test. The area of the loop depends on the frequency. Maintenance of steady temperature of the specimen is required to avoid considerable temperature effects. The relation between fatigue limit and ultimate static strength is necessarily complicated.

Journal Bearing Friction in the Region of Thin Film Lubrication. (S. A. McKee and T. R. McKee, S.A.E. Jrnl., Vol. 31, No. 3, Sept., 1932, pp. 371-377.) (8.37/24860 U.S.A.)

In a previous paper—Vol. 20, January, 1927, p. 3—the author described his apparatus for measuring the friction couple of bearings. A large number of measurements is given in the present paper for three lubricating oils with bronze and Babbitt metal bearings, under constant load, at constant speed, etc. The results are tabulated and the graphical representations show very clearly the comparative superiority of Babbitt metal and the improvement due to running in, by postponing the failure of the lubricating film.

The independent variable is non-dimensional $(u \cdot w/p)$, u=coefficient of viscosity $(m \cdot l^{-1} t^{-1})$, w=angular velocity (t^{-1}), p=pressure $(m \cdot l^{-1} t^{-2})$.

Inconsistent units are used, $z = u/100$ is measured in centipoises ($100 \times$ g.c.$^{-1}$s^{-1}), angular speed is given in r.p.m. and pressure in lbs./sq. in.

The author suggests the parameter $u \cdot w/p^{\frac{1}{2}}$ although he notes that it has dimensions $(p^{\frac{1}{2}})$.

Apart from the necessity of using non-dimensional parameters such empirical methods are rendered superfluous by Osborne Reynolds' full treatment of the problem (Papers, Vol. 2, p. 228).

The experimental results appear to be worthy of similar treatment.

French Engine Accessories. (Collard, Revue Générale de l'Aéronautique, No. 14, 1932, p. 197.) (8.7/24861 France.)

The article deals with carburettors, fuel pumps, magnetos, sparking plugs, starters and wireless shielding. The " Eyquen " plug has a powdered insulator packed inside a mica sleeve, which gives a uniform distribution of internal pressure and prevents local concentrations of stress.

Cooling

Application of Heavisides Operational Method to the Solution of a Problem in Heat Conduction. (S. Goldstein, Z.A.M.M., Vol. 12, No. 4, Aug., 1932, pp. 234-243.) (8.4/24862 Germany.)

The method is applied to three cases :—An infinite plate, an infinite cylinder, and a circular cylinder of finite length. The results are expressed in terms of elementary exponentials, error functions and Bessel functions. Interesting points arising in these applications are discussed.

Heat Transfer. (A Symposium of Papers presented to the V.D.I. Sub-Committee on Heat Research.) (Z.V.D.I., Vol. 76, No. 37, Sept. 10, 1932, p. 895.) (8.4/24863 Germany.)

Experiments on heat transfer in a Diesel engine gave coefficients of heat transfer from piston rings to cylinder wall, from piston through rings to wall and from piston direct to wall as 30,000, 3,000 and 300 kilo-calories/m^2x°C. respectively.

Heat Conduction in Tubes, Non-Uniform Distribution. (A. Konejung, Z.A.M.M., Vol. 12, No. 4, Aug., 1932, pp. 229-231.) (8.4/24864 Germany.)

Expressions are formed in cylindrical co-ordinates for the quantity of heat transferred. Arbitrary distributions of temperature are assumed and the results obtained in the form of Fourier series with arbitrary coefficients. The coefficients are obtained in the usual way to satisfy the boundary conditions. Simplified results are obtained for a particular type of distribution. A numerical example is worked out.

Passage of Air through Radiators with Tubes at Right Angles to the Air Stream. (H. Schmidt, Z.V.D.I., Vol. 76, No. 11, 12/3/32, pp. 275-276.) (8.4/24865 Germany.)

Specifications are given of fourteen radiators and cost and performance are given in tables and in diagrams. Some empirical formulæ are developed for the thermal relations.

Cowling

Engine Cowl Rings. (P. M. Boyd, Aeron. Eng., July-Sept., 1932, pp. 93-101.) (8.426/24866 U.S.A.)

Ten photographs show different types of cowling and ring as fitted to aircraft. A photograph shows the Curtiss anti-drag ring ready for mounting. A graphical chart shows the percentage increase of maximum flying speed with ring, as a function of maximum speed without ring, rising from 2 per cent. at 120 m.p.h. to 14 per cent. at 170 m.p.h. The development of the ring is stated to be independent of work in England.

Five references are given.

Engine Ring Cowlings. (W. H. Evers, Aeron. Eng., July-Sept., 1932, pp. 103-108.) (8.426/24867 U.S.A.)

An elementary descriptive account is given of the aerodynamical principle of the N.A.C.A. or Townend type of ring cowling, illustrated by rough sketches of air flow. A number of test data are tabulated. Three photographs are reproduced showing ring cowlings in position on radial engines.

Fuels, etc.

Non-Poisonous Coal Gas (by Hydrogenation). (Z.V.D.I., Vol. 76, No. 38, 17/9/32, p. 914.) (8.602/24868 Germany.)

An effective catalytic agent has been discovered for the conversion of a mixture of CO and H_2 into CO_2 and CH_4 and is being applied on a large experimental scale by the Berlin Gas Works to the removal of CO from coal gas.

Alcohol Motor Fuels in Europe. (G. Kaltenbrunner, " Facts about Sugar," Vol. 26, p. 67, 1931. Chem. Absts., Vol. 26, No. 10, 20/5/32, p. 2845.) (8.606/24869 U.S.A.)

European alcohol is obtained principally from agricultural products, molasses and sulphite pulp waste liquor.

The last method yields the cheapest alcohol, but at a price which still requires legislation to enforce admixture with light mineral oil fuels.

Testing of Naval Aviation Gasoline. (B. P. Ward and W. P. Sinclair, Jrnl. of Am. Soc. of Naval Engrs., Vol. 44, No. 3, Aug., 1932, pp. 285-297.) (8.64/24870 U.S.A.)

A brief account is given of the considerations which led to the present specification and tests, which are now largely concerned with anti-knock qualities.

The specification is given. Photographs show the bouncing pin knock testing apparatus, the N.A.C.A. Universal test engine and the ageing apparatus for gum determination.

Desirable practical qualities are discussed.

Carbon Formation—Standard Oil Co. Research Laboratory. (Autom. Eng., Vol. 22, No. 297, Sept., 1932, p. 429.) (8.64/24871 Great Britain.)

The carbon deposit in an engine due to the lubricating oil approaches an equilibrium thickness sufficient to raise the surface temperature to the point of complete evaporation of the oil deposit. The deposition is substantially independent of the oil consumption. The thickness depends on the distillation curve of the lubricating oil and can be predicted therefrom.

The " Conradson " carbon number is stated to be unreliable.

Knock Rating of Motor Fuels. (F. H. Garner and E. M. Dodds, Engineering, Vol. 134, No. 3469, 8/7/32, pp. 45-47, and No. 3470, 15/7/32, pp. 60-62.) (8.645/24872 Great Britain.)

The knock rating of fuels is seriously influenced by local hot spots in the cylinder, notably in the exhaust valve. The paper describes modifications applied to a test engine which include a specially designed carburettor for maintaining correct proportions, an improved bouncing pin of reduced mass, improved seating and movement, spark control by neon tube, free from oscillatory discharges, liquid cooling of valves, and other modifications of less immediate importance.

Experimental results on comparative knock values are shown in tables and graphically in diagrams, and enable the designer to estimate the relative anti-knock values of blending with benzol and of adding small quantities of tetraethyl lead over a wide range of temperatures.

Some observed temperatures are given for the cylinder head near the exhaust valve and for the cooling medium. Reference is made to the advantages of oil-cooled pistons.

Fuel Atomisation. (Autom. Eng., Vol. 22, No. 297, Sept., 1932, p. 417.) (8.7/24873 Great Britain.)

The sizes of the drops into which the fuel is sub-divided are recorded by a special film camera, which can be used both for injection and carburettor engines.

Large drops burn incompletely with loss of power and production of poisonous exhaust gases. The consequent loss of fuel is estimated at $1,500,000,000 per annum.

Researches of D.V.L. 1931-32. (Z.V.D.I., Vol. 76, No. 37, Sept. 10, 1932, p. 883.) (8.7/24874 Germany.)

Two single cylinder engines of large dimensions have been installed for fuel injection experiments. A small air-cooled engine has been installed for work on fuels.

Schauffer's ionisation method has been applied to investigation of the processes of combustion in weak mixtures, with a view to determining the most economical running of carburettor engines.

Behaviour of Diesel Fuel Spray. (Autom. Ind., Vol. 67, No. 1, 2/7/32, p. 10.) (8.705/24875 U.S.A.)

The article deals mainly with the characteristics of the Bosch fuel injection pump. The effect of back pressure on discharge is slight, but there is a sensible increase of fuel temperature at high pump speeds.

Exhaust Systems

Acoustic Filters as Silencers. (K. Schuster and M. Kipnis, Ann. d. Phys., Vol. 14, No. 1, July, 1932, pp. 123-128.) (8.721/24876 Germany.)

Acoustic filters may be regarded as partial sound absorbers, and application is made to engine exhaust silencers in the present paper. The elementary relations between the area of the exhaust pipe and the openings leading to the filter are stated. Further relations are deduced and a numerical example is worked out.

On the basis of the physical discussion a silencer was constructed with four high pitch filters in parallel, in accordance with sketches and dimensions specified. It was applied to a 9 h.p. two-stroke cycle engine and the damping was notably better than with the silencer already fitted. In addition there was no sensible throttling of the exhaust gases, as was to be expected from physical principles.

Water Recovery Apparatus for Airships. (C. P. Burgess, Aeron. Eng., July-Sept., 1932, pp. 83-92.) (8.723/24877 U.S.A.)

A photograph is given of the water recovery plant for the U.S.S. " Shenandoah " and sketches give details of the type of condenser fitted to U.S.S. " Los Angeles." Elementary thermal principles are discussed; formulæ are developed and graphical charts illustrate the numerical relations.

A discussion follows.

Armament

The Equipment of Air Forces. (E. P. Warner, Aviation, Vol. 31, No. 9, Sept., 1932, pp. 369-373.) (9.34/24878 U.S.A.)

The development of bombing principles and practice in the U.S.A. is discussed historically with photographs of successive machines and tables of performance, the latest date being 1931. Bombing operations are classified as light and heavy, short range and long range, day and night. Under certain conditions, *e.g.*, attack on a battleship, bridge or modern building, etc., concentration of the explosive in a single charge produces greater damage than a number of smaller charges. This leads to a demand for the large aeroplane carrying heavy bombs containing a large individual charge. At present 2,000lbs. appears to be the limit of the demand in the U.S.A. A comparison is made with practice in European countries.

A further article discusses training machines and system of training, illustrated by eleven photographs of training types (see *Aviation*, No. 11, November, 1932, pp. 440-443).

Protection against Poisonous Gases. (Z.V.D.I., No. 30, Vol. 76, July 23, 1932, p. 736.) (9.47/24879 Germany.)

In addition to helmets and filters special close fitting suits of rubberised cloth, rubber shoes and gloves are required and have been designed for protection against mustard gas and other skin irritants.

The putting on ordinary sale of such articles indicates that civilian gas protection is receiving practical consideration.

Signalling

Voice Projectors. (C. Huey, Jrnl. of Am. Soc. of Naval Engineers, Vol. 44, No. 3, Aug., 1932, pp. 327-329.) (9.66/24880 U.S.A.)

Direct voice communication to pilots in formation on deck, and even to aeroplanes in flight, is rendered possible by a new type of voice projection. The voice-produced currents in a microphone receiver are amplified in the usual way, and these control discharges of compressed air in the throat of a funnel projector. The beam of sound is fairly narrow and has a horizontal range of 3,000 ft. A range of nine miles has been obtained in communicating with an airship at 3,000 ft.

Much greater secrecy is maintained than with radio messages. A photograph shows some details of the new type.

Searchlights. (C. Huey, Jrnl. of Am. Soc. of Naval Engrs., Vol. 44, No. 3, Aug., 1932, pp. 329-331.) (9.67/24881 U.S.A.)

The main improvement is due to advance in design of electrodes.

The old type $1\frac{1}{4}$ in. dia. positive and 1 in. dia. negative carbons gave a $\frac{7}{8}$ in. dia. crater with a maximum usable power of 120 amps. × 60 volts = 7,200 watts, producing 40,000 candle power. The new type electrodes have a hard-baked shell of carbon from anthracite coke and a core of bituminous coke mixed with cerium fluoride. The positive electrode is .63 ins., the negative .433 ins. dia., with a maximum usable power of 150 amps. × 80 volts = 12,000 watts, producing 140,000 candle power. Minor improvements in the optical parts have been made. Photographs of old and new type arcs are reproduced.

Materials—Corrosion, Welding, etc.

The Creep Strength of Metals at High Temperatures and the Effect of Pre-Heat Treatment. (W. Rohn, Z. Metallk., Vol. 24, No. 6, June, 1932, pp. 127-131.) (10.1/24882 Germany.)

Pure iron, nickel and various alloys were tested at temperatures up to 1,200°C. The creep strength at high temperature was increased considerably by previous exposure to a temperature of the same order.

Corrosion. (U. R. Evans, Engineering, Vol. 133, No. 3460, 6/5/32, pp. 550-551, and No. 3463, 27/5/32, pp. 639-641.) (10.125/24883 Great Britain.)

A closely-reasoned survey is given of the present state of knowledge on corrosion, defined as the destruction of materials by chemical action. Although much remains in doubt and controversy, the body of agreed results is so significant that in the author's view a knowledge of chemistry is indispensable to every engineer who has to deal with corrosion.

At high temperatures, direct combination with oxygen is the common form of corrosion—the rate of reaction depending more on the protective nature of

the oxide film rapidly formed than on the reactive nature of the material. For example, aluminium is highly reactive, but the oxide film is self-healing and gives excellent protection.

Local pittings at weak points in the oxide film may cause more rapid and dangerous damage than much more extensive general corrosion, although the total combined oxygen is less.

A protective coat which prevents general corrosion at the cost of producing intense local pitting may do more harm than good. Numerous instances are quoted from experience. Oxygen may act either directly or by a more or less roundabout process of chemical exchanges. The successful use of paints depends largely on the weathering properties of the paints themselves, but the interaction with a small area of corrosion may accelerate the deterioration of the paint greatly and must be studied in conjunction with direct weathering.

The inclusion of salt crystals between paint and metal may greatly accelerate further corrosion. Other inclusions may be harmful, and cleaning of the surface before treatment becomes correspondingly important.

A wide range of examples is given.

The Combating of Corrosion Fatigue by Preliminary Compression. (A. Thum and H. Ochs, Z.V.D.I., Vol. 76, No. 38, 17/9/32, p. 915.) (10.125/24884 Germany.)

Fatigue limits under corrosion are determined by "breathing" of the surface cracks of the material, by means of which a pumping action is exerted. By preliminary compression these cracks are sealed, and increases up to 50 per cent. in the fatigue limits can be observed in notched or drilled materials when the notch is surface rolled under high pressure or the surface of the drilled hole compressed axially.

Arcatom Welding Process. (Z.V.D.I., Vol. 76, No. 28, 9/7/32, p. 19 (adverts.).) 10.14/24885 Germany.)

Langmuir's original suggestion of using the electric arc in an atmosphere of hydrogen has been developed in America, and the patents covering the process are handled in Germany by the A.E.G.

It is claimed that a very high quality weld is produced, both in steels and light alloys, and for materials up to 3 ins. thick.

Welded Tube Structures. (G. Ivanow, L'Aéronautique, No. 159, Aug., 1932, pp. 255-260.) (10.14/24886 France.)

A descriptive account is given of the technique of welding joints in tubular frame structures. Seven photographs and three sketches illustrate different types of joints.

Strength of High Grade Arc Welding. (G. Czternasty, Z.V.D.I., Vol. 76, No. 28, 9/7/32, pp. 679-682.) (10.14/24887 Germany.)

An arc welded boiler of 6m.^{3} capacity was tested to destruction by water pressure. The deformation of the boiler was recorded with gradually increasing pressure and after the burst samples containing parts of the weld were cut out of the material and tested separately. According to regulations the boiler is intended for a maximum load of 29 atmospheres. It actually failed under 150 atmospheres. Both the nature of the break and the behaviour of the test pieces subsequently cut showed clearly that the material had in no way been influenced deleteriously by the process of arc welding.

Spot Welding of Stainless Steel. (J. Geschelin, Autom. Ind., Vol. 67, No. 1, July 2, 1932, pp. 4-6.) (10.14/24888 U.S.A.)

Under the designation of " shot welding " a method of spot welding is described. Short bursts of current are applied to stainless steel which has eight to fourteen times the resistance of carbon steel. For each spot weld a pen inscribes a curved line, the length of the arc being proportional to the energy expended.

The welding apparatus is set by an expert to give the optimum time of current application for each type of weld and nothing is left to the judgment of the routine operator.

Photographs show the apparatus, welded channels tested to collapse and an improved wing rib in conjunction with a previous design.

" Shot-Weld " Construction. (Aero Digest, Vol. 21, No. 1, July, 1932, p. 64.) (10.14/24889 U.S.A.)

The Budd Manufacturing Co.—The Italian rights have been acquired by the " Savoia " Co. and will be applied to the construction of flying boats.

The U.S. Steel Corporation has acquired the rights for the structural steel in buildings.

See previous Abstract.

Calculation of Helical Springs. (O. Göhner, Z.V.D.I., Vol. 76, No. 11, 12/3/32, pp. 269-272.) (10.164/24890 Germany.)

The methods given in Love's elasticity are extended, and approximate formulæ for computation are developed.

Wind Tunnels, Testing Apparatus, etc.

Free-Jet Type Wind Channel, Focke-Wulf Construction Co. (11.1/24891 Germany.)

A full translation of the article by H. Focke, Z.F.M., No. 11, 14/6/32 (see Abstract 24/24082), appears in *Aircraft Engineering,* No. 43, Sept., 1932, pp. 219-220.

Wind Channel. (P. Rebuffet, Pub. Sci. et Tech. du Ministère de l'Air, No. 5, 1932.) (11.1/24892 France.)

A full technical description is given of a wind channel in use by Service Technique, equipped with dynamometer based on the principle of variable electrical capacity. The theory of the apparatus and the calibration are discussed fully. Once the dynamometer has been regulated measurements can be carried out rapidly. The underlying mechanical principle is the extremely small movement of the dynamometer, which has been reduced to from one-tenth to two-tenths of a millimetre. It is stated that a complete polar diagram can be produced by a single observer in ten minutes. A comparison of results with characteristic curves obtained at the Moscow, Göttingen, Eiffel and Sainte Cyr laboratories shows satisfactory uniformity.

Description and Calibration of 10-foot Wind Channel, California Inst. of Technology. (C. B. Milliken and A. L. Klein, Guggenheim Publication, No. 17.) (11.1/24893 U.S.A.)

A full descriptive account is given of the construction and calibration of a 10-foot wind channel, designed in accordance with v. Karman's suggestions and with many improvements introduced by the authors. The ratio of stream energy per second to motive power attains the high figure of 5.5 at full speed. This is ascribed to a combination of design details of which seven are cited.

An account is given of the calibration of the flow in the test section, including measurements of resistance of spheres as a check on initial turbulence in the flow. Results are excellent. Certain discrepancies raise interesting questions.

A brief survey is given of test work on international models of dirigibles and of aerofoils.

Eight German and American references are given.

Special Methods of Testing Aircraft Materials. (D. M. Warner, Aeron. Eng., July-Sept., 1932, pp. 141-149.) (11.4/24894 U.S.A.)

The equipment and methods of testing at the Wright Field are described and illustrated by photographs of the apparatus and diagrams of the test results. These include combined bending and torsion tests of beams, stress and strain tests of wing ribs, fatigue tests of tubes and streamline wires, Brinell hardness, etc. An apparatus, consisting of a furnace and extensometer for tests at high temperatures is shown in a photograph, and test results from room temperatures to 600°F. are reproduced.

The Duroscope. (O. Schwarz, Z. Metallk., Vol. 24, No. 4, April, 1932, pp. 93-94.) (11.4/24895 Germany.)

A pivoted steel hammer carrying a hardened steel ball at the point of impact is allowed to fall through an arc of known angle, and the hardness is measured by the height of the rebound, which is indicated by a needle on a graduated scale. Correlations between the hardness thus measured and the Brinell hardness are given graphically.

Standardisation of Notch Impact Tests. (M. Moser, Z.V.D.I., Vol. 76, No. 11, 12/3/32, pp. 257-261.) (11.4/24896 Germany.)

The effect of size and shape of the notch is discussed from the point of view of international standardisation. Eight photographs of fractured specimens are reproduced and some correlation curves are given. The test conditions specified in various countries are given with dimensioned sketches.

X-Ray Examination of Materials at the D.V.L. (K. Matthaes, Z.F.M., Vol. 23, No. 15, 12/8/32, pp. 459-466, 292nd D.V.L. Rept.) (11.47/24897 Germany.)

A specification is given of the electrical apparatus for generating suitable X-rays. The testing cabin is 5 m. by 6.2 m. and is shown in sketches of plan and elevation. A photograph of the installation is reproduced. Examination of castings of cast iron, U-girders of cast electron, aluminium alloy castings, cores, etc., is discussed and photographs are reproduced. Methods of welding are also discussed and X-ray photographs of specimens are given. It is concluded that the method is well adapted to examination of completed structural parts and should find increasing use.

Valve Inspection. (Aero Digest, Vol. 21, No. 1, July, 1932, p. 54.) (11.47/24898 U.S.A.)

The General Electric X-ray Corporation have developed a stereoscopic X-ray camera for investigating flaws in aircraft valves.

X-Ray Investigation of Welded Joints. (N. Lefring, Material-prüfungsanstalten, No. 10, Nov., 1931, pp. 145-149.) (11.47/24899 Germany.)

Nine types of joints are shown in sectional sketches. Defects due to electric arc welding are given under three headings:—

(1) Failure of welding material to weld on to the surface.
(2) Failure of successive layers of the weld to weld together.
(3) Formation of blow holes in the weld itself.

Two surface photographs of a long welded joint are reproduced and compared with the X-ray photograph, and types of failure are marked by arrows. A further series of X-ray photographs is reproduced, and the various defects brought out are indicated by arrows or are immediately visible.

Airships

New German Airship, L.2 129, under Construction. (L'Aéronautique, No. 155, April, 1932, p. 125.) (12.1/24900 France.)

Double gasbags are fitted—the outer containing helium and the inner hydrogen. Control by release of hydrogen avoids loss of the relatively expensive helium. This is considered preferable to fitting water recovery plant with increase of weight and head resistance, as in the U.S.A. "Akron."

The following details are supplied:—

	Old Type.	New Type.
Length	235 m.	248 m.
Major axis	33.8 m.	45.5 m.
Minor	30.5 m.	41 m.
Volume	105,000 m.^{3}	200,000 m.^{3}
Fuel and oil	—	60 tonnes
Water ballast	—	6 ,,
Service water	—	4 ,,
50 passengers	—	3 ,,
Freight	—	8 ,,

The frames are 36-sided polygons with 16 m. spacing.

Adiabatic Expansion of Gas in Balloons, etc. (M. Panetti, Aeron. Lab., R. Eng. School, Turin; Atti d. Reale Accad. de Scienze, Vol. 45, 1929.) (12.1/24901 Italy.)

When a dirigible is rising rapidly the expansion of the gas in the cells may approximate to adiabatic expansion. The thermo-dynamic relations are worked out, and it is shown that there is a loss of lift which increases with the rate of ascent.

Indeterminate Stresses in Rigid Airships. (W. Watters Pagon, Aeron. Eng., July-Sept., 1932, pp. 123-139.) (12.2/24902 U.S.A.)

The author discusses the approximations necessarily introduced into complicated frameworks in order to obtain some sort of solution, and makes copious quotations from N.A.C.A. and A.R.C. reports and from classical methods of mathematical theory. Particular cases are illustrated by framework diagrams in which the stresses calculated by the usual methods are entered numerically for different applications of the load. The article is intended to be suggestive rather than exhaustive.

Wireless

Kennelly-Heaviside Layer, Rapid Determination of Virtual Height. (J. P. Schafer and W. M. Goodall, Vol. 20, No. 7, July, 1932, pp. 1131-1148.) (13/24903 U.S.A.)

The displacements of a cathode ray oscillograph tube were used to measure the intensity and time of signals received by reflection from the ionised layers. A definite signal pattern was given out by the sender and the direct and reflected waves were recorded by the oscillograph. The record of the direct wave remained constant in position and amplitude. The reflected wave changed both in amplitude and in displacement from the direct wave according to height of the ionised layers, the length of the path and the absorption. Diagrams of connections are shown and a large number of observations of the height of the ionised layer are recorded. The results are in line with previous work. The rapidity with which observations can be made yields a substantially continuous record.

Absorption of Electrical Condensers. (R. E. W. Maddison, Jrnl. Franklin Inst., Vol. 214, No. 3, Sept., 1932, pp. 327-343.) (13.2/24904 U.S.A.)

The physical significance of various terms entering into the total charging current of the condenser at constant potential is made clear. Elementary mathematical expressions are formed and numerical results of experiments are exhibited graphically. The properties of several insulators are tabulated, as a function of moisture content.

Circuit Relations in Radiating Systems and Applications to Antennæ Problems. (P. S. Carter, Proc. Inst. Rad. Engs., Vol. 20, No. 6, June, 1932, pp. 1004-1041.) (13.3/24905 U.S.A.)

From author's summary.—Expressions for the self and mutual impedances within a radiating system are developed by the use of the generalised reciprocity theorem. These expressions are given in terms of the distributions of the electric field intensities along the radiators.

A method for determining the field intensities is outlined. Formulæ for the self and mutual impedances in several types of directional antennæ are given.

Questions of practical interest in connection with arrays of half-wave dipoles, long parallel wires, and " V " type radiators are discussed. Different types of reflector systems are considered. Curves of the more important relations are shown.

Production of Ultra Short-Wave Oscillations; New Circuit. (H. N. Kozanowski, Proc. Inst. Rad. Engs., Vol. 20, No. 6, June, 1932, pp. 957-968.) (13.3/24906 U.S.A.)

From author's summary.—The circuit consists of two tubes connected by symmetrical plate and filament Lecher systems instead of the usual plate-grid arrangement. The wave length of the oscillations is determined by the length of the plate Lecher circuit. The tuning of the filament Lecher system governs the amplitude of the oscillations.

The radio frequency output is 5 watts.

The Action of Screened Grid Sender Valves. (C. J. de L. de la Sabloniére, H.F. Technik., Vol. 39, No. 6, June, 1932, pp. 191-199.) (13.31/24907 Germany.)

Three types of sender valve of the screened grid type are described and illustrated by photographs and a diagram of connections. The statical characteristics are given and from these the grid and antennæ currents are derived

as functions of the screened grid voltage, which give an insight into the working processes of the valves. The grid and anode losses are considered and the corresponding expressions are formed. Practical conclusions are drawn for the application of such valves and tabulated under eight headings. Relations between antennæ current and grid current are dealt with by modification of the circle diagram of the induction motor. All the quantities discussed are exhibited graphically in seventeen diagrams.

Sheet Metal and Grid Reflectors in Short-Wave Transmission. (W. Köhler, H.F. Tecknik., Vol. 39, No. 6, June, 1932, pp. 207-219.) (13.31/24908 Germany.)

Brief specifications are given of the sender and receiver apparatus and of the layout of the experiments. A photograph shows the installation of a sheet metal parabolic cylindrical reflector for sending 16.8 cm. waves, which was compared with four other shapes and showed much greater sharpness of directional definition. At the receiver end only 42 per cent. of the strength is collected and reflected by the parabolic mirror.

Detection of Two Modulated Waves. (C. B. Aitken, Bell Tele., B.637, 1932.) (13.32/24909 U.S.A.)

From author's abstract.—A discussion of the characteristics of shared channel interference is given and it is shown that there are only two important components of this interference, one being the carrier beat note and the other being what has been designated as side band noise. This latter consists of two frequencies of the undesired station but is shifted upward by a constant amount equal to the difference between the carrier frequencies. The other spectrum is of similar type but is shifted downward by the same amount.

Noises in Receivers. (W. Brintzinger and H. Viehmann, H.F. Technik., Vol. 39, No. 6, June, 1932, pp. 199-207, 282nd D.V.L. Rept.) (13.32/24910 Germany.)

Absolute measurements of noise in short wave receivers would require elaborate apparatus of a nature not yet realised. Mutual comparison of valves for relative intensity of noises is more readily carried out, and three short wave receivers were subjected to comparison of this sort. Measurements made by the D.V.L. are exhibited graphically showing intensity of noise as a function of heating voltage and the anode stream of the grid resistance. The intensity of noise shows a well defined maximum when plotted against heat voltage and grid resistance, but a characteristic rise through the whole range is plotted against anode current. The investigation of the selected receivers is then discussed and the results are shown graphically as functions of the different variables. A number of conclusions are drawn with reference to the design of receiver valves.

Fourteen references are given.

Twin Triode Tubes. (C. F. Stromeyer, Proc. Inst. Rad. Eng., Vol. 20, No. 7, July, 1932, pp. 1149-1162.) (13.5/24911 U.S.A.)

The design of a new valve is described in which two triodes are contained in one tube. Both the positive and negative regions of the grid voltage-plate current characteristic are utilised. A diagram of connections shows the details of the fundamental circuit, the input cathode being directly connected to the output grid. A discussion is given of the characteristics of the circuit, compensation, gain and distortion. The distortion and output are plotted against load impedance and show maximum output at minimum distortion. A quantitative comparison shows twice the output of the pentode and thrice the output of the triode. New solutions of design problems are suggested, by use of twin-triode valves.

The Structure of Cuprous Oxide Rectifiers. (K. Scarf and O. Weinbaum, Phys. Zeit., Vol. 33, No. 8, p. 336.) (13.5/24912 Germany.)

Rectification is due to orientation of Cu_2O and Cu crystals, no bias voltage being required. Cells of this type have successfully replaced the gas-filled photo cell.

The Cathode Ray Oscillograph. (J. B. Johnson, Bell Tele., B.639.) (13.5/24913 U.S.A.)

The elementary theory of the cathode ray tube is given for electrostatic and magnetic deflection. The technical development of the cathode ray tube is summarised and illustrated with 11 sketches and four photographs of different types.

Full details are given of the problems arising in the design and operation of a recent tube.

Twelve oscillograms are reproduced to illustrate applications to high-frequency work.

Radio-Goniometric Deviations on Aeroplanes. (E. Fromy, Pub. Sci. and Tech. du Ministère de l'Air, No. 6, 1932.) (13.6/24914 France.)

The metallic parts of an aeroplane structure form closed circuits of a complex geometrical nature. Reference is made to the work of R. Mesny, which is carried further in the present paper. Induced currents in closed circuits are first discussed in a general manner on the single assumption that the disturbing field is uniform in the interior of the circuit. A general formula is obtained containing Mesny's formula in a particular case. Experimental verifications were carried out taking into account the various sources of error inherent in radio-goniometry. Numerical examples are given from experience on particular aeroplanes. Methods of compensating the errors are discussed.

New Wireless Apparatus in German Aerial Transport. (F. Eisner, Z.F.M., Vol. 23, No. 9, 14/5/32, pp. 259-266, 275th D.V.L. Rept.) (13.6/24915 Germany.)

A description is given of the standard wireless apparatus evolved for air navigation through the joint efforts of the industry, the Luft Hansa, the Central Insurance Company, and the D.V.L. Two photographs of the installation in an aeroplane are given. Weights of component parts are tabulated, and sketches show some of the details, the scheme of connections, and the general arrangement in an aeroplane. Some experimental wireless measurements are also reproduced and include two oscillograms, eight graphical charts of the electrical characteristics and the corresponding numerical tables.

Reference is made only to the 1932 German handbook, "Applications of wireless in air navigation."

Photo-Electric Cell Recording Device. (Z.V.D.I., Vol. 76, No. 35, 27/8/32, p. 838.) (13.7/24916 Germany.)

A new Siemens apparatus has a rotating sector which renders intermittent a beam of ultra-red rays falling on a photo-electric cell and produces an alternating current. The current is rectified and holds open a relay circuit. Interruption of the beam is recorded by the closing of the relay. A number of reflections by mirrors may be interposed between source of light and cell, giving great flexibility in selecting the path of the beam.

Modes of Vibration of Quartz Plates by Interferometer. (W. D. Dye, Proc. Roy. Soc., Vol. 138, No. A.834, 1/10/32, pp. 1-16.) (13.81/24917 Great Britain.)

The mode of vibration of quartz crystal rods and plates is of importance in constructing frequency controls in radio transmission.

The behaviour of rods has been worked out with sufficient completeness, both experimentally and mathematically. In the present paper the modes of vibration of quartz plates are studied by methods of optical interference.

Flexural, torsional and compression vibrations offer a great variety of possible modes.

Numerous typical cases are recorded by direct photography and by stroboscopic methods.

Application of Quartz Plates to Radio Transmitters. (O. M. Hovgaard, Bell Tele., B.673.) (13.81/24918 U.S.A.)

Temperature variations are the chief source of frequency variations and a necessarily somewhat elaborate thermostatic control is described as developed in the laboratory.

Two units specially designed for aircraft work are described and illustrated by photographs of parts, one weighing 5 ozs., the other less than 1 lb.

Two graphical records show a frequency control within 0.01 per cent. over a range of external air temperatures from $-40°$, to $+40°$, the frequency being 3,926 kilocycles per second.

Craft Location

Recording Balloon Theodolite. (Z.F.M., Vol. 23, No. 15, 12/8/32, p. 471.) (15.10/24919 Germany.)

A photograph shows the main features of the instrument. The two eyepieces are arranged at right angles to the axis of the telescope. Altitude and azimuth appear in the field of the main telescope and can be read off, and recorded on a polar diagram by pricking with needle styluses.

(Abstractor's Note.—A similar instrument was embodied in a recording theodolite to the design of the Naval Air Service in 1917.)

Noise

Sounds Emitted by Rotating Airscrews. (J. Obata and others, Aer. Res. Inst. (Tokyo) Rept., No. 80, July, 1932.) (15.34/24920 Japan.)

The sounds emitted by six model airscrews, one-third and one-fourth full size, were recorded by condenser microphone, amplifier and oscillograph. The records supply an harmonic analysis of the sound into fundamental tones and overtones, and the amplitudes should be a measure of the intensities. Numerous oscillograms are reproduced and graphical representations are given of the relative intensities of the components.

Sound Emitted by Airscrews. (C. F. B. Kemp, Proc. Phys. Soc. 44, pp. 151-162.) (15.34/24921 Great Britain.)

The first six harmonics of the sound produced by an airscrew at a fixed point were investigated, the total sound energy being 18 watts, of which 9 watts were due to the fundamental note and 7 watts to the second and third harmonics together. Beyond 200 feet from the hub the intensity is inversely as the square of the distance. Within this distance directional effects confuse the observations. Maximum intensity was observed at $15°$ to $30°$ behind the airscrew disc.

Cathode ray oscillograms indicate significant frequencies up to 600.

Lynam and Webb's work is discussed.

D.V.L. Research Work—Noise Measurement. (Luftwacht, No. 8, August, 1932, p. 320.) (15.38/24922 Germany.)

A new instrument for analysing the gamut has been designed in application of the methods of Barkhausen and Grutzmacher. The partials range in frequency from 100 to 1,000 Hertz and the quality of the noise is similar for different types of aircraft. The cabin walls damp the higher frequencies more than the lower. The results have been applied to the design of an echo sounding apparatus with a sending note of frequency 3,000 Hertz, and with sound filters between receiving and recording apparatus.

Aircraft, Unorthodox

Experimental Characteristics of an Aeroplane with a Hollow Cylindrical Body. (L. Stipa, Riv. Aeron., No. 7, July, 1932, pp. 75-86.) (17.03/24923 Italy.)

The body is substantially a hollow cylinder acting as a guide channel for the airscrew jet. The pilot's cockpit is built into the thickness of the upper surface. Three diagrammatic sketches in plan and front and side elevation show the external diameter of the body as 488 mm., the internal diameter as 400 mm., and airscrew diameter as 320 mm. The span, measured to scale, appears to be 2.9 m. It is stated that the model was tested in the aeronautical research tunnel, and graphical characteristics are reproduced. It is claimed that the airscrew efficiency is increased by the guide channel.

A general specification of a full-sized machine is given.

Stipa Aeroplane. (Flight, Vol. 24, No. 43, 20/10/32, p. 995.) (17.03/24924 Great Britain.)

Three photographs of an experimental aeroplane are reproduced and the following figures are quoted:—

Span	13.3 m.
Wing area	19 m.^{2}
Tare weight	600 kg.
Gross weight	800 kg.

See previous Abstract.

Military Value of Autogiro. (H. L. Lewis II (? sic), U.S. Air Services, Vol. 17, No. 10, Oct., 1932, pp. 36-37.) (17.05/24925 U.S.A.)

A highly optimistic forecast is given of possible uses of the autogiro for special services in war.

The Rotating Wing Flying Machine. (M. Schrenk, Z.V.D.I., Vol. 76, No. 35, 27/8/32, pp. 843-846.) (17.05/24926 Germany.)

The modern form of autogiro with gear drive to rotating wing for starting purposes is described. From the performance figures supplied by the Autogiro Co. the three-blade lifting screw is a distinct improvement on the four-blade gyro plane. The omission of the lower stabilising plane is anticipated. It is considered that the autogiro is only suited for reliable short flights.

Propulsion by Reaction. (M. Roy, Pub. Sci. et Tech. du Ministère de l'Air, No. 1, 1930.) (17.2/24927 France.)

Part I discusses reaction-propulsion by rockets and by fuel burning with a forced supply of air and exhausting through a shaped nozzle.

Part II deals with airscrews, the blades of which are driven by the reaction of gas exhausting from nozzles at the blade tips along the negative axis of motion relative to the air. It is useful to have the theoretical relations worked out and tabulated systematically, but the region of applicability remains above

speeds which can be considered feasible in the present state of development, *i.e.*, above 500 m.p.h.

Students of the possibilities of reaction propulsion should avail themselves of the results worked out in this paper.

Motorless Flight. (Bulletin No. 3 of the International Commission for the Study of Motorless Flight, June, 1932.) (17.4/24928 Germany.)

The bulletin contains a review of gliding activities in various countries during the past year. Germany appears to be the only country with a proper organisation, and there the sport has maintained its position. Recent developments include starting by motor car and towed flights. The German Gliding Association favours the construction of gliders designed as such but fitted with auxiliary engines, to familiarise pupils with the piloting of power aeroplanes at low cost and risk.

Aircraft Carriers

Navies and the Aeroplane. (F. H. Wagner, Army Ord., No. 73, July-Aug., 1932, pp. 29-35.) (18.01/24929 U.S.A.)

The author develops the usual argument with reference to battleships *versus* aeroplanes, and appears to favour the latter. He considers the possibilities of dirigibles to be small. The use of poison gases against ships is put forward as a major problem of defence for the latter. Reference is made to chloro-vinyl-dichloro-arsine, which is stated to cause death by wetting a skin area of a few cm.^{2}

An air photograph of the U.S.S. " Lexington " is reproduced.

Physiological Conditions

Human Sensibility to Shocks. (Reiher and Meister, Forschung, Vol. 3, No. 4, July-Aug., 1932, pp. 177-180.) (19.29/24930 Germany.)

Graphical records are reproduced of typical shocks occurring in engineering practice, and of shocks produced by the apparatus employed in the investigation. Six degrees of intensity are selected:—

0.—Imperceptible.
1*a*.—Just perceptible.
1*b*.—Easily perceptible.
1*c*.—Strongly perceptible, but endurable.
2*a*.—Unpleasant, dangerous if continued.
2*b*.—Extremely unpleasant, immediately harmful.

Three diagrams are constructed with the duration as abscissa and amplitude of the shock as co-ordinate.

The regions corresponding to the above classification appear as parallel straight lines inclined at from 20° to 45° with the horizontal axis. These lines are displaced vertically downward as the number of shocks increases.

Another type of diagram has the number of shocks per second as the axis of abscissæ, and in this case the regions are bounded by straight lines inclined at small negative angles to the horizontal axis. A table gives comparison between the effects of horizontal shocks and of pure harmonic horizontal oscillation applied to a man standing upright.

These results enable an immediate estimate to be made as to whether shocks or vibrations of known intensity and duration are likely to be dangerous.

The Semi-Circular Canal of the Ear as a Direction Indicator. (E. Everling, Z.F.M., Vol. 23, No. 12, 24/6/32, pp. 342-343.) (19.29/24931 Germany.)

In blind flying, without instruments and without visual fixed points of reference, it is a common experience that the pilot loses all sense of altitude and direction. The author states that, on moving the head from side to side, the increase of acceleration when turning the head with the aeroplane and the decrease on turning the head against the aeroplane produces a difference of physiological sensations so clearly accentuated that the direction and approximate rate of the turn can be estimated. Training can be carried out to some extent in rotating chairs of cabins mounted on the ground, and the required perceptions developed.

References are given in nine footnotes.

Equipment

Collapsible Boat for Seaplanes. (Sci. Am., Vol. 147, No. 4, Oct., 1932, p. 236.) (20.34/24932 U.S.A.)

Two illustrations show the boat or raft inflated, with two passengers, and deflated. Two concentric tubes, independently inflatable, reduce the danger of collapse by puncturing. It is stated that the design is under the supervision of the U.S. Army Air Corps.

Lighting

Aeroplane Lights and Landing Ground Illuminations. (B. Duschnitz, Licht und Lampe, No. 12, 9/6/32, pp. 179-181; No. 13, 23/6/32, pp. 196-198; No. 14, 7/7/32, pp. 214-215.) (21.09/24933 Germany.)

In Part I a description is given of aeroplane lights with fixed or movable reflectors, streamlined for external mounting, or without fairing when sunk in the structure. Five photographs are reproduced.

Descriptions of ground lights on fixed and movable standards or retractable below the surface are also illustrated by two photographs. In Part II, systems of ground lighting are considered. Three travelling searchlights, a fixed 24 k.w. standard and a battery of eight 3 k.w. standard lights are shown in photographs. A typical lighted area is shown in diagram with a boundary curve of equal lighting intensity. A diagram of intensity for the 3 k.w. standard light is also shown.

In Part III, two systems of wiring are shown in diagram, one with all lights on a common main, the other with independent wiring to each group of lights.

Recommendations of International Airways Lighting Commission. (F. Born, Z.F.M., Vol. 23, No. 12, 24/6/32, pp. 343-346.) (21.095/24934 Germany.)

Diagrams show typical lighting of an aerodrome and of an air route. The general activities of the Commission are summarised under fourteen headings.

Visual Range of Lights at Night. (Bennett, Quarterly Journal of the Met. Society, Vol. 58, No. 245, July, 1932.) (21.09/24935 Great Britain.)

Author's summary.—The visual range of a point source of light is given by the formula:—

$$\frac{\text{Intensity} \times \text{transmission}}{(\text{Distance})^2} = \text{constant.}$$

Experiments are described in which the dependence of the constant on the brightness, B, of the background, is found to follow roughly the empirical formula, constant $= 0.12 + 10^{-4} B^{2/3}$ where the constant is in c.p./km.^{2}, and the background brightness is apparent c.p./km.^{2}.

From these results, and their application to some observations quoted by Bigg, deductions are made as to the magnitude of the effect of background brightness on the visual range of lights, and on the relation between the visual range of lights at night and of ordinary objects by day.

Meteorology

The Electrical Properties of Dust and Fog. (H. Sachsse, Ann. d. Phys., Vol. 14, No. 4, Aug., 1932, pp. 396-397.) (21.22/24936 Germany.)

Experiments were carried out on a variety of substances by the Millikan condenser method. Individual fog particles produced either by condensation of gases or the so-called " atomisation " of a liquid by a jet of compressed air are not electrically charged. This applies to paraffin oil. Fogs containing products of combustion are highly charged.

Friction plays an important part in the electrification of clouds and accounts for the well-known electrical properties of sand and snow storms.

Eight references are given.

Aerodynamics and Hydrodynamics

Velocity Field Round a Surface of Revolution with a Symmetrical Joukowski Profile as Meridian Section. (C. Ferrari, Aeron. Lab., R. Eng. School, Turin, R. Academia d. Sci. d. Torino, Series 2, Vol. 47.) (22.1/24937 Italy.)

A mathematical analysis is worked out in extension of Joukowski's methods to three dimensions. Some numerical results are given.

Conformal Transformation of Two Circles into Two Wing Profiles. (C. Ferrari, Aeron. Lab., R. Eng. School, Turin, R. Accad. d. Sci. d. Torino, Series 2, Vol. 67, 1930 and 1931.) (22.1/24938 Italy.)

The problem is stated in two steps; first the determination of the potential in the region external to the circles; secondly, the determination of the transformation from the circles to two wing profiles. The circles are first transformed into segments of straight lines, the transformation necessarily involving elliptic functions. Further transformations by methods analogous to Joukowski's transform the straight lines into segments of circles and into profiles of the Joukowski type.

A graphical procedure is given and the results are compared with calculated points, for which a numerical table is given, and agree as closely as is possible on a drawing board.

Aerodynamical characteristics of a biplane with determinate wing profiles and a number of geometrical properties connected with the transformation are worked out in a manner analogous to the work of V. Mises on a single Joukowski profile.

Mutual Effects of Eddy Systems. (A. Betz, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 164-174.) (22.1/24939 Germany.)

It is to be noted that the problems dealt with are substantially two-dimensional on the lines of Lamb's " Hydrodynamics," 5th Edition, para. 154. It is shown that the centre of intensity remains fixed while the moment of intensity formed in a manner analogous to the moment of inertia of distribution of mass also remains constant.

An application is made to the rolling up of the vortex sheet trailing from a wing. The sheet is assumed to roll up into two substantially circular tubes of vorticity.

The basis of the treatment appears to lie in the radial distribution of vorticity assumed in equation 20, for which no experimental or mathematical physical reason is offered. Subject to this assumption the numerical relations are worked out and shown graphically.

The effect of trailing vortices behind a system of lifting surfaces arranged as in a Venetian blind is also dealt with, and some elementary results are obtained subject to the usual simplifying assumptions.

The presentation of these elementary results in an explicit form should help to make clear the underlying ideas.

Eleven references are given.

The Eddy System in a Plane Turbulent Flow. (F. Magyar, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 157-163.) (22.1/24940 Germany.)

The flow is considered as compounded of a mean steady motion on which is superposed a variable motion due to a distribution of vorticity.

The distribution of vorticity is uniform along tubes at right angles to the flow, thus maintaining the two-dimensional nature of the problem. Further, the vorticity is assumed to be a periodic function of time and position—expressible in a Fourier series. The typical periodic term is formed and the velocities are obtained by integration over the field and over a half period. The effect of the vorticity on the mean velocity profile is shown graphically for a particular assumption. Suggestions are made for applying the method to observed conditions.

Abstractor's Note.—As experiment indicates the breakdown of two-dimensional conditions, it is not clear to what extent the two-dimensional treatment will offer useful results.

Wake of Two-Dimensional Wind Flow. (H. Schlichting, Ing. Archiv., Vol. 1, No. 5, Dec., 1930, pp. 533-571.) (22.1/24941 Germany.)

The author attacks the solution of the differential equations of turbulent viscous fluid motion along the lines suggested by Prandtl on the assumption that the effects of distributed eddies may be averaged in time and space and produce shear forces analogous to ordinary viscous motion. The so-called inertia terms are introduced by successive approximations of which the first and second are developed fully, further approximations leading to intractable computations.

The order of magnitude of various terms is classified with a view to selecting suitable approximations, but the assumptions appear, in part at least, to be drawn from the form of wake in steady flow under viscous shear forces. The first approximate solution is an algebraic equation of the sixth degree, which has to be fitted to the boundary conditions observed or assumed from the analogy of steady viscous flow. This is readily done with the seven arbitrary coefficients at disposal. The second approximations are obtained in the form of additive terms for the velocity components, by the superposition of which more elaborate curves are built up. A fit is obtained for the wake behind two parallel cylinders side by side.

Abstractor's Note.—A series of successive diagrams representing the flow at consecutive time intervals and exhibiting the transference of fluid, momentum, and heat is required to give some sort of definiteness to the analogy between the mean free path of kinetic theory and the mean transference path of the suggested analogy with turbulent motion. In the absence of such a physical basis the paper leaves an impression of an elaborate fitting of equations to known or assumed curves, the nature of the operation being obscured by a mass of analysis.

Examples of Irrotational Flow in Three Dimensions. (A. Alayrac, Pub. Sci. et Tech. du Ministère de l'Air, No. 13, 1932.) (22.1/24943 France.)

Elliptic and ellipsoidal co-ordinates are applied to two-dimensional and three-dimensional flow about elliptic cylinders and ellipsoids, hyperboloids, etc. An attempt to account for resistance by cyclic motions in three dimensions does not appear to lead to any definite results.

Measurements of Velocity and Pressure in Three-Dimensional Flow. (F. Krisam, Z.F.M., Vol. 23, No. 13, 14/7/32, pp. 369-373. Rept. from Inst. of Hydraulic Machines, Tech. High School, Karlsruhe.) (22.1/24944 Germany.)

A description is given of a spherical pressure head with five perforations connected to manometers and calibrated for measurement of velocities in terms of pressures, the mean direction of flow being also determined approximately.

The pressures agree fairly closely with the values calculated from hydrodynamical theory up to an angle of 60° from the forward head water branching point, and thereafter fall off rapidly in the region where the flow is diverted from the surface of the sphere.

A number of calibration curves are given and comparisons are made with numerical results obtained by other experimenters. The apparatus is applied to measure velocities in the Kaplan turbine and the results are given graphically.

Thirty references are given.

Calculations of Two-Dimensional Periodic Flow in the Boundary Layer. (H. Schlichting, Phys. Zeit., No. 8, 15/4/32, pp. 327-335.) (22.1/24945 Germany.)

A definition is given of a new type of boundary layer flow which partly meets the serious objections recently raised by visual observation with the ultra-microscope (see Abstract No. 24/24123). For two-dimensional flow along a plane boundary the surface of an ideal boundary layer is assumed to be a wave surface with fixed nodes equally spaced along a parallel plane, but with an amplitude which is a periodic function of the time. Admitting that such a surface exists, the flow in a boundary layer also becomes a periodic function of time. A diagrammatic representation of the resulting longitudinal waves near the boundary recalls G. I. Taylor's note to the abstracted paper mentioned above.

It is possible that in actual motion the nodes are not stationary. The idea, however, appears to be valuable, and might be generalised by introducing moving nodes. In the present paper application is made not to steady flow affected by turbulence but to periodic flow set up by an oscillating cylinder.

The equations of motion are written down and first and second approximations are worked out on lines similar to the author's previous paper. The results are shown graphically and compared with Andrade's photographs of Kundt dust figures (see Abstract No. 23/23116). Generally the resemblance is striking, and it may be inferred that the mathematical physical treatment is a satisfactory approximation.

Hollow Spindle-Shaped Liquid Jet. (K. Ito, Aer. Res. Inst. (Tokyo), Rept. No. 81, July, 1932.) (22.1/24946 Japan.)

Experiments were carried out on a hollow jet of water with air at a pressure of several millibars applied at the axis. Numerous photographs of the hollow jets thus obtained are reproduced.

The object of the experiments is not quite clear.

Configuration of Streamlines shown by Formation of Rust. (F. Numachi, Phil. Mag., Vol. 14, No. 91, Sept., 1932, pp. 496-500.) (22.1/24947 Great Britain.)

The radial flow of water past guide vanes gave a formation of rust on the iron end plate which indicated the direction of the streamlines along the boundary. Three photographs are reproduced which show clearly the lines thus formed. The discontinuity of flow at the tip of the guide vanes is well defined.

Flow of Water through a Circular Pipe; Effect of an Axial Wire. (A. Fage and H. C. H. Townend, Phil. Mag., Vol. 14, No. 91, Sept., 1932, pp. 500-508.) (22.2/24948 Great Britain.)

The investigations of Lea and Tadros on the effect of an axial wire on the flow of water through a circular pipe are discussed. The experiment was repeated and the motions observed by ultra-microscope. A number of discrepancies arose and these are discussed carefully. At low Reynolds numbers the motion is found to be steady. Slight irregularities in mounting may account for the discrepancies.

Motion of Water in a Tube. (J. Baurand, Ann. d. Phys., Vol. 18, Sept., 1932, pp. 107-194.) (22.2/24949 France.)

Waves were produced at the surface of a basin 1.12 metres in diameter and observed optically. Methods and results are described in minutest detail. Wave velocities and amplitudes are given graphically and in tables and some photographs of wave trains are reproduced.

Analysis of Mutual Influence of Aeroplane Organs. (Abridged Report of Paper by C. Weiselsberger read at 21st meeting of W.G.L., 1932. Z.F.M., Vol. 23, No. 18, 28/9/32, pp. 533-535.) (22.4/24950 Germany.)

Interfering organs are considered in three principal pairs: Airscrew-Body, Body-Wings, Wings-Airscrew. The influence of the body on the air stream, in which a tractor airscrew works, is shown diagrammatically and a simple formula expressing the effect of a simple source near the nose of the body represents closely enough the actual effect.

The influence of body on wing lift is considered in terms of distribution of circulation along the span. This is expressed in a Fourier series in which enough terms can always be taken to give as close a fit as is desired. Numerical data and results for two nacelles built into a wing are given graphically and show a satisfactory fit between observed and calculated lifts with eight terms of the Fourier series.

The mutual influence of airscrew and wings is discussed, superposing velocity fields in accordance with previous investigations to which reference is made. Lift-drag curves are calculated for two cases—the airscrew set above the wing and below the wing, and a close fit with experimental points is obtained.

The Eddy System in Turbulent Flow between Planes. (F. Magyar, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 157-163.) (22.4/24951 Germany.)

The mean flow is taken as parallel to a given direction. The conceptions of Prandtl and others are stated, and an attempt is made to build up expressions representing the eddy systems and giving a flow approximately equivalent to the actual stream. Developments in Fourier series are assumed for the periodic function representing the eddy motion, and the resulting expressions are integrated

over the whole region of vorticity to give the resulting superposed motions at any point. The expressions are so general that no contradiction of the facts need be anticipated. On the other hand, mere qualitative agreement does not appreciably advance the solution of the general problem.

Twenty-one references are given.

Air Resistance of Spheres at Medium and High Speeds. (C. Pasqualini, Aeron. Lab., R. School of Engineering, Turin; IVth Congress, Internat. Rept., Vol. 4.) (22.4/24952 Italy.)

Experiments were carried out on the resistance of spheres at velocities up to 300 m. per sec., on a whirling arm. The distribution of pressure is plotted for four values from 57 m. per sec. to 180 m. per sec. Measurements were also carried out on a sphere rotating in a uniform current. The results are tabulated.

Air Resistance of Spheres at the Velocity of Sound. (Riv. Aeron., No. 3, March, 1931.) (22.4/24952 Italy.)

Spheres mounted on a whirling arm were carried at velocities up to 340 m. per sec. Observed distributions of pressures are plotted graphically.

Resistance of Projectiles at Oblique Angles at Speeds Less than that of Sound. (F. Burzio, Aeron. Lab., R. Eng. School, Turin, Riv. D'Artiglieria e Genio, June, 1929.) (22.4/24953 Italy.)

A summary is given of measurements of pressures on a projectile, obtained at the Royal School of Engineering, Turin, at velocities up to 240 m. per sec. Rough curves of pressure distribution are drawn for velocities of 60, 150 and 240 m. per sec., and the pressures are integrated over the surface in order to obtain the total force and moments on the projectile. The distribution of pressure along the axis is shown graphically. The conclusion is reached that the lateral force is two to three times the resistance for an angle of 11°.

Experimental Determination of Fields of Velocity in Two and Three Dimensions by the Electrical Analogy. (C. Ferrari, Aeron. Lab., R. Eng. School, Turin, L'Aerotecnica, Vol. 10, No. 6, June, 1930.) (22.4/24954 Italy.)

The mounting of the body in the tank and the methods of recording equal potential lines are described. Worked-out results are shown for a wing profile and for a dirigible.

In a reprint of Riv. d'Artiglieria e Genio, June 1930 (F. Burzio), the ideal field of flow round a projectile is worked out. Tests were carried out by the same author on the resistance of projectiles at the velocity of sound and the results are given graphically and in tables in a reprint from Riv. d'Artiglieria e Genio, Sept./Oct. 1931.

Two Problems in Potential Theory. (T. C. Fry, Bell Tele., B.671.) (22.4/24955 U.S.A.)

The potential field due to a circular cylinder surrounded by a coaxial circular cylinder slotted between two generators is worked out by the methods of conformal transformation. The field due to two parallel planes, one with a circular slot, is also worked out in elliptic co-ordinates.

The results have applications to the production of beams of electrons by shielding the source with slotted metal sheets.

Long Distance Gas Transmission (Hamm-Hanover). (Z.V.D.I., Vol. 76, No. 38, 7/9/32, p. 916.) (22.5/24956 Germany.)

Power gas is transmitted 60 miles through a 50 cm. diameter pipe line under a pressure of one atmosphere. The resistance coefficients at different Reynolds numbers are in satisfactory agreement with the results of Jakob and Erk (Forschung Arb. Ing. Wes. No. 267).

Materials, Elasticity

The Factor of Safety of a Statically Indeterminate Framework. (E. Melan, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 129-136.) (23/24957 Germany.)

The author discusses the relation between the factor of safety and the cross-sectional area of individual members. The course of the deformation is considered up to and beyond yield point of a particular member. The inclusion of a redundant member which is strained beyond its yield point may reduce the factor of safety of the frame as a whole.

Static Deflection of a Clamped Rectangular Plate. (H. Schmidt, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 142-151.) (23/24958 Germany.)

The usual partial differential equation of the fourth order in two variables is considered. A solution is written down in the form of an integral, the integral containing products of Bessel functions and elementary functions.

The boundary conditions are introduced. A valuation of the integrals and series is discussed and formal solutions are obtained. The analysis is heavy and unsuitable for abstraction.

Deformation of a Rectangular Plate with Rigidly Held Edges. (H. Schmidt, Z.A.M.M., Vol. 12, No. 3, June, 1932, p. 142-151.) (23/24959 Germany.)

The solution proceeds along formal lines, and expressions are obtained for the flexion of the plate under specified loads.

The author gives three references to his own previous work.

Determination of the Position of Equilibrium from Observation of Damped Oscillations by the Theory of Probabilities. (M. Schuler, Z.A.M.M., Vol. 12, No. 3, June, 1932, pp. 152-156.) (23/24960 Germany.)

It is pointed out that the usual method of determining the mean position is inaccurate. A more precise result is obtained by applying the method of least squares.

Three references are given.

Elastic Limit of Metals under Tri-Axial Stress. (G. Cook, Proc. Roy. Soc., A.833, Sept., 1932, pp. 559-574.) (23.2/24961 Great Britain.)

A relation between the principal stresses at the elastic limit is sought. No satisfactory correlation of the test results with current hypothesis, *e.g.*, maximum shear stress constant, maximum shear strain energy constant, maximum total strain energy constant, is obtained.

The exposition is obscured by a variety of units, mms., cms., inches, lbs., tons and atmospheres.

Recovery of Elasticity in Overstrained Steel. (S. L. Smith and J. V. Howard, Proc. Roy. Soc., Vol. 137, A.833, Sept., 1932, pp. 519-530.) (23.2/24962 Great Britain.)

Elasticity is defined as proportional or linear when the stress strain diagram is a double straight line and as non-linear when there is a definite hysteresis loop which is repeated over a number of stress cycles. A period of repose after overstrain may restore the linear elasticity. Overstrain may merely shift the linear stress strain diagram by reason of permanent strain, but beyond a certain overload hysteresis loops appear with increasing areas. A table gives a specification of fifty test pieces with a summary of results in recovery of elasticity.