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(*Prepared by R.T.P.*)

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Aircraft Design

Rolling Moments due to Rolling and Yaw. (M. Knight and C. J. Wenzinger, N.A.C.A. Rept. No. 379, May, 1931.) (5.1/22001 U.S.A.)

Rotation and torque tests were made of four wing systems rotated at various angles of yaw with different angular velocities. An important parameter is:

Angular velocity × span/flying speed.

The torque is measured by a dynamometer enclosed in a torpedo-shaped casing and is shown with other details of the installation in photographs. Rolling moments are plotted against the parameter for different angles of yaw and are tabulated numerically. Twelve references are given.

Moments of Inertia of Aeroplanes. (M. P. Miller and H. A. Soulé, N.A.C.A. Tech. Note No. 375, May, 1931.) (5.10/22002 U.S.A.)

The moments of inertia of all flight research aeroplanes are measured as a matter of policy. The principal axes of the ellipsoid of inertia are given for ten aeroplanes.

In the plane of symmetry the principal axes coincide with the trim-axis in two cases and are inclined at angles varying from $+2°30'$ to $-3°40'$ in extreme cases. Non-dimensional inertia coefficients are given for comparison of aeroplanes differing widely in dimensions. The use of units is inconsistent.

Pressure Distribution over Fuselage of Pursuit Aeroplane in Flight. (R. V. Rhode and E. E. Lundquist, N.A.C.A. Report No. 380, May, 1931.) (5.10/22003 U.S.A.)

Photographs exhibit the machine with the installation of manometer leads and distribution of orifices over the body. The results are plotted graphically in twenty-three sets of curves and numerically in tables.

Lift Distribution on a Wing of Arbitrary Plan. (I. Lotz, Z.F.M., Vol. 22, No. 7, April 14th, 1931, pp. 189-195.) (5.20/22004 Germany.)

The problem reduces to the solution of an integral equation. Incomplete solutions by Betz, Fuchs, Trefftz, Munk, Glauert and Gates are briefly discussed. The outstanding difficulty lies in the indeterminate value of the integral at the wing tips. The author investigates the possibility of completing the solution, including the determination of rolling and yawing moments, without prohibitive computation.

A result is obtained for a wing with an arbitrary plan, and variable incidence, which gives sufficient numerical convergence.

Expressions are found for rolling and yawing moments and are compared with experimental results.

Fuselage Interference Effect. (A. S. Hartshorn, Airc. Eng., Vol. 3, No. 30, August, 1931, pp. 201-203.) (5.11/22005 Great Britain.)

A number of experimental results are taken from international laboratory tests and are discussed in reference to the aerodynamical qualities of complete aeroplanes. The results indicate some advantage for a high wing arrangement.

Head Resistance and Thrust Efficiency. (H. B. Helmbold, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 323-325.) (5.102/22006 Germany.)

Exact measurement of resistance and thrust efficiency at full scale requires measurement by thrust and torque meters. As these were not available, full scale flight performances were reduced in accordance with standard aerodynamic relations and compared with model tests. The types tested were Junkers W.33 and A.35, with Junkers L.5 engines. Rumpler C.VI and Heinkel H.D.22 with B.M.W.IV engines.

Aeroplane Design and Tactical Requirements. (Major T. N. Joyce, Air Services, Vol. 16, No. 7, July, 1931, pp. 37-40.) (5.15/22007 U.S.A.)

The author, who is a test pilot of military aircraft, discusses the relation of design to tactical requirements in a comprehensive manner. Particular attention is given to the field of view. The need of specialised machines in addition to general service machines is maintained.

Relations of Speed, Cost and Range to Aircraft Resistance. (A. Koyemann, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 329-332.) (5.14/22008 Germany.)

Approximate expressions are developed, depending largely on empirical factors. The costs of passenger traffic are worked out numerically in pfennigs per passenger per kilometre and are roughly equal to the figures for railway transport, while the air speed is from six to nine times as great.

Air Races and Design. (W. Wait, Aero Digest, Vol. 18, No. 5, May, 1931, pp. 46-48.) (5.15/22009 U.S.A.)

The author maintains that progress in design comes more rapidly from racing than from mere step by step development, and collects a large number of figures to illustrate his point. He attributes the present backwardness of American military design to their falling out of the Schneider Cup contests.

Method of Least Work in Stressing Aeroplanes. (F. G. Evans, J. Roy. Aer. Soc., Vol. 35, No. 247, July, 1931, pp. 642-644.) (5.15/22010 Great Britain.)

The elementary theory is developed and methods of application are outlined. Correction for secondary stresses is indicated.

Mechanical Testing in Aircraft Construction. (I. J. Gerard, J. Roy. Aer. Soc., Vol. 35, No. 247, July, 1931, pp. 579-608.) (5.15/22011 Great Britain.)

The methods of testing imposed by the requirements of the A.I.D. are discussed and illustrated by sketches of test pieces. Photographs exhibit spars, pipes, frames and hulls under load factor tests. A brief note on testing engine components is added.

Interaction of the Spars in Cantilever Wings. (E. Abit, L'Aeronautique, No. 144, May, 1931, p. 172.) (5.252/22012 France.)

Previous work, mainly by German writers, is reviewed and certain criticisms are offered. The author appeals to test results which indicate important reactions between the main spars under ordinary conditions of loading, and devises a new scheme of calculation taking this factor into account. The details of computation are omitted, but numerical results are embodied in curves and numerical examples. Finally it is claimed for the method that the best utilisation of material is rendered possible.

Gerin Variable Surface Wing. (L'Aeronautique, No. 144, May, 1931, pp. 188-190.) (5.254/22013 France.)

Photographs and diagrams illustrate the construction and operation of the Gerin variable surface wing. See Abstr. No. 19/21314.

Investigation of Aeroplanes with Variable Wings. (W. Schmeidler, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 325-329.) (5.254/22014 Germany.)

The distribution of circulation along the wing is discussed mathematically, and results, given numerically and graphically, are in fair agreement with measured results.

Starting and Landing of Aircraft without Undercarriages. (A. Pröll, Z.F.M., Vol. 22, No. 9, May 15th, 1931, pp. 255-258.) (5.50/22015 Germany.)

The saving in weight and resistance obtained by dispensing with a landing carriage is so great that the possibilities of starting from a trolley or detachable carriage and landing without a carriage are considered worthy of detailed discussion. The principal difficulty in landing is the need for maintaining clearance between the airscrew and the ground.

Tests with Aeroplane Brakes. (Conclusion of 222nd D.V.L. Report, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 338-344.) (5.58/22016 Germany.)

In continuation of the first part, the effect of braking landing wheels is discussed. The moment about the centre of gravity on different types of soil is shown graphically against time of taxying. The wearing properties of various facing materials are tabulated. Photographs show the effects of wear and the mounting of the load indicator. Comparisons are made with the braking of automobile wheels.

Aeroplane Braking Systems. (R. Waring-Brown, Airc. Eng., Vol. 3, Nos. 28/29, June/July, 1931, pp. 139-140 and 157-161.) (5.58/22017 Great Britain.)

The not inconsiderable difficulties met in applications of braking to aeroplanes are discussed clearly. Elementary formulæ are derived for the braking drag obtainable and the effect in reducing landing run. Various relations between machine weight, drag, attitude, aerodynamical drag, brake drag, wheel position, and wheel loading are given graphically. Variations of coefficients of friction of brake lining with temperature, pressure and rubbing speed are plotted. Servo brakes are discussed and a number of mechanical details are illustrated.

Experiments with Floats. (F. Seewald, Z.F.M., Vol. 22, No. 9, May 15th, 1931, pp. 265-276, 219th D.V.L. Report, Pt. 1.) (5.51/22018 Germany.)

The paper was read at the D.V.L. meeting 18. 7. 30. The author investigates the resistance of floats during the start and compares them with English model results. It is pointed out that the usual model experiment takes place within the region of low Reynolds numbers in which the surface flow is partly laminar and partly turbulent, and the total resistance falls short of that observed with high Reynolds numbers. The coefficients of moment of resistance of a float are exhibited graphically for constant loading and speed as functions of the trim angle for three different velocities, all lower than the starting velocity.

The moments of the wing lift, airscrew thrust and control surface forces about the centre of gravity are also shown graphically for different positions of the elevator.

The inferences to be drawn from Pabst's paper on landing shocks (see Abstract No. 14/12779) are discussed at length.

Seaplanes—Flotation Gear. (V. W. Harshman, Air Services, Vol. 16, No. 6, June, 1931, pp. 30-32.) (5.51/22019 U.S.A.)

A pilot after a forced descent at sea remained afloat in a rubber boat for five days. His log is reproduced and is illustrated by a photograph of the boat, inflated by the use of compressed carbon dioxide.

See Abstract No. 19/21306.

Variable Pitch Airscrew. (Autom. Ind., Vol. 64, No. 24, June 13th, 1931.) (5.658/22020 U.S.A.)

The blades of a Curtiss variable pitch airscrew are rotated to the required setting by a small electric motor. The drive is geared down heavily so that the required motor torque is small, and the storage battery for lighting supplies the power. The centrifugal force on the blade roots offered the most serious mechanical problem.

No design details are given.

Instruments

Metering of Large Volumes of Air. (H. S. Bean, M. E. Benesh, and E. Buckingham, Bur. Stan. J. Res., Vol. 7, No. 1, July, 1931, pp. 93-145.) (6.22/22021 U.S.A.)

From authors' abstract :—

Experiments were carried out on the flow of air from a large gas-holder through a rotary displacement gas meter of 200,000 c.f. per hour rated capacity, a 24 by 12 inch Venturi meter, and various thin-plate orifices installed in a smooth 24 in. pipe. The rate of flow was determined from observations on the holder, which was flooded by a stream of water, to control the temperature. The average precision of a determination was better than ± 0.5 per cent.

When the values obtained for the discharge coefficients of the orifices were so reduced as to be comparable with the most complete and accurate published values for water, the agreement was very satisfactory.

The Functioning of the Pitot Tube. (L. Escande and M. Teissié Solier, C.R., Vol. 192, No. 19, May 11th, 1931, pp. 1152-1154.) (6.251/22022 France.)

The effect of the position of the lateral orifice was measured at various distances downstream. The coefficient approaches unity very closely. The orifice is moved nearer and nearer the hemispherical head and finally over it the calibrated curve departs altogether from the straight line indicating constant unit value.

The Effect of Working Conditions on a Pitot Tube. (Teissié Solier, C.R., Vol. 192, No. 21, May 26th, 1931, pp. 1306-1309.) (6.251/22023 France.)

The calibration of a pitot tube was carried out in non-turbulent and turbulent flow. The author states that the coefficient remains practically unity under both sets of conditions.

The impulse of a turbulent jet upon a flat plate was also measured, and was found to agree closely with the calculated impulse neglecting the turbulence.

Diaphragm Pressure Elements. (T. Theodorsen, N.A.C.A. Rept. No. 388, July, 1931.) (6.251/22024 U.S.A.)

The calibration of diaphragms of pressure elements shows changes with temperature, and ageing effects with time. The temperature factor was found to arise from difference between the coefficient of expansion of the diaphragms and of the cylindrical wall of the element. Methods for compensation are described. Internal hysteresis was found to be negligible, and lag was found to be due to the friction of the point of the stylus. Weaker springs controlling the stylus gave better results. Other errors were found to be due to bad adjustment. Calibration results are given graphically for useful ranges of temperature and pressure. The elementary elastic theory of deformed membranes is given.

A New Instrument for Accurate Measurement of Air Pressure in Mine Ventilating Shafts. (E. Stach and H. Kirsten, Z. Instrum., Vol. 51, No. 2, February, 1931, pp. 106-107.) (6.252/22025 Germany.)

The Askania statoscope adapted to air pressure measurements in mines indicates pressure differences of the order of .1 mm. of mercury in ventilating shafts.

A Balanced Diaphragm Indicator of Maximum Cylinder Pressure. (J. A. Spanogle and J. H. Collins, N.A.C.A. Tech. Note No. 359.) (6.251/22026 U.S.A.)

The diaphragm is contained in a compact pressure element which brings it within $\frac{1}{8}$ in. of the combustion chamber walls without necessitating water cooling. Contact of the diaphragm with a stop encloses a circuit containing a Neon lamp. In measuring maximum explosion pressures a range of pressures is taken which shows the variation between cycles. The indicator is in use at the Langley Memorial Aeronautical Laboratory, and is considered the most accurate available instrument for indicating maximum cylinder pressures.

Piezo-Electric Measurement of Rotary Acceleration. (Z. Instrum., Vol. 51, No. 5, May, 1931, p. 239.) (6.44/22027 Germany.)

The German Reichsanstalt have constructed a piezo-electric device for measuring engine acceleration. It virtually consists of a small flywheel, acting as an inertia mass and driven by the engine crankshaft through quartz crystals. The arrangement is balanced against centrifugal acceleration.

A New Turn Indicator. (Airc. Eng., Vol. 3, No. 28, June, 1931, p. 146.) (6.52/22028 Great Britain.)

A brief description, illustrated by a sectional sketch, is given of a gyroscopic turn indicator in which some novel mechanical details are applied. The diameter of the casing is given as 4 in., and total weight as 25 ounces. It is stated that test flights have given useful results.

Course Indicator of Pointer Type for Visual Radio Range-Beacon System. (F. W. Dunmore, Bur. Stan. J. Res., Vol. 7, No. 1, July, 1931, pp. 147-170.) (6.55/22029 U.S.A.)

From author's abstract:—

A form of tuned-reed radio range-beacon course indicator is described, called a reed converter, in which the course indications are not given by observing the two reed motions as heretofore, but by means of a zero-centre pointer type indicating instrument. The motion of the two reeds generates small alternating voltages, which, when rectified by oxide rectifiers and passed in opposing polarities through a zero-centre indicating instrument, serve to give course indications by the deflection of the indicating instrument needle in the direction of deviation of the aeroplane from the course.

A New Device for Shock-Proof Mounting of Measuring Instruments. (R. Müller, Z. Instrum., Vol. 51, No. 2, February, 1931, pp. 95-97.) (6.9/22030 Germany.)

The instrument is mounted on a platform which has torsional motion with a free period of about four seconds under spring control and liquid damping.

The device is compact and easily fitted or removed, and enables steady and accurate readings to be made in buildings subject to vibration without providing independent foundations.

Stability and Control

Longitudinal Stability of the Canard Type. (Z.F.M., Vol. 22, No. 11, June 15th, 1931, p. 333.) (7.25/22031 Germany.)

A complete enumeration is given in tabular form of possible arrangements of wings and control surfaces for longitudinal stability.

Focke-Wulf Canard. (H. Focke, L'Aeron., No. 144, May, 1931, pp. 165-171.) (7.25/22032 France.)

The designer, Prof. H. Focke, gives a brief specification of the Focke-Wulf and an elementary examination of the stability problems, which take a somewhat special form. A more technical note follows by W. Margoulis, on the relative stability of the normal aeroplane and of the Canard type, and formally demonstrates certain disabilities imposed on the latter by the relatively high loading of the stabilising surface on account of its forward position.

Method of Flight Measurement of Spins. (H. A. Soulé and N. F. Scudder, N.A.C.A. Rept. No. 377, May, 1931.) (7.62/22033 U.S.A.)

The test aeroplane was equipped with:

(*a*) three single component turn-meters affording three angular velocities about the main axis,

(*b*) a three-component accelerometer at the c.g. of the aeroplane affording acceleration along the aeroplane axes,

(*c*) a recording statoscope and special altimeter; the former was found to agree with the change of height measured by camera-obscura, and to be more convenient in operation. The recording altimeter was found to be inaccurate.

Two training aeroplanes were used, and the specification of their main characteristics is given with dimensioned sketches and photographs of the equipment. A list of symbols and formulæ used is given, and tables of measured and computed quantities. It is considered that the accuracy is sufficient to determine changes in design.

Eleven references are given.

Thermodynamics, Engines, Etc.

Current German Aircraft Engine Research. (Autom. Ind., Vol. 65, No. 5, August 1st, 1931, p. 155.) (8.1/22034 U.S.A.)

According to D.V.L. reports, the direct injection of light fuels in two-stroke spark-ignition engines offers certain advantages. An experimental aircraft engine is being constructed.

The Theory of the Combustion Chamber. (Jacoby, Autom. Zeit., Vol. 34, No. 14, May 20th, 1931, pp. 332-335.) (8.10/22035 Germany.)

To raise the compression ratio of an engine to its maximum possible value the compression space should be flat to give intensive cooling to the portion of the gas which burns last. The sparking-plug should be placed as near as possible to the exhaust valve; so that the last portion of gas to burn may not be compressed against this hot spot.

Equation of State of Propellant Gases. (A. D. Crow and W. E. Grimshaw, Trans. Roy. Soc., Lond., No. A.682, February 13th, 1931, pp. 39-73.) (8.10/22036 Great Britain.)

From authors' summary :—

To formulate an expression for the equation of state of the gases resulting from explosions of propellant of known chemical composition it has been found necessary :—

1. To evolve adequate methods for the measurement of pressure in the conditions encountered;
2. To investigate in detail the nature of, and to establish an expression for, the energy losses arising from the cooling of the hot gases at the wall surface of the vessel, together with the work absorbed in wall stress;
3. To re-formulate in the light of the latest available data expressions for assessing the molecular heats at constant volume of the various constituents of the gas complex, for temperatures ranging from 2700°K. to 4200°K.;
4. To re-calculate the equilibrium constant for the water-gas reaction over the range of temperatures involved;
5. To utilise the experimental evidence available for determining the effective volume occupied by the gas molecules.

Agreement to within 2 per cent. has been established for the ballistic force of the propellant, between the values derived from direct experiment and those obtained from thermodynamical considerations.

The Mechanics of Fire. (H. E. Armstrong, Jrnl. Soc. Chem. Ind., July, 1931, Jubilee No., p. 179.) (8.1/22037 Great Britain.)

This lecture by Prof. Armstrong in 1905 contains a remarkable forecast of many recent theories of combustion, including autoxidation, peroxidation and hydroxydation. Twenty-one references from 1867 to 1904 are given.

Combustion Process in the Injection Engine Using Pre-Combustion Chamber. (E. Schmidt, Z.V.D.I., Vol. 75, No. 19, May 9th, 1931, pp. 585-591.) (8.10/22038 Germany.)

The temperature distribution in an engine cylinder of a 10 h.p. 450 r.p.m. two-stroke crank scavenger by Deutz was measured by inserting thermo-couples and registering on a string galvanometer. The couples were of the platinum-rhodium type and ranged in thickness from 0.03 to 0.05 mm. The records obtained show the distribution of the flame in the pre-combustion chamber and in the main cylinder. The scavenging is indicated by discontinuities in the temperature curves. The absolute temperatures recorded may be affected by temperature

lag, but the motion of the scavenger air, as traced out by the couples, throws light on the operation of the cycle.

Engine Performance at High Compression Ratios. (Autom. Ind., Vol. 65, No. 5, August 1st, 1931, p. 175.) (8.1/22039 U.S.A.)

Experiments carried out on a N.A.C.A. universal test engine by the Engineering Research Department of the University of Michigan show that equal power outputs can be obtained from a high compression engine with equal intensity of detonation using fuels of very different antiknock properties, provided the spark can be adjusted over a wide enough range.

Superchargers and Supercharging. (O. W. Schey, Airc. Eng., Vol. 3, No. 28, June, 1931, pp. 134-138.) (8.235/22040 U.S.A.)

The data obtained in N.A.C.A. experiments are collected in a convenient form for reference and use by designers. Different types of superchargers are discussed and the principles illustrated diagrammatically. Numerous curves are reproduced showing comparative performance with various types of supercharger. The selection of a suitable type and capacity of supercharger is discussed and numerical values are assigned to the gain in maximum altitude, rate of climb, and speed.

Some Factors Influencing the Sizes of Crankshafts for Double-Acting Diesel Engines. (S. F. Dorey, J. N.E. Coast Inst. Eng., Vol. 47, No. 6, June-July, 1931, pp. 229-316.) (8.25/22041 Great Britain.)

Author's summary:—

The diameter of a shaft subjected to combined bending and torsion is calculated from the equivalent bending or twisting moment to a constant working stress, irrespective of the type of engine. In the paper a different working stress is allowed for each type of engine according to the ratio of twisting moment to bending moment, and also to the fluctuations of shear stress at the most severely stressed crank. The diameter of a crankshaft subjected to large fluctuations of torque is allowed a lower working stress than a shaft with the same maximum torque subjected to small fluctuations.

The method indicated in the first part of the paper shows how the strength of crankshafts can be ascertained from a knowledge of the fatigue properties of materials at various ranges of stress, and has been used to determine suitable diameters of crankshafts for double-acting Diesel engines, based on previous experience with steam reciprocating engines and single acting Diesel engines. The results indicate that for engines having a small number of cylinders the working stress permissible should be appreciably less than for engines having a large number of cylinders for the same factor of safety.

For two-stroke-cycle double-acting engines having a large number of cylinders the maximum working torsional stress due to combined twisting and bending suggested is somewhat in excess of that usually adopted in existing steam engines and single-acting Diesel engines, viz., 7,000-7,500 lbs. per sq. in., as against 5,600 lbs. per sq. in., and as a result some comments have been made relative to the shrinkage grip for built shafts.

Compression-Ignition Engines. (H. T. Tizard, Airc. Eng., Vol. 3, No. 30, August, 1931, pp. 185-186.) (8.25/22042 Great Britain.)

The author discusses the physical principles of combustion and power production in petrol engines, where the combustion is regarded as taking place with constant volume, and in compression ignition engines, in which combustion in the limit takes place at constant pressure but in practice between conditions of constant pressure and constant volume.

Using recent figures for the specific heats of the gaseous products of combustion and for the dissociation of water and carbon dioxide, ideal efficiences are calculated and shown graphically as functions of maximum pressure. A discussion of the relations between these quantities, taking into account the strength and radiating surface of the two types, indicates that the necessary compromise limits maximum pressure in a very definite way. The greater radiating surface of the compression ignition engine leads to the suggestion that the two-stroke cycle with initial pressures above atmospheric renders possible a design which will compete successfully with the petrol engine.

Heavy-Oil Engine Research in U.S.A. (W. F. Joachim, Z.V.D.I., Vol. 75, No. 3, January 17th, 1931, pp. 69-76.) (8.25/22043 Germany.)

Recent research work in America on Diesel engines is viewed critically with numerous extracts from the test results, illustrations of test apparatus, graphical charts of temperatures and pressures, delivery of fuel from nozzle, indicator diagrams, etc. A table is reproduced from the experience of Busch-Sulzer Bros. Diesel Engine Co., showing replacements in over six years for 100 Diesel engines kept under observation.

Numerous references are given to German work in the same direction.

The Michel Diesel Engine. (Autom. Zeit., Vol. 34, No. 11, May 20th, 1931, pp. 258-263.) (8.25/22044 Germany.)

In the Michel opposed cylinder engine three pistons move simultaneously with reference to a star-shaped combustion chamber. In a previous design the three pistons operated a hollow drum by roller and cam-track motion. The power output is taken from the rotating drum, which acts as a reduction gear. This arrangement is only suitable for ship propulsion. The article describes a later design in which three pistons of one unit operate on three separate crank-shafts, which are inter-geared by means of a triangular link plate. In this way an arrangement suitable for lorry work is obtained. Performance figures on an experimental unit show that reasonable m.e.p. can be held at 2,000 r.p.m. Work is in progress to adapt the design to aircraft purposes.

The Junkers Heavy-Oil Engine "Jumo IV." (Die Luftwacht, No. 6, June, 1931, pp. 284-285.) (8.26/22045 Germany.)

During a 50-hour type-test in five runs of 10 hours each under D.V.L. regulations, an average of 645 h.p. was developed at 1,710 r.p.m. The fuel consumption was .37 lbs. of gas-oil per brake-horsepower-hour. The lubricating oil consumption was relatively high at .033 lbs. per brake-horsepower-hour. During the run no critical periods were found for torsional vibration over the normal range between 1,300 and 1,800 r.p.m. On dismantling after the test no undue wear was discovered in any part. The engine is now undergoing flight test in a freight carrier.

Direct Fuel Injection for Four-Stroke Engines Using Electric Ignition. (Autom. Zeit., Vol. 34, No. 11, April 20th, 1931, p. 265.) (8.25/22046 Germany.)

A review is given of experiments carried out at the Massachusetts Institute of Technology. The fuel was injected by a Bosch pump, the duration of injection varying between 19° and 35° crank angle, either into the induction manifold or directly into the cylinder. The maximum possible compression ratio is not changed appreciably, but fuel injection increases the volumetric efficiency, and hence the power about 10 per cent. over that obtained with a carburettor.

Isovolt Electrodes for Sparking Plugs. (Autom. Zeit., Vol. 33, No. 25, September 10th, 1930, pp. 611-612.) (8.283/22047 Germany.)

It is claimed that a new alloy for sparking-plug electrodes, introduced by the A.C. company as Isovolt, does not burn away as rapidly as steel electrodes and requires a smaller sparking potential by its effective emission of electrons.

Stresses in Combustion Engines. (Autom. Zeit., Vol. 33, No. 25, September 10th, 1930, pp. 604-606.) (8.32/22048 Germany.)

Piston side pressure over a full working cycle is increased by off-setting the piston and displacing the gudgeon pin from the axis of symmetry. Cylinder wear is mainly due to piston ring friction and should be reduced by using rings of wider section.

The Balancing of Crankshafts. (W. Späth, Autom. Zeit., Vol. 33, No. 28, October 10th, 1930, pp. 671-675.) (8.34/22049 Germany.)

In slow speed balancing machines the crankshaft is usually supported by two bearings at the ends. At high speeds a shaft with unbalanced webs will deflect in the middle. If this is corrected by the machine considerable out-of-balance forces appear at low speeds. In the engine the shaft is usually supported by more than two bearings and the resultant deflection will depend upon the play in the bearings. The author describes a method of balancing with three bearings. Satisfactory results are obtained only if each throw of the crankshaft is separately balanced taking into account the effective mass of the connecting rod.

New Vibration Recording Apparatus. (W. Späth, Z.V.D.I., Vol. 75, No. 3, January 17th, 1931, pp. 83-85.) (6.104/22050 Germany.)

A brief note is given on developments of vibration recording instruments and their application.

Borg and Beck Coupling with New Oscillation Damper. (Autom. Zeit., Vol. 34, No. 2, January 20th, 1931, p. 32.) (8.765/22051 Germany.)

The coupling keeps the rubber cushion drive always under compression, which gives increased life of the material.

Cooling

Cooling System for Lubricating Oils. (British Pat. 339650, September 10th, 1929. T. R. Cave-Browne-Cave.) (8.4/22052 Great Britain.)

A cooling coil is mounted inside the oil tank and connected to an outside condenser. Carbon tetrachloride is suggested as a suitable cooling medium.

International Aero Exhibition, December, 1930, Paris. (Z.V.D.I., Vol. 75, No. 16, April 18th, 1931, pp. 473-480.) (8.40/22053 Germany.)

The majority of engines exhibited were air-cooled from 150 h.p. to 300 h.p. Water-cooled engines were mostly from 500 h.p. to 600 h.p. For many fighting purposes 300 h.p. is considered sufficient by the French authorities. The head resistance depends on the required cooling which takes place primarily in the boundary layer located on the fins of the air-cooled cylinder or on the cooling tubes of the radiator. If attempts are made to reduce the resistance below a certain amount the engine overheats. There does not appear to be much difference between the head resistance of the two types, nor does the air-cooled in-line differ appreciably from the radial engine. In the former case the guiding of the air from one cylinder to another requires cowling and guide vanes. The radial engine requires no guiding of the air, and, in spite of bigger cross-section, has equally low resistance, especially if the flow is controlled by ring cowling.

Endurance of Air-Cooled Engines. (Autom. Tech. Zeit., Vol. 34, No. 8, March 20th, 1931, pp. 188-189.) (8.422/22054 Germany.)

Statistics of endurance are collected from various foreign sources for the Rhone-Jupiter, Bristol-Jupiter, Cirrus and Wright-Whirlwind engines. The wide differences in the figures suggest that there is still a considerable factor of ignorance of engine performance.

Cooling of Engines. (A. Nutt, Airc. Eng., Vol. 3, No. 29, July, 1931, pp. 172-173. Nat. Aeronautic Meeting S.A.E., April, 1931, Detroit.) (8.44/22055 U.S.A.)

Cooling is discussed largely in relation to improved power output of the engine concerned by the use of a high temperature cooling medium. Ethylene-glycol and di-ethylene-glycol have been found satisfactory. Seven sets of curves show the experimental results obtained.

Patent Wing Radiator. (French Patent No. 701546, December 3rd, 1929, Nieuport-Astra. L'Aerophile, Vol. 39, No. 6, June 15th, 1931, p. 186.) (8.464/22056 France.)

The radiator consists of two metal sheets following the wing profile, between which the cooling liquid circulates. The radiator sections are attached at their edges and at intermediate points at which they are also inter-connected to form a closed circuit with the engine jackets.

Lubricants and Fuels

Carbonisation of Lubricating Oil. (H. N. Bassett, Chem. and Ind., Vol. 50, No. 26, June 26th, 1931, pp. 527-529.) (8.540/22057 Great Britain.)

The tendency of a lubricating oil to produce carbonaceous or gummy deposits in an engine is an important characteristic. The various laboratory methods of investigation may be divided into three groups depending on (*a*) volatility, (*b*) coking, and (*c*) oxidation. None of these reproduce engine conditions satisfactorily, and the rating of lubricating oil can be determined only by engine tests.

The Lubricating Properties of Mineral, Vegetable and Fatty Oil. (A. S. T. Thomson and P. S. Caldwell, J. Roy. Tech. Coll. (Glasgow), 2, 490-502 (1931). Chem. Absts., Vol. 25, No. 11, June 10th, 1931, p. 2842.) (8.54/22058 Great Britain.)

Tests were carried out on pure mineral oil, rape oil, castor oil, sperm oil and blended oils. A new apparatus is described for investigating the lubrication of cylinder bearings of the ring oiler type. The " oiliness " factor of mineral oils is increased by the addition of small quantities of fatty oils.

Lubricating Quality of Oils. (Z. Instrum., Vol. 51, No. 5, May, 1931, p. 237.) (8.54/22059 Germany.)

Indications of the boundary lubrication conditions are sought from the electrical rectifying property of the oil film. The displacement of the shaft in the bearing is measured. The beginning of rectification and minimum friction occur near the same speed and are thus associated with the thickness of the film.

Failure of Lubrication Under High Tooth Loading. (W. C. Bauer, Autom. Ind., Vol. 64, No. 24, June 13th, 1931, pp. 910-912.) (8.540/22060 U.S.A.)

The Standard Oil Development Co. have long held that the quality of an oil can be assessed only by tests to destruction, particularly for heavy-duty lubricants in the hypoid gear.

In 43 runs on a low-speed heavy duty chassis, 18 out of 29 lubricants failed.

The Use of Alcohol for Motor Fuels. (Karel Loskot, Chem. Ind., 25, 37-44, 62-7 (1931). Chem. Absts., Vol. 25, No. 10, May 20th, 1931, p. 2541.) (8.606/22061 U.S.A.)

Good results have been obtained from a fuel mixture of composition:—

Petrol	37·5 per cent.
Ether alcohol	37·5 ,, ,,
Benzine	25 ,, ,,

The alcohol must be anhydrous.

A fuel mixture, 60 per cent. petrol, 40 per cent. alcohol (99 per cent. anhydrous) has also given good results.

Mixing Alcohol and Motor Spirit. (K. R. Dietrich, Autom. Zeit., Vol. 33, No. 36, December 31st, 1930, pp. 873-877.) (8.606/22062 Germany.)

Five sectional diagrams are given of tanks equipped with apparatus for mixing alcohol and motor spirit to meet German legal obligations in this respect.

Fuel Quality. (F. R. Banks, Airc. Eng., Vol. 3, No. 29, July, 1931, pp. 168-170.) (8.64/22063 Great Britain.)

The author discusses fuel quality largely from the U.S. point of view, but also with reference to British Air Ministry specifications. Great importance is ascribed to suitable blending of fuels, and the remark is made that engine-makers in the U.S. can correlate the distribution of engine failures with local types of blended fuels used. The two most important points are wear and tear from high knock temperatures. The whole discussion is illustrated by references to particular fuels actually in use, and to selected specifications for valves and valve seatings.

Memorandum on Petrol-Alcohol-Benzole Mixtures. (C. Baron, C. Boulanger, R. Le Grain, C.R., Vol. 192, No. 22, June 1st, 1931, pp. 1383-1385.) (8.64/22064 France.)

Freezing experiments were carried out on a series of alcohol-petrol-benzole mixtures, as a result of which fuel consisting of 70 per cent. petrol (aviation), 20 per cent. benzole, and 10 per cent. alcohol is recommended as fulfilling best normal flying conditions.

Motor Fuel. (German Patent No. 520011, June 13th, 1926, E. G. E. Meyer.) (8.64/22065 Germany.)

The fuel consists of a mixture of a hydrocarbon distillate containing 1-5 per cent. of ether and a small quantity of a volatile base such as ammonia or methylamine.

Latent Heat of Evaporation in Fuels. (Wawrziniok, Autom. Tech. Zeit., Vol. 33, No. 26, September 20th, 1930, pp. 644-646, and No. 31, November 10th, 1930, pp. 764-766.) (8.640/22066 Germany.)

A method is described for determining the latent heat of evaporation of various fuels. The results for pure benzol, pure alcohol, and four intermediate mixtures of the two are given graphically against the percentage volume evaporated. Tables and graphical representations of several types of fuels and fuel mixtures are also given. On comparing the experimental results with calculated values it is concluded that the latter have sufficient accuracy for practical purposes.

Fuels. (Chem. and Ind., Vol. 50, No. 27, July 3rd, 1931.) (8.640/22067 Great Britain.)

In a symposium of fuel utilisation are papers on Gaseous Combustion in Industry, R. V. Wheeler, p. 550; Refining Progress in Petroleum Development, A. E. Dunstan, p. 557; and Low Temperature Tar, T. F. Hurley and M. A. Matthews, p. 584.

Fuel. (German Patent No. 520010, March 26th, 1929, A. J. Duncamp.) (8.64/22068 Germany.)

Premature combustion of the fuel or lubricant is prevented by the addition of mercury cyanide. The salt may be dissolved in a mixture of alcohol and ether and added to the fuel. Alternatively the salt may be dissolved in glycerol and added to the lubricating oil. The proportions of salt required range from .1 to 1 gram of cyanide to 10 litres of fuel.

High Temperature Knock Testing. (G. Edgar, Airc. Eng., Vol. 3, No. 29, July, 1931, p. 171. National Aeronautic Meeting S.A.E., April 1931, Detroit.) (8.645/22069 U.S.A.)

Curves and tables are given showing tetra-ethyl lead content against octane numbers for various blended fuels, so as to give satisfactory matching.

Photographic Determination of the Detonation Resistance of Petrols. (M. Aubert and R. Duchêne, C.R., Vol. 192, No. 25, June 22nd, 1931, pp. 1633-1635.) (8.645/22070 France.)

Flame photographs of an explosion in a bomb show two distinct features. The first portion of the flame, initiated at the sparking-plug, travels at relatively small speed and is not very actinic till it reaches the walls of the confining vessel, where it is reflected; and the reflected flame is generally much more actinic. The intensity of detonation depends on the relative intensity of these two phenomena. The authors propose a method of knock-rating fuels. A series of flame photographs with gradually increasing bomb temperatures shows a diminution in intensity of the flame travelling outwards from the plug, and an increase in the intensity of the reflected flame. The temperature at which detonation first takes place is marked by the failure of the first flame to register, while the detonation is recorded at some period subsequent to the passage of the spark preceded by the apparent blank on the negative. This temperature can be recorded with precision and is defined as the detonating characteristic of the fuel. By adding a dope, but keeping the temperatures the same, detonation is reduced and the first part of the flame reappears. The authors state that the classification of fuels obtained by them has been found to hold in actual engine tests.

Anti-Knock Motor Fuel. (British Patent No. 339637, July 10th, 1929, I. G. Farbenind.) (8.645/22071 Great Britain.)

The dope consists of a mixture of an amine such as dimethyl aniline and iron carbonyl.

The Behaviour of Anti-Knocks. (A. Egerton and L. M. Pidgeon, Nature, 127, p. 591 (1931). Chem. Absts., Vol. 25, No. 12, June 20th, 1931, p. 3156.) (8.645/22072 Germany.)

An experiment shows that lead tetra-ethyl must become oxidised before it acts as an effective anti-knock.

Anti-Aircraft Guns, Etc.

Aircraft Defence. (U.S. Nav. Inst. Proc., Vol. 56, No. 333, November, 1930, pp. 1034-1036.) (9.11/22073 U.S.A.)

In a descriptive article, quoted from the daily press, a number of technical details are given of anti-aircraft equipment and training.

Anti-Aircraft Gun Control. (R. H. Ward, Army Ordnance, Vol. XI., No. 66, May-June, 1931, pp. 452-457.) (9.61/22074 U.S.A.)

An elementary theory of range determination is illustrated by diagrams. The scheme of connections between a Sperry anti-aircraft gun control system mounted

on a truck and a battery of aircraft guns is reproduced. A photograph shows the battery and control in action. The principal requirements of anti-aircraft control are summarised.

Transportation of Artillery by Air. (L. B. Ely, Aero Digest, Vol. 18, No. 6, June, 1931, pp. 38-39.) (9.61/22075 U.S.A.)

An operational account is given of the transport by aeroplane of a three-inch four-gun howitzer battery, with crews.

Materials

Cast Iron Containing Molybdenum. (Autom. Ind., Vol. 65, No. 5, August 1st, 1931, pp. 168-171.) (10.1/22076 U.S.A.)

The physical properties of the whole range of cast irons are improved by the addition of .4 to 1.4 per cent. of molybdenum. The tensile strength, fatigue limit, Brinell hardness, and resistance to wear are improved, without loss of machining qualities.

Some New Anti-Corrosion Protective Coverings for Iron and Steel. (H. Reinniger, Autom. Zeit., Vol. 34, No. 2, January 20th, 1931, pp. 27-29.) (10.125/22077 Germany.)

Three methods are described. One consists of spraying with aluminium; the other two are chemical in the sense that an iron oxide or iron phosphate deposit is produced on the steel. The latter has received a fairly wide application.

"Ni-resist," a New Cylinder Material. (Mahle, Autom. Zeit., Vol. 34, No. 11, April 20th, 1931, p. 257.) (10.101/22078 Germany.)

The International Nickel Co. has introduced a new iron nickel alloy for which great advantages are claimed as a cylinder liner material. Its thermal expansion is stated to be as high as .000019, compared with .000012 for cast iron, and with a light alloy piston of similar thermal expansion close working fits can be maintained at all temperatures. According to tests carried out by the German firm producing Electron the thermal expansion of the material does not generally exceed .000016. The higher the thermal expansion the lower is the hardness, and the heat conductivity is only about one quarter of that of cast iron.

Nickel-Iron Alloys. (F. E. J. Ockenden, J. Sci. Insts., Vol. 8, No. 4, April, 1931, pp. 113-117.) (10.210/22079 Great Britain.)

The properties are described of a new group of nickel-iron alloys which give extremely high permeability and low core losses. Various applications to the design of instruments are suggested.

Influence of Acetylene Pressure on the Quality of Welded Joints. (K. Gabler, Z.V.D.I., Vol. 75, No. 3, January 17th, 1931, pp. 77-81.) (10.140/22080 Germany.)

The effect of pressure on the delivery of the jet, the mixing with air, and the composition of the burnt gases is discussed in relation to their effect on extension and tensile strength of welds. The results are exhibited graphically in numerous diagrams.

Investigations on the Thermal Expansion of Aluminium Alloys. (H. Sieglerschmidt. Z. Metallk., Vol. 23, No. 1, January, 1931, p. 26-30.) (10.231/22081 Germany.)

Comparative experiments were carried out on duralumin, lautal (5 per cent. copper), and on pure and commercial aluminium. The coefficient of expansion

depends on the temperature and state of the sample, especially after cold working. The coefficient increases with temperature, with stationary points indicating the crystallisation of the metal. The opinion is expressed that this new method of studying thermal expansion will throw light on the theory of alloy structure.

The Process of Ageing in Various Aluminium Sand-Cast Alloys. (W. Saran, Z. Metallk., Vol. 23, No. 1, January, 1931, pp. 32-33.) (10.231/22082 Germany.)

Two types of alloys were tested, one requiring heat treatment after casting, the other ageing at room temperature.

The ageing process was completed in 12 days, and the heat treatment in 20 days. Brinell tests on the heat treated alloys showed day to day variations in the hardness, possibly due to periodic changes in the room temperature.

Magnesium. (J. A. Gann, S.A.E., Vol. 28, No. 6, June, 1931, pp. 653-668.) (10.232/22083 U.S.A.)

The author describes foundry practice in the production of magnesium and magnesium-alloy castings, and the effect of heat-treatment and fabrication processes on the microstructure and physical properties.

Applications of magnesium alloys to aircraft and automobiles are outlined.

The importance of magnesium as a structural metal is now being recognised, as the factors that have retarded its development and restricted its use are overcome.

Dural Plate Riveted Joints, Corrosion Tests. (P. Brenner, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 344-346.) (10.262/22084 Germany.)

The loss of strength and extensibility after 80 days' exposure to corrosion by salt water spray with 20 per cent. Na.Cl. solution is tabulated. Seven photographs show the surface appearance and the sectional view of the rivets. The worst effects are avoided by counter-sinking the heads of the rivets in the riveted plates.

Wind Tunnels, Testing Gear, Etc.

An American Wind-Channel. (R. J. Fairbanks, Airc. Eng., Vol. 3, No. 28, June, 1931, pp. 147-148.) (11.1/22085 U.S.A.)

A brief account is given of the American 8-foot wind tunnel at the University of Michigan. A number of technical data are given, and three photographs illustrate the equipment of tunnel, test chamber and workshop.

Full-Size Wind-Channel. (Aviation, Vol. 30, No. 7, July, 1931, p. 405.) (11.1/22086 U.S.A.)

A descriptive account is given of the new N.A.C.A. 60′ × 30′ wind channel. It is of the free-jet type and is equipped with two 34′ diameter airscrews absorbing 4,000 h.p. each and producing a flow speed of over 50 m/s. Two photographs show the driving airscrews and a full size biplane mounted on the balance.

Modern Windmills. (Inst. World, Vol. 4, No. 39, July, 1931, p. 56.) (11.12/22087 Great Britain.)

A quotation from a catalogue states that the substitution of two blades with stream-line profiles reduces the thrust and the corresponding stresses on the tower to an appreciable extent.

Method for Measuring Turbulence. (C. F. Taylor, N.A.C.A. Tech. Note No. 380, June, 1931.) (11.16/22088 U.S.A.)

The conductivity of a hot wire under ordinary wind channel conditions and with artificially increased turbulence is plotted for inclinations to the stream

between 0° and 90°. There is in every case a marked maximum near 90°. With artificial turbulence the curve remains almost the same up to about 80°, where it branches off and develops a lower maximum.

It is not considered that the phenomenon is completely analysed, but beginning has been made in setting up some sort of quantitative standard of turbulence.

Experimental Towing Basin. (Aviation, Vol. 30, No. 7, July, 1931, p. 406.) (11.35/22089 U.S.A.)

The new N.A.C.A. towing basin is 2,040 feet long by 24 feet wide by 12 feet deep at the centre line. Some details are given of the travelling carriage and equipment. Speeds up to 50 m.p.h. are obtained.

Two photographs are reproduced.

Sound-Proof Aero-Engine Test Bench at Travemunde. (H. Weidinger, Z.V.D.I., Vol. 75, No. 16, April 18th, 1931, pp. 501-502.) (11.55/22090 Germany.)

The engine is mounted on a Seppeler reaction torque bench, the power being absorbed by an airscrew. The air stream is drawn through a 50 ft. channel with guide vanes, passes over the engine, and is propelled into the open through a second channel. The torque bench is insulated from the air stream by a wall with windows and control apertures. The building has heavy concrete double walls lagged with sound-absorbing material. An air speed of 100 ft. per second can be maintained and is sufficient for the cooling of large air-cooled radial engines.

The sound insulation is sufficiently complete to make it possible to erect the plant in a residential neighbourhood without noise nuisance.

Lubricants and Bearings Test Machine. (E. S. Glauch, Iron Steel Eng., 8, p. 129 (1931). Chem. Absts., Vol. 25, p. 2842, No. 11, June 10th, 1931.) (11.55/22091 U.S.A.)

A new test machine is described capable of taking loads up to 40,000 lbs. The machine is suitable for testing lubricants or bearing materials.

Aerostats, Etc.

Graf Zeppelin Flights, 1930. (Luftwacht, No. 5, May, 1931, p. 203.) (12.10/22092 Germany.)

From April to December, 1930, the airship Graf Zeppelin made 109 flights. The total flying time was 1,273 hours. The average speed was about 60 miles an hour. The number of passengers carried, including crew, was over 7,000.

The Airship "Akron." (B. Jones, Air Services, Vol. 16, No. 6, June, 1931, pp. 21-24.) (12.10/22093 U.S.A.)

A descriptive account of the airship is given, illustrated by two photographs, one of the internal girder construction, the other of the partly-covered airship in its shed.

Helium Output. (U.S. Nav. Inst. Proc., Vol. 56, No. 333, November, 1930, pp. 1046-7.) (12.45/22094 U.S.A.)

Data are given of the output and cost of helium. The Government plant at Amarillo, Texas, produced 1,200,000 c.ft. of helium in the month of May, at a gross operating cost of $11 per thousand feet.

High Altitude Flight of Piccard and Kipfer. (Aero Review, Vol. 6, No. 13, July 1st, 1931, pp. 7-39.) (12.19/22095 Switzerland.)

The balloon had a volume of 14,000 m^3. It was filled with 2,600 m^3 of hydrogen, and the total weight, including fabric, cabin, ballast and crew, amounted

to 2,150 kg. From this a ceiling of approximately 17,000 m. can be calculated, and it appears that an altitude of 16,000 m. was reached. The weather conditions were exceptional. The balloon stayed at an altitude of this order for nearly 17 hours, and finally landed at a distance of less than 120 miles from the starting-point. It was the intention to remain for a short period at the maximum altitude, but the rope operating the gas valve broke and the crew had to await the cooling effect of the evening combined with gas leakage to produce a landing. The article contains a diary of the flight, but no scientific data apart from altitude are given. It appears that ionisation experiments were intended as well as the taking of gas samples. These are promised in a future report.

Wireless

Bibliography of Radio Wave Phenomena, Etc. (Proc. Inst. Rad. Eng., Vol. 19, No. 6, June, 1931, p. 1034.) (13.3/22096 U.S.A.)

A list of 620 references is given, classified under fourteen headings, and appearing in sixty publications. An alphabetical index of authors is added.

Short Radio-Electric Waves. (R. Jonaust and N. Stoyko, C.R., Vol. 192, No. 20, May 18th, 1931, pp. 1207-1209.) (13.30/22097 France.)

In the transmission of wireless waves of 18½m. wave-length from Saigon to Paris, double signals were received with a time interval of about .068 sec. It was inferred that one signal followed the shorter arc of the great circle and the other the longer arc, but the velocity of propagation deduced was slightly less than that of light. On making a correction for the height of the ionised layer the speed of radiation was found to be exactly equal to that of light with the accuracy attainable.

Suppression of Radio-Frequency Harmonics in Transmitters. (J. W. Labus and H. Roder, Proc. Inst. Rad. Engs., Vol. 19, No. 6, June, 1931, pp. 949-962.) (13.31/22098 U.S.A.)

From authors' summary:—

The harmonic components of the antenna current are determined in terms of the corresponding components of the plate current of the power amplifier of transmitters. After investigating the cause of harmonic currents and pointing out the difficulties arising in connection with an exact calculation of the harmonics of the field strength, the discussion is confined to the effect of the circuits inserted between plate and antenna circuit on the suppression of harmonics. Several types of circuits are considered and the current ratios of the harmonic antenna currents with respect to the fundamental are given. The results are tabulated.

Extensions to Theory and Design of Electric Wave-Filters. (O. J. Zobel, Bell Tele. Lab., B.556, April, 1931.) (13.5/22099 U.S.A.)

From author's abstract:—

The problem of terminal wave-filter impedance characteristics is considered, in particular that of obtaining an approximately constant wave-filter impedance in the transmitting bands, which is of importance where the wave-filter is terminated by a constant resistance.

Parts I and II give the derivation and composition of wave-filter structures meeting these requirements. Two allied subjects, respectively, the designs of networks which simulate the impedances of wave-filters, and of loaded lines, are dealt with in Parts III and IV making use of the previous results.

The four appendices contain new reactance and wave-filter frequency theorems, and a chart for determining terminal losses at the junction of a fixed wave-filter transducer with a resistance termination. The chart supplements those previously given in a method of calculating wave-filter transmission losses.

Direct Indication of Small Radio Frequency Differences. (E. and M. Mittelmann, Z.H.F.T., Vol. 37, No. 5, May, 1931, pp. 191-199.) (13.8/22100 Germany.)

A description is given with two photographs and diagrams of the connections of a new type of instrument which indicates directly small frequency differences of the order of 10^{-5}. Where the frequency to be measured approaches the natural frequency of the reactance coil, a sensitivity of the order of 1.4×10^{-6} is obtained.

Automatic Volume Control for Aircraft Radio Receivers. (W. S. Hinman, Jr., Bur. St. J. Res., Vol. 7, No. 1, July, 1931, pp. 37-46.) (13.32/22101 U.S.A.)

From author's abstract:—

An automatic volume-control device is described for use primarily in the reception of visual type radio range-beacon signals, the device being easily applied to existing aircraft radio receiving sets. This device operates on the output voltage of the radio receiver, and is provided with a filter unit to prevent operation of the automatic volume control by signals other than those from the range beacon. The controlling voltage is derived from the output of the radio receiver, part of which is rectified and then applied as negative bias to the radio-frequency amplifier. The automatic volume control maintains a substantially constant output voltage for input voltage variations of the order of 5,000 to 1. A distance indicator, operating in conjunction with the automatic volume-control device, is provided to serve as a gauge of distance from the transmitting station.

Receiver Design for Minimum Fluctuation Noise. (N. P. Case, Proc. Inst. Rad. Eng., Vol. 19, No. 6, June, 1931, pp. 963-970.) (13.32/22102 U.S.A.)

Author's summary:—

The effects of various changes in both tube and circuit conditions are investigated with regard to their influence on the limitations which fluctuation noise sets on the sensitivity of a receiver.

It is concluded that for minimum noise the following conditions should obtain:—The gas pressure in the tube should be less than 10^{-4} mm. of mercury; the antenna-to-grid transfer circuit should be as efficient as possible; the plate-circuit load impedance should be high enough to give a gain of at least five for the first radio frequency tube, apart from the antenna coupling circuit; and the cathode emission should be so high that the tube is always operating under dense space-charge conditions.

Radio Range Beacons, Design and Calibration of Vibrating-Reed Indicators. (G. L. Davies, Bur. St. J. Res., Vol. 7, No. 1, July, 1931, pp. 195-213.) (13.4/22103 U.S.A.)

From author's abstract:—

The paper gives a general treatment of the theory of design of vibrating-reed indicators, which was developed in connection with measurement and design work on the tuned-reed course indicator for the aircraft radio range beacon. The equations and conclusions may be readily adapted to apply to any similar vibrating system.

Aeroplane Antennæ for Radio Range Beacon Reception. (H. Diamond and G. L. Davies, Bur. St. J. Res., Vol. 6, No. 5, May, 1931, pp. 901-916.) (13.4/22104 U.S.A.)

Seven types of antennæ are illustrated by sketches. The mathematical theory of the radiated field and of the reception voltage is discussed by means of vector analysis and the required formulæ derived and expressed in elementary trigonometrical functions. The relative intensity of the received voltage is plotted against the relative distance of aircraft from beacon. The object of the installation is to determine the course. The symmetrical T antenna is recommended as giving the best all-round results.

Directional Transmitting Systems. (E. J. Sterba, Proc. Inst. Rad. Eng., Vol. 19, No. 7, July, 1931, pp. 1184-1215.) (13.6/22105 U.S.A.)

Using Poynting's theorem, the power radiated by an antenna is written down as a double integral over the solid angle. The improvement factor for a row of short grounded elements is then expressed in decibels and evaluated by appropriate series. The results are plotted as gain in decibels against antennæ lengths, wave lengths and spacing of elements. Other calculated relations are given graphically. Experimental results are given for comparison.

Various practical considerations in the operation of arrays are discussed.

A Photo-Electric Integraph. (T. S. Gray, J. Franklin Inst., Vol. 212, No. 1, July, 1931, pp. 102.) (13.5/22106 U.S.A.)

A high narrow beam of light from a vertical line source passes through apertures in two screens bounded by curves, of which the product corresponding is to be integrated and falls on a photo-cell. The intensity of the incident beam is proportional to the product of the corresponding ordinates of the functions. On passing the screens horizontally across the ray the total output of the cell is proportional to the integral between the limits of the horizontal displacement. The error is stated to be within from 2 per cent. to 5 per cent. Examples are given.

Rectifying Effects of Copper Oxide Films. (W. Schottky, R. Stormer and F. Waibel, Z.H.F.T., Vol. 37, No. 5, May, 1931, pp. 175-187. Publication of the Siemens firm.) (13.7/22107 Germany.)

A recent development of photo-electric cells depends on the rectifying action of oxide films. It appears that the effect is influenced by the surface condition of the metal electrode in contact with the oxide film. The effect is considerably increased by etching the metal electrode with nitric acid.

Photo-Cell Theory and Practice. (V. K. Zworykin, J. Franklin Inst., Vol. 212, No. 1, July, 1931, pp. 1-42.) (13.7/22108 U.S.A.)

A clear account is given of the discovery and development of the physical principles. Methods of preparing photo-cells are described and illustrated. The sensitivity at different parts of the spectrum is given graphically for a variety of materials. The distinctive principle of the selenium cell and its analogues is discussed briefly. Methods of amplification are described.

Applications to transmission of sound and visible objects are given in some detail.

Temperature Rating of Engine-Driven Aircraft Radio Generators. (C. B. Mirick and H. Wilkie, Proc. Inst. Rad. Eng., Vol. 19, No. 7, July, 1931, pp. 1175-1183.) (21.03/22109 U.S.A.)

Authors' summary:—

Previously described methods of temperature measurement and computation are applied to engine-driven radio generators in flight. Observed and computed heating curves are shown from which an emission constant has been derived.

Photography

Aerial Cameras and Photography. (Inst. World, Vol. 4, No. 39, July 1931, p. 59.) (14.25/22110 Great Britain.)

Reference is made to an article in the Engineering Journal of Canada, May, 1931, p. 297, which gives a description of the equipment and technique employed in survey work in Canada.

A High-Speed Cine-Camera Giving 2,000-3,000 Exposures Per Sec. (E. Huguenard, C.R., Vol. 192, No. 22, January 6th, 1931, pp. 1370-1372.) (14.28/22111 France.)

A film of normal width is used which passes the optical system at the relatively low speed of 3 m.sec. The optical system consists of four small lenses placed side by side covering the width of the film. These lenses are uncovered in turn by a rotating shutter, and 12 photographs 6 × 5 mm. are obtained on the space normally covered by a single exposure.

Explosion Waves and Shock Waves.—Part I., Photography of Bullets in Flight. (W. Payman and D. W. Woodhead, Proc. Roy. Soc., Vol. 132, No. A.819, July 2nd, 1931, pp. 200-213.) (14.28/22112 Great Britain.)

Three special cameras are described and are designated:—

(1) Wave-speed camera,
(2) High-speed wave-speed camera,
(3) Direct photography high-speed camera.

In the first the photographic film is mounted on the outer rim of a revolving drum; in the second on the inner rim, where it is kept in position by centrifugal force; in the third the film is stationary, and the photographic image is moved at high speed over the film by a revolving mirror.

Photographs obtained by different methods are reproduced of tracer bullets and of ordinary bullets in flight through air and water.

Acoustics

Most Favourable Reverberation Time in Halls. (G. v. Békésy, Ann. d. Phys., Vol. 8, No. 7, 1931, pp. 851-873.) (15.20/22113 Germany.)

A vibrating string appears to be damped so that the sound perception falls below the threshold of sensation in a time interval of the order of 0.8 seconds. This time is called presentation time.

The area of the apparent source of sound is limited in space by the restrictions of the ear, and the apparent extent of the source is called the presentation area. The reverberation time is the time in which echo and re-echo sink below the threshold of hearing.

The present paper is concerned with the special problem of the best relations between the acoustical characteristics of a hall and the presentation time and area, with a view to producing the best musical effect of sonority without confusing echoes.

The methods of measurement are of more general interest.

Acoustic Threshold Values. (E. Waetzmann and H. Heisig, Ann. d. Phys., Vol. 9, No. 8, July, 1931, pp. 921-973.) (15.20/22114 Germany.)

The problem is defined and a description is given of recent work, which is often in mutual contradiction on important points. A description is given of a mechanical equivalent ear, which may be standardised in a manner impossible with the human ear.

A hemispherical calibration chamber is described and illustrated by a sketch which gives a practically undistorted acoustical field and agrees completely with the results obtained from a telephone in the position of the ear. Numerous curves of acoustical efficiency are plotted against frequency. The results are stated to agree closely with the values obtained by E. Meyer and to be slightly greater than those obtained by Fletcher and Vogel.

Experiments with Ultra-Sonic Waves. (H. Straubel, Phys. Zeit., Vol. 32, No. 9, pp. 379-383.) (15.20/22115 Germany.)

A quartz oscillator was cut with its edges parallel to the optical and electrical axes and laid upon a polished plate of insulating material. A two-watt valve sender imposed an oscillator frequency of 75,000 hertz producing a wave-length of 4.4 mm. A powder was strewn on the insulator plate and marked the nodes of the air waves.

Ten photographs are reproduced.

Sound-Proofing Cabins. (Aero Digest, Vol. 18, No. 5, May, 1931, pp. 74 and 76.) (15.38/22116 U.S.A.)

A useful descriptive summary, with considerable technical detail, is given of the methods of measuring sound intensity and of applying various materials as dampers to the walls of cabins. The descriptive matter covers tests on absorbent materials, types of wall padding, and tests in two types of cabin, the reduction in sound level being 32 and 28 decibels respectively.

Fire Precautions

Fire Precautions. (F. Kuhn, Z.F.M., Vol. 22, No. 7, April 14th, 1931, pp. 197-206. 216th D.V.L. Report, to be ctd.) (16.05/22117 Germany.)

Precautions against and methods of extinguishing fire are discussed under 25 headings. Tables are given of ignition temperatures for various fuels and of exhaust temperatures for a B.M.W. engine on the test bench. The construction of tanks is discussed and the damage done by shocks is illustrated by photographs. A number of diagrams are given of couplings, and methods of rendering them free from leakage and fracture are discussed. The possibilities of ignition by sparks from the electrical equipment are considered.

Modern Methods of Fire Fighting. (C. B. White, J. Franklin Inst., Vol. 211, No. 6, June, 1931, pp. 757-776.) (16.05/22118 U.S.A.)

Carbon tetrachloride extinguishers are useful only for small incipient fires. Generators producing carbon dioxide gas have a wider application. These devices are rendered much more effective by the production of foam, which keeps the inert gas in the neighbourhood of flame to be extinguished. Types of fire are classified and appropriate extinguishers are recommended.

Gliding

Construction of Sailplanes and Gliders. (A. Lippisch, J. Roy. Aer. Soc., Vol. 35, No. 247, July, 1931, pp. 532-578.) (17.40/22119 Great Britain.)

The expressed aim of the lecturer was to include everything of importance in the last ten years' development. This is carried out by the presentation of scale sketches and photographs of the principal types of glider in flight, accompanied for the most part by dimensioned sketches with empty weight and glider surface. Elementary formulæ are developed showing effective aspect ratio and gliding properties, and the relations obtained are exhibited graphically. A number of details of construction are given, in sketches and photographs.

The extreme logical development of these ideas is expressed in the author's glider " The Ultimate." A discussion followed, and answers were given to 14 participators.

Gliders and Gliding. (W. R. Andrews, Flight, Vol. 23, No. 26, June 26th, 1931, pp. 612-614.) (17.40/22120 Great Britain.)

An elementary discussion is given of the best aspect ratio to select for a glider in order to ensure the best gliding angle. The elementary theory of the transformation of wing profile characteristics for any aspect ratio is given. A numerical example is worked out.

Gliding Competition in Russia. (Stoklitzky, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 335-336.) (17.4/22121 Germany.)

Dimensioned sketches and principal data are given of the competing gliders. Three photographs of machines are reproduced, and one of a glider in flight, showing the nature of the surrounding country.

Meteorological Aspects of Gliding. (F. Entwistle, J. R. Aer. Soc., Vol. 35, No. 246, June, 1931, pp. 423-459.) (17.40/22122 Great Britain.)

A systematic exposition is given of the meteorological conditions which produce rising currents of sufficient vertical velocity to sustain a glider or carry it upward. Special attention is given to the line squall, and a number of observed cases is described in some detail. It is well known that the size of hailstones depends upon the velocity of the upward current in which they are formed. A photograph exhibits the record hailstones which fell in Texas on May 8th, 1926, the diameter of which, $2\frac{1}{2}$ inches, corresponds to a vertical current of about 120 feet per second. Rules for applying the results are laid down and suggestions for further investigation are made.

Carriers

Carrier and Cruiser Design. (Lt.-Com. F. Sherman, U.S. Navy, U.S. Nav. Inst. Proc., Vol. 56, No. 333, November, 1930, pp. 997-1002.) (18.01/22123 U.S.A.)

The duties of a carrier are discussed in relation to attack of and defence against other types of warship. The difficulties in designing a carrier of sufficient speed and defensive power combined with aeroplane carrying capacity leads to a recommendation for the provision of four types of four classes of operation:—

(1) For independent offensive and defensive—roughly, battle cruiser type;
(2) For operations with battle fleet—large carrying capacity, slight defensive qualities;
(3) Scouting carriers—very high speed;
(4) Carrier-cruisers—carrying light bombers and armed with 6 in. guns.

Meteorology

Weather Reporting for the Air Corps. (D. Blake, Air Services, Vol. 16, No. 7, July, 1931, pp. 45-46.) (19.10/22124 U.S.A.)

A descriptive account is given of the operational methods of obtaining meteorological data in the air and of circulating them.

Goodrich De-Icers. (Aero Digest, Vol. 18, No. 5, May, 1931, p. 66.) (19.15/22125 U.S.A.)

The method of removing ice from the nose of a wing by the inflation of tubes in the leading edge has been applied by the Goodrich Co. Diagrammatic cross section sketches illustrate the action of the device.

Picking Up Loads

Device for Picking Up Loads by an Aeroplane in Flight. (Autom. Zeit., Vol. 34, No. 14, May 30th, 1931, pp. 337-338.) (20.10/22126 Germany.)

The load is catapulted in the direction of flight and moves forward with a speed comparable to that of the aircraft when the tackle engages. In this way loads up to 100 lbs. can be taken by the plane in flight without any shock. The device is stated to be in constant use for postal work in America.

Visibility

Navigation Lights. (F. Born, Z.F.M., Vol. 22, No. 9, May 15th, 1931, pp. 253-255.) (21.10/22127 Germany.)

Schemes of arranging navigation lights in aircraft with arcs of visibility and of landing lights with distribution of intensity are discussed with reference to their application in air transport routes.

A Visibility Meter. (M. G. Bennett, J. Sci. Inst., Vol. 8, No. 4, April, 1931, pp. 122-126.) (21.22/22128 Great Britain.)

Author's abstract:—

Very slightly ground glasses are introduced one by one into the field of vision. The number of these glasses which is just sufficient to obscure the object observed is the measure of its visibility. Various precautions are adopted to eliminate sources of error found in other instruments. Applications to meteorology and to illuminating engineering are given.

Fog Penetration. (S. H. Anderson, Air Services, Vol. 16, No. 7, July, 1931, pp. 20-25.) (21.22/22129 U.S.A.)

The elements of the theory of the scattering of light are discussed. The great difference in size between particles in a haze and in a fog and the consequent failure of red light to penetrate the latter is referred to. The only possible development lies in the use of ultra red rays with a wave-length large in comparison with the diameter of the particles. Experiments in this direction are referred to.

Hydro- and Aerodynamics

Modes of Contraction of a Filament at the Entry of a Nozzle. (C. Camichel and P. Dupin, C.R., Vol. 193, No. 2, July 15th, 1931, pp. 102-103.) (22.1/22130 France.)

Four photographs are given, two at low Reynolds numbers showing laminar flow with formation of standing eddies, and two at high Reynolds numbers showing formation of a well-defined boundary layer surrounding the vena contracta. It is found that the contraction is a function of the Reynolds number up to the formation of an apparent surface of discontinuity, after which the contraction remains constant.

The Path of a Vortex in the Neighbourhood of Sources, Sinks, Double Sources and Fixed Vortices, in the Half Plane. (A. Kneschke, Ann. d. Phys., Vol. 9, No. 8, July, 1931, pp. 905-915.) (22.1/22131 Germany.)

The author applies special forms of "Routh's function," obtained by Routh in a paper "Some applications of Conjugate Functions," Proc. Lond. Math. Soc., pp. 73-78, 1818-81, to obtain the equation of the paths of free vortices. These are exhibited graphically.

Vortex Motion Round a Cylinder. (A. Kneschke and S. Matthes, pp. 916-920.) (22.1/22131 Germany.)

The Routh function is applied to find the motion near a semi-circular boss in the x axis, and about a plane projection at right angles to the x axis, of two symmetrically-placed vortices.

Break-up of a Fluid Jet into Drops. (A. Haenlein, Forsch. Geb. Ing., Vol. 2, No. 4, April, 1931, pp. 139-149.) (22.1/22132 Germany.)

The phenomenon, which is of importance in carburation, was examined experimentally. Twenty-four photographs are reproduced showing various stages of the break-up for different fluids. The qualitative explanation of the forces

involved is illustrated by diagrams. A reference is made to Rayleigh's mathematical treatment, taking into account surface tension but not viscosity. For the fluids observed the critical speed is plotted against the jet velocity. In several cases there is sharp discontinuity in the curve. Some elementary dimensional considerations are given.

Break-up of a Fluid Jet into Drops. (C. Weber, Z.A.M.M., Vol. 11, No. 2, April, 1931, pp. 136-154.) (22.10/22133 Germany.)

The experimental stresses discussed in preceding abstract are the subject of analysis in the present paper. Differential equations are formed and solutions are obtained in Bessel functions. The rational nature of the assumptions made, and the agreement with experiment, indicate that a truly physical theory of the phenomenon has been established.

The Viscous Layer Associated with a Circular Cylinder. (J. J. Green, Phil. Mag., No. 75, July, 1931, pp. 1-41.) (22.1/22134 Great Britain.)

The equations of viscous fluid motion are reduced to approximate form by Prandtl's device of assuming the existence of a narrow boundary layer in which transitions take place from zero motion at the surface of a cylinder to potential motion outside it. The equations are reduced to non-dimensional form in the usual way, and a solution in series is assumed. Using observed experimental values, successive numerical approximations for the coefficients are constructed. As with other solutions propounded by German writers, the validity of the approximations certainly fails at the branching point where the initial stream-line leaves the surface of the cylinder. The predicted branching point is claimed to be in satisfactory agreement with experiment.

The computations are laborious, and it is difficult to assess the relative convenience and accuracy of this method as compared with other approximate solutions.

Superposed Turbulence. (E. G. Richardson and E. Tyler, Phys. Zeit., Vol. 32, No. 13, July 1st, 1931, pp. 509-517.) (22.1/22135 Germany.)

Reference is made to the work of Prandtl, v. Karman, Schiller, and others, in obtaining approximate forms of equations of viscous fluid motion appropriate to the disturbed motion in a pipe or past a barrier or periodically disturbed. Some elementary results are given, subject to boundary conditions which are not reproducible in the laboratory. In their experimental work the authors have superposed periodic axial motion by the oscillation of a concentric sliding mouthpiece.

With regard to the problem of flow past an obstacle, the turbulence was set up by the vibration of a strip close to the nose of a stream-lined strut, or by the oscillation of a cylinder.

The velocity fields are plotted as explored by hot wire instrument, and six samples are given in three figures, the upper half of the figures showing the natural flow and the lower half the effects of artificially superposed turbulence.

Stability and Turbulence of Fluid Motion. (W. Heisenberg, Ann. Phys., Vol. 74, No. 15, 1924, pp. 577-627.) (22.1/22136 Germany.)

The author summarises the position of the problem (1924), and, following Rayleigh, forms non-dimensional differential equations. Methods of integration are developed. Boundary conditions are examined. Stability under external disturbance is investigated and a condition is obtained for critical stability. The result is obtained that Rayleigh's substitution of a polygon for a curvilinear disturbance of velocities is not permissible. Further, if a distribution of velocity is unstable in a perfect fluid, it is likewise unstable in the presence of viscosity,

beyond a certain Reynolds number. A critical wave-length exists for a disturbance which is damped out.

A discussion of turbulence follows. It is not possible to summarise the argument without a detailed mathematical discussion.

Circulation Round a Rotating Cylinder in a Viscous Fluid. (E. G. Richardson, Phil. Mag., Vol. 11, No. 74, June, 1931, pp. 1215-1220.) (22.1/22137 Great Britain.)

The velocity field in the neighbourhood of a rotating circular cylinder was explored with a hot wire instrument. It was found that the velocity fell off more rapidly near the cylinder than for the irrotational flow which would be the final steady distribution for a long cylinder rotating in a large mass of viscous fluid. The suggestion is made that instability near the cylinder causes turbulence and gives a higher effective transference of vorticity from the surface of the cylinder outwards.* Experimental results are exhibited graphically and an empirical expression is obtained.

Flow of Water Through Circular Concentric and Rectangular Tubes. (F. C. Lea and A. G. Tadros, Phil. Mag., Vol. 11, No. 74, June, 1931, pp. 1235-1247.) (22.2/22138 Great Britain.)

The elementary formulæ for steady laminar flow are worked out for circular and concentric circular tubes. Experimental values are plotted logarithmically and exhibit the breakdown at the critical Reynolds number and the subsequent flow with the resistance proportional to the velocity raised to the power of 1.73. A small core appears to have the effect of setting up and maintaining turbulence at much lower Reynolds numbers than for circular tubes without core. The assumption of slip at the core surface is introduced. Formulæ are given, without demonstration, for mean velocity with laminar flow in the rectangular tubes.

Influence of Viscosity on Measurement of Velocity with Venturi Tubes. (H. Peters, Z.F.M., Vol. 22, No. 11, June 15th, 1931, pp. 321-323.) (22.4/22139 Germany.)

The ideal relation between pressure drop, density and velocity contains a multiplying factor K, which would be constant for an ideal fluid, but varies considerably for a viscous fluid.

Values of the factor are determined under a wide range of conditions of temperature and pressure for the Bruhn double venturi tube and the results are shown graphically. An elementary theory is laid down in which the effects of compressibility are considered. The readings of an ordinary pitot tube are increased 6 to 13 times.

Secondary Eddies Behind an Obstacle in a Stream. (E. Crausse and J. Baubiac, C.R., Vol. 192, No. 24, June 15th, 1931, pp. 1529-1531.) (22.4/22140 France.)

Circular cylinders of diameters between 8mm. and 100mm., and of axial length 3mm., were placed in a stream or moved in a mass of fluid. A photograph shows the initial vortex detached and another shows secondary eddies forming along the boundary of the turbulent wake. The period of the secondary eddies is plotted against the velocity for a cylinder of 15mm. diameter.

Recording of Period of Eddies by Hot-Wire Instrument. (E. Crausse and J. Baubiac, C.R., Vol. 192, No. 22, June 1st, 1931, pp. 1355-1357.) (22.4/22141 France.)

The periods of alternating eddies behind an obstacle recorded by a hot wire instrument are plotted for water and for a sugar solution with a coefficient of

* This suggestion, illustrated by sketches, was put forward by Föppl, in discussion, at the International Congress for Applied Mechanics at Zürich, 1926.

viscosity four times as great. On transforming for dynamic similitude the experimental points for both fluids are closely grouped along a unicursal curve. The record of the periodicity is reproduced and shows great uniformity at about 0.8secs. A record of the periodic effect of secondary eddies is also reproduced. The periodicity is less regular than in the previous example, but is reasonably uniform at about 0.017secs.

Experiments in Sucking Away the Boundary Layer of a Wing. (O. Schrenk, Z.F.M., Vol. 22, No. 9, May 15th, 1931, pp. 259-264.) (22.6/22142 Germany.)

Plates with punched orifices were fitted to the surface. The distribution of the orifices and the position of the plates is shown diagrammatically. The test results for lift, drag and moment are given graphically, and are compared with the calculated results of hydrodynamical theory. Comparison with previous results shows a marked advance in increasing the lift coefficient by this method. The observed incidence in the latest experiments also approach much more nearly the theoretical incidence.

Resistance of the Air to Ballistic Speeds. (Gabeault, C.R., Vol. 192, No. 25, June 22nd, 1931, pp. 1630-1633.) (22.4/22143 France.)

The formation of a series of ring vortices behind an ogival shell is assumed. Using an elementary analysis analogous to v. Karman's two-dimensional theorem, a formula for the resistance is obtained showing a discontinuity at twice the speed of sound. Comparison with experimental results obtained by others shows points of quantitative agreement.

(The fact that such a regular series of ring vortices is not necessarily formed, or if momentarily formed is not stable, may not invalidate the result as some sort of time average).

Lift on a Flat Plate Between Parallel Walls. (L. Rosenhead, Proc. Roy. Soc., Vol. 132, No. A.819, July 2nd, 1931, pp. 127-152.) (22.4/22144 Great Britain.)

Methods of conformal transformation are applied to find the lift upon a flat plate between walls. The results are obtained in Weierstrass and Theta functions. An error is pointed out in a paper by Sasaki in applying a method of Villat's. Numerical values are tabulated to various approximations and compared with Glauert's values, which are shown to be useful first approximations.

Compressibility Effects in High-Speed Air Flow. (S. G. Hooker, J. Roy. Aer. Soc., Vol. 35, No. 247, July, 1931, pp. 645-647.) (22.4/22145 Great Britain.)

A summary is given of the restricted progress made in taking into account the compressibility of the air in aerodynamical relations.

Wind Pressure on a Model of a Mill Building. (H. L. Dryden and G. C. Hill, B. St. J. Res., Vol. 6, No. 4, April, 1931, pp. 735-763.) (22.4/22146 U.S.A.)

The model building, 48 ins. long, 24 ins. wide, and $12\frac{3}{4}$ ins. high, was placed in the 10 ft. tunnel and pressure measurements were made at 388 orifices. Charts of pressure distribution under different wind directions are reproduced. Local pressures were as high as twice the mean pressure.

Miscellaneous Unclassified

The Art of Metallography. (F. F. Lucas, Bell Tele. Lab., B.565, June, 1931.) (22147 U.S.A.)

The optical principles of metallography are discussed and in particular the application of ultra-violet rays to obtain finer detail is considered. Twenty micro-photographs are reproduced.

Application of Statistical Method in Engineering. (W. A. Shewhart, Bell Tele. Lab., B.560, May, 1931.) (22148 U.S.A.)

The paper indicates briefly the sort of problems an engineer can solve by the statistical method which he could not solve without it. The examples selected show test results as distributed on a frequency curve instead of as an undistributed set of variations from the mean value.

Measurement of Dust in Smoke Gases. (E. Zimmerman, Z.V.D.I., Vol. 75, No. 16, April 18th, 1931, pp. 481-486.) (22149 Germany.)

The Berlin Electricity Works have standardised the measurement of the dust in flue gases by filtering a portion of the gases through a glass wool filter and measuring the increase in weight. Certain precautions are necessary in designing the pipe connection between the filter and the main gas passages, and in obtaining representative samples and correlating with the total delivery of flue gas.

Visibility from Aircraft. (D. Huntingdon, Aero Digest, Vol. 18, No. 6, June, 1931, p. 52.) (22150 U.S.A.)

The importance of visibility to commercial craft is discussed in a non-technical manner. The article is illustrated by the totally inadequate representation of the arc of view in the plane of symmetry only.

Field of View. (G. Kurtz, Z.F.M., Vol. 22, No. 6, March 28th, 1931, pp. 167-176, 215th D.V.L. Report.) (22151 Germany.)

The comparative fields of view of the seven aircraft reproduced show remarkable differences in the total area obscured. The importance of measuring the field of all types of aeroplanes for comparative purposes is emphasised. The methods are substantially those employed in this country in 1917, but since discontinued.

Production and Measurement of High Vacua. (S. Dushman, J. Franklin Inst., Vol. 211, No. 6, June, 1931, pp. 689-750.) (22152 U.S.A.)

Recent advances in production and measurement of high vacua are summarised, and some recent results are tabulated. The lowest value obtained is about 10^{-7} mm. of mercury, roughly equivalent to 10^{-6} dynes per cm.^{2} A large number of applications are discussed.

Acetylene Storage. (The Gas Accumulator Co., British Patent No. 339899, May 30th, 1929.) (22153 Great Britain.)

The cylinders for holding the acetylene are filled with a cemented block of pumice, artificial slag, or other material having the same coefficient of expansion by gas absorption and heat as cement.

Night Air Mails. (Carl Florman, J. R. Aer. Soc., Vol. 35, No. 246, June, 1931, pp. 460-488.) (22154 Great Britain.)

The author is the Managing Director of the A.B. Aerotransport, Stockholm, and his analysis of conditions of operation of night air mails in Europe and America indicates the importance of various factors as they appear to an experienced administrator of flying services.