ABSTRACTS AND NOTICES

FROM THE

SCIENTIFIC AND TECHNICAL PRESS

Issued by the

Directorates of Scientific Research and Technical Development, Air Ministry

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

No. 28. OCTOBER, 1933

LIST OF ABBREVIATIONS OF TITLES OF JOURNALS.

Aeron. Eng.	Aeronautical Engineering.
Airc. Eng.	Aircraft Engineering.
Ann. d. Phys.	Annalen der Physik (Germany), Annales de Physique (France).
Army Ord.	Army Ordinance.
Autom. Absts.	Automotive Abstracts.
Autom. Tech. Zeit.	Automobiltechnische Zeitschrift.
Autom. Eng.	Automobile Engineer.
Autom. Ind.	Automotive Industries.
Bell Tele.	Bell Telephone Laboratory.
Bur. Stan. J. Res.	Bureau of Standards (U.S.A.) Journal of Research.
Chem. Absts.	Chemical Abstracts.
Chem. and Ind.	Chemistry and Industry.
F.G.I.	Forschung auf dem Debiete des Ingenieurwesens.
Fuel.	Fuel in Science and Practice.
H.F. Technik.	Hochfrequenztechnik und Electroakustik.
Ind. and Eng. Chem.	Industrial and Engineering Chemistry.
J.R. Aer. Soc.	Journal of Royal Aeronautical Society.
J. Sci. Inst.	Journal of Scientific Instruments.
L'Aéron.	L'Aéronautique.
L.F.F.	Luftfahrtforschung.
N.A.C.A.	National Advisory Committee for Aeronautics (U.S.A.)
Phil. Mag.	Philosophical Magazine.
Phys. Rev.	Physical Review.
Phys. Zeit.	Physikalische Zeitschrift.
Proc. Inst. Rad. Eng.	Proceedings of the Institute of Radio Engineers.
Proc. Roy. Soc.	Proceedings of Royal Society.
Pub. Sc. et Tech.	Publications Scientifiques et Techniques du Ministere de l'Air.
Rev. S.G.A.	Revue de la Societé Générale Aéronautique.
Rev. F. Aer.	Revue des Forces Aériennes.
Rev. Sci. Insts.	Review of Scientific Instruments.

Riv. Aeron.	Rivista Aeronautica.
S.A.E. Jrnl.	Society of Automotive Engineers Journal.
Sci. Am.	Scientific American.
Tech. Aeron.	La Technique Aéronautique.
Z.A.M.M.	Zeitschrift für Angewandte Mathematik und Meckanik.
Z.F.M.	Zeitschrift für Flugtechnik und Motorluftschiffahrt.
Z. Instrum.	Zeitschrift für Instrumentenkunde.
Z. Metallk.	Zeitschrift für Metallkunde.
Z.V.D.I.	Zeitschrift für Vereines Deutscher Ingenieure.

Aircraft Design, etc.

Profile Characteristics at Super Sonic Velocities. (A. Busemann and O. Walchner, Forschung, Vol. 4, No. 2, March/April, 1933, pp. 87-92.) (5.102/26501 Germany.)

A description of the Göttingen wind channel for high velocities is illustrated by three section sketches. The selected aerofoil profiles were three Göttingen airscrew profiles Nos. 622, 623 and 624; three plano-convex, one symmetrical bi-convex, a wedge and a wedge with cylindrical nose. The polar diagrams are shown graphically for wind velocities about $1\frac{1}{2}$ the speed of sound. The airscrew profiles show lower resistances with the sharp edge leading.

It is remarked that, by a very fortunate chance, an approximate physical treatment can be based on the hydrodynamical theory of an inviscid fluid, at least for certain types of suitable profiles with sharp leading and trailing edges, at which the velocity never falls below the speed of sound.

The analytical development appears to be based on an empirical modification of previous work by Ackeret, and it is difficult to assess the significance of the fairly close fit with experimental results for the plano-convex profiles.

For the wedge profiles, both observed and calculated, polar curves have a parabolic form but the numerical values are in the ratio of 5 : 1 at zero incidence.

Ceiling and Performance. (C. W. Tinson, Flight, Vol. 24, No. 53, 29/12/32, pp. 1232 f-g; Vol. 25, No. 4, 26/1/33, pp. 80 f-g; Vol. 25, No. 8, 23/2/33, pp. 178 a-d.) (5.106/26502 Great Britain.)

Empirical and semi-empirical formula for climbs, speed, and ceiling are plotted as families of curves for different parameters.

Ocean Air Transport. (Sci. Am., Vol. 148, No. 3, March, 1933, pp. 166-168.) (5.14/26503 U.S.A.)

Reference is made to the somewhat pessimistic views expressed by Dr. Kimball, of U.S. Weather Bureau, on ocean hazards, particularly fog.

The Dept. of Commerce lay down stringent regulations with regard to navigational equipment, and ability to navigate by instruments only.

Some details are given of flying boats operating on U.S.A. cross-sea air routes.

Civil Aviation. (Aviation, Vol. 32, No. 3, March, 1933, pp. 69-88.) (5.14/26504 U.S.A.)

A summary of aeronautical activities is given for U.S.A. in comparison with European countries and includes costs, air mails, factory output, training of pilots, and passenger miles. The totals show 1,200 airports and 20,000 miles of airways, and 140,000,000 passenger miles in 1932.

Reference is made to reductions in money available for army, navy and civil aviation.

Civil Aviation. (Autom. Ind., Vol. 68, No. 8, 25/2/33, pp. 256-261.) (5.14/26505 U.S.A.)

A list of 344 aeroplanes and 90 engines is given with specifications of type, dimensions, weights and performance.

Recent Methods in Riveting in Aircraft Construction. (Outside Germany.) (W. Pleines, Z.F.M., Vol. 24, No. 3, 14/2/33, pp. 65-75.) (5.16/26506 Germany.)

The article deals with the De Bergne process of riveting, in which the material is recessed in the neighbourhood of the rivet so as to reduce stressing in the latter.

Nine references (English and American).

Maintenance of Metal Air Frames. (S. G. Young, Airc. Eng., Vol. 5, No. 47, Jan., 1933, pp. 13 and 16.) (5.16/26507 Great Britain.)

Practical information is given for inspectors and air mechanics.

Welding, pinned sockets and riveting are discussed from the point of view of possible defects, and methods of inspection with a view to discovery.

The presence of inspectors' stamps or of rough file marks may be definitely dangerous, and smooth finish is desirable in modern high duty materials.

The finish and fit of rivets, screw bolts, and pins present points of importance.

Corrosion in inaccessible positions is a source of special difficulty, and protective coatings must be applied with extreme thoroughness.

Welding and heat treatment are sources of danger from corrosion in stainless and high tensile steels.

Strength of Stiffening Ribs. (A. Thum and S. Berg, Z.V.D.I., Vol. 77, No. 11, 18/3/33, pp. 281-287.) (5.25/26508 Germany.)

Plate sections are shown with stiffening ribs of various dimensions.

Expressions are given for relations between volume, loading, strain, deflection, etc., and a large number of graphical charts show the distribution of stress and the strength under steady load and impact.

Six references.

Rolling, Yawing and Hinge Moments on Rectangular Ailerons. (R. H. Heald, N.A.C.A. Tech. Note 441.) (5.30/26509 U.S.A.)

Empirical expressions are formed with the dimensions of the ailerons, the angular displacement and the distance from the rolling and yawing axes of the aeroplane as parameters.

These are shown graphically in five diagrams in comparison with experimental points from three previous technical notes.

Observed values of moments produced by pairs of ailerons are found to agree closely with the sums of the moments of the ailerons observed separately.

Six references.

Further English Investigation on Forced Vibrations in the Tail Structure. (H. Blenk, Z.F.M., Vol. 24, No. 1, 14/1/33, pp. 21-24. Appendix to D.V.L. Report 267.) (5.32/26510 Germany.)

By reason of the almost simultaneous appearance of the English and German reports on the Meopham accident (D.V.L. No. 267 and R. & M. 1360) no comparison of test results was made in either report. A summary is therefore given for information of German readers of the more recent R. & M. 1457.

Investigations on Elimination of Tail Flutter. (C. Biechteler, Z.F.M., Vol. 24, No. 1, 14/1/33, pp. 15-21. D.V.L. Report No. 309.) (5.32/26511 Germany.)

Reference is made to a qualitative investigation by G. Mathias in an unpublished D.V.L. report on a Junkers monoplane, and to Blenk, Hertel and Thalau's D.V.L. Report No. 267 on the German investigation into the Meopham accident.

In the present report full scale investigation was made on a B.F.W.-M. monoplane of similar general design.

The principal dimensions are specified and eight photographs show the complete aeroplane, the junction of wings and bodies, the skeletons of several fairings investigated, and the smooth streaming or variable fluttering of short yarn streamers distributed over the wings to indicate smooth or disturbed flow over the wings.

Diagrams show the region of breakdown of smooth flow, with engine on or off and with or without fairing. Curves show the corresponding effect on the lift-incidence curve.

No evidence was found of forced vibrations in the tail under the different conditions investigated, with the exception of a slight shudder in side slip with engine off.

Aircraft—Landing Gear

Retractable Landing Gears. (R. M. Mock, Aviation, Vol. 32, No. 2, February, 1933, pp. 33-37.) (5.555/26512 U.S.A.)

Numerical estimates are given of the relative advantage of reduced head resistance as against the disadvantages of greater weight and complication.

An illustrative flying cost schedule is worked out on U.S.A. post office data and appears to be in favour of the retractable carriage.

The argument includes the increased risk of accident from failure of the retractable gear in reverse to restore the landing gear to its landing position.

Several types are discussed and illustrated by four photographs and four sketches of details.

Retractable Carriage. (U.S. Air Services, Vol. 18, No. 3, March, 1933, p. 23.) (5.555/26513 U.S.A.)

A photograph shows a new Martin monoplane bomber in flight with retracted carriage. The flying speed is stated to be 213 m.p.h.

Design of Twin Seaplane Floats. (H. Parkinson, Flight, Vol. 25, No. 8, 23/2/33, pp. 187 d-f.) (5.56/26514 Great Britain.)

Formulæ of reduction are given for determining the dimensions and scantling of floats similar to those used on the Schneider Cup winning seaplane.

Airscrews

Controlled Pitch Airscrew. (U.S. Air Services, Vol. 18, No. 3, March, 1933, pp. 27-30.) (5.658/26515 U.S.A.)

Descriptive technical details are given of the Hamilton hub. A photograph shows the airscrew and hub fitted to an aeroplane.

Four sketches illustrate the mechanical parts. The control is operated by oil pressure.

Graphical Functions for Calculating Performance of Heavily Loaded Marine Screws. (H. Lerbs, Werft-Reederei-Hafen, No. 3, 1/2/33, pp. 29-31.) (5.60/26516 Germany.)

The method of calculating airscrew performance by integrating over blade elements is applied to marine screws.

Goldstein's results for the induced velocity of trailing spiral vortices is used in Helmbold's form, and experimental corrections are applied in developing semi-empirical formulæ.

Numerical values of the functions are tabulated and plotted graphically for use in design.

Experimental values of r.p.m. and ship's speed were slightly in excess of the calculated values.

Five references.

Calibration of Windmill Anemometers at Low Speeds. (R. Loewenstein, Z.V.D.I., Vol. 77, No. 7, 18/2/33, pp. 177-178.) 5.670/26517 Germany.)

Reference is made to the difficulties inherent in low speed tests, in particular the induced wind. A description is given of a vertical shaft, up and down which the anemometer with a counterbalance weight is drawn at a known pace. The mean is taken as the true calibration curve.

Two examples are shown graphically in comparison with calibration in a jet of air from a nozzle.

Instruments

A New Precision Balance for Very Small Weights. (W. Loebe, Z. Instrum., No. 1, Jan., 1933, pp. 21-27.) (6.00/26518 Germany.)

The balance calibrated for weights between one and five milligrams has no jewelled pivots, the beam being suspended at each end on springs of such shape that a rotation of the beam does not alter its position in space appreciably.

The apparatus is cheap and robust.

Short Time Measurements in Engineering. (W. Ende, Z.V.D.I., Vol. 77, No. 1, 7/1/33, pp. 10-12.) (6.3/26519 Germany.)

The A.E.G. have developed a film camera capable of taking 80,000 pictures per second. The film speed is of the order of 20 m./sec. Two seconds are required to get the camera up to speed and the film is blank for 40 m., after which it is re-sensitised for 1-2 m. The saving in material is considerable, but accurate synchronisation is required. A few examples of film photographs are reproduced.

Nine references.

Three Co-ordinate Vibrograph. (J. E. Schrader, J. Frank. Inst., Vol. 215, No. 4, April, 1933, pp. 455-469.) (6.48/5.17/26520 U.S.A.)

A technical description of the apparatus is illustrated by photographs and diagrammatic sketches.

The instrument records linear acceleration in three rectangular co-ordinate directions continuously on a steadily moving film.

Fourteen sections of oscillogram are reproduced and illustrate records with vibrations with components in one only, in two, and in all three directions.

Illumination of Thermometer Mercury Thread by Reflected Red Light. (Z.V.D.I., Vol. 77, No. 2, 14/1/33, p. 47.) (6.71/26521 Germany.)

Light reflected from a polished strip of red enamel fused into the glass thermometer tube renders the mercury easily visible as a thick red column. A diagrammatic sectional sketch shows details of construction.

Reference Tables for Platinum Rhodium Thermocouples. (W. F. Roeser and H. T. Wensel, Bur. Stan. J. Res., Vol. 10, No. 2, Feb., 1933, pp. 275-287.) (6.71/26522 U.S.A.)

Twenty standard thermocouples were calibrated by comparison with platinum resistance thermometer and optical pyrometer and checked at the melting point of Zn, Sb, Ag, Au, Ni and Pt.

Empirical curves were constructed for seven temperature ranges and used for interpolation and extrapolation and the whole co-ordinated with the international temperature scale.

Thermo-Electric Properties of Platinum Rhodium Alloys. (F. R. Caldwell, Bur. Stan. J. Res., Vol. 10, No. 3, March, 1933, pp. 373-380.) (6.71/26523 U.S.A.)

The specimens contained a proportion of rhodium varying from 1/10 to 100 per cent.

The thermal e.m.f.'s against pure platinum were determined from 0°C. to 1,200°C. and the results are tabulated and shown graphically.

The results are in close agreement with other investigations.

Zeiss Inspection Equipment. (Autom. Eng., Vol. 23, No. 304, March, 1933, pp. 89-92.) (6.85/26524 Great Britain.)

Applications of the microscope to precision inspection are described. Errors in shape, defects in surface finish, profiles of gear teeth, etc., are observed with extreme accuracy.

Practical mountings for inspection are illustrated by photographs.

Stress Optical Experiments on Drilled Plates. (A. Hennig, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 53-63.) (6.86/26525 Germany.)

Optical glass is considered as the most suitable material on account of its freedom from internal stresses when suitably prepared. Reference is made to Report No. 34 of 1930, of the Munich Technical High School, details from which would be required to follow the present article fully.

The possibilities of conformal transformation are mentioned and reference is made to work by Filon.

An improbable elementary blunder by Coker is suggested but cannot be traced in the references given.

Approximate formulæ are quoted and contour diagrams of isoclinics and principal stresses show the effect of the ratio of diameter of hole to width of plate and of the application of force to the surface of the rivet-hole by the rivet at one or two symmetrical points.

The admirably finished contour drawings may suggest a greater accuracy than is attainable.

Twenty-two references.

Aircraft Flight

Estimation of (Aeroplane) Performance. (R. M. Clarkson, Airc. Eng., Vol. 5, No. 47, Jan., 1933, pp. 3-5; also Feb.-April.) (7.15/26526 Great Britain.)

The author gives a systematic scheme of reducing test figures to a standard basis by comparison. The results of modern aerodynamical theory are used, and empirical correction factors are given from experience. Expressions for aerodynamical qualities are defined and developed.

Engine output and efficiency are discussed as empirical functions of pressure and density and working formulæ are given for all the quantities entering into the design problems discussed. Numerical examples are worked out and the results shown in tables and graphically. The effects of small changes in the condition are considered in detail.

Approximate generalised curves of climb, speed and starting are obtained and characteristics of numerous typical aircraft show reasonable narrow scattering.

The articles are a useful practical course for designers.

Aeroplane Maximum Speed. (F. M. Thomas and H. W. Fairchild, S.A.E. Jrnl., Vol. 32, No. 3, March, 1933, pp. 78-86.) (7.15/26527 U.S.A.)

The assumption is made that engine b.h.p. is proportional to the reciprocal of absolute temperature, and this relation is combined with the usual aeroplane and airscrew formulæ to obtain the best combination for maximum speeds by means of charts and abacs (nomograms).

Notes on Long Range Aeroplanes. (M. Constantin, L'Aérophile, No. 1, Jan., 1933, pp. 16-17.) (7.15/26528 France.)

Aeroplanes are subject to additional drag from negative lift on the tail control surfaces. Shifting the centre of gravity farther back decreases the tail load and drag but affects the stability adversely. An automatic wind vane device maintains constant incidence and reduces the tail surface drag. An increased radius of action is claimed.

Devices for Increasing Lift. (Z.F.M., Vol. 24, No. 2, 28/1/33, p. 62.) (7.20/26529 Germany.)

The Fowler wing has an auxiliary wing of the same section placed at a greater angle of incidence behind the main wing, with an intervening slot space, which is closed by housing the auxiliary wing in the rear portion of the main wing. The lift is nearly trebled in the open slot position.

Comparative tests were made with the Lachmann slotted wing.

Engines—Thermodynamics

Changes of State of Ideal Gases with Finite Velocity. (L. Vahl, Forschung, Vol. 4, No. 1, Jan.-Feb., 1933, pp. 31-37.) (8.10/26530 Germany.)

The effect of piston speed on the compression of air and CO_2 and SO_2 is investigated. The absence of thermal equilibrium entails an increase in work spent on the piston which may reach 2 per cent. for moderate piston speeds of the order of 10 m. per sec. Piston speeds have a profound effect on Carnot cycle efficiencies. With SO_2 between 0 and 20°C., the maximum realisable efficiency is only 50 per cent. of the ideal, with infinitely slow piston travel.

Gaseous Combustion at High Pressure—Explosion of H_2/Air and Carbonic Oxide Air Mixtures. (W. A. Bone, D. M. Newitt and D. T. A. Townend, Proc. Roy. Soc., Vol. 139, No. A.837, 2/1/33, pp. 57-74.) (8.13/26531 Great Britain.)

Explosions of hydrogen-air and carbonic oxide-air mixtures were carried out at initial pressures up to 1,000 atmospheres. The activation of N_2 previously observed with carbonic oxide-air mixture was confirmed and found to reach a maximum at approximately 500 atmospheres initial pressure. The activation is apparently due to radiation emitted by the CO flame and absorbed by the N_2 molecules.

Gaseous Combustion at High Pressure—Formation of Nitric Oxide in Carbonic Oxide-Oxygen-Nitrogen Explosions. (D. T. A. Townend and L. E. Outridge, Proc. Roy. Soc., Vol. 139, No. A.837, 2/1/33, pp. 74-83.) (8.13/26532 Great Britain.)

Explosions of carbonic oxide mixtures showed traces of nitric oxide. Commercial applications to fixation of atmospheric nitrogen would require a minimum yield of 10 per cent. at an initial pressure of 75 atmospheres. The explosion chamber was separated from a large expansion chamber by a "notched" diaphragm designed to blow out at a predetermined pressure. The rapid cooling thus obtained gave a maximum yield of 5.4 per cent. nitric oxide.

Gaseous Combustion at High Pressure—Nitric Oxide Formation in Continuous High Pressure Flames of Carbonic Oxide in Oxygen Nitrogen Mixtures. (D. M. Newitt and F. G. Lamont, Proc. Roy. Soc., Vol. 139, No. A.837, 2/1/33, pp. 83-93.) (8.13/26533 Great Britain.)

Haber in 1909 has obtained yields of the order of 1 per cent. by burning CO in " Linde " air at 10 atmospheres. A pressure of 100 atmospheres doubled the yield in these new experiments. The conditions in a flame are less favourable to NO formation than on explosion in a bomb, and this is shown in the smaller yield.

The Combination of Hydrogen and Oxygen Photo-Sensitised by Nitrogen Peroxide. (R. G. W. Norrish and J. G. A. Griffiths, Proc. Roy. Soc., Vol. 139, No. A.837, 2/1/33, pp. 147-162.) (8.13/26534 Great Britain.)

Previous conclusions (of Haber, Hinshelwood and others) confirm that the reactions between hydrogen and oxygen are of the chain type and can be sensitised by the introduction of hydrogen atoms. The present paper extends the work of Hinshelwood and Thompson and shows that the chains can also be sensitised by the introduction of oxygen atoms found by the decomposition of the nitrogen peroxide. In terms of petrol pressure less than .25 mm. of nitrogen peroxide in a total of 150 mm. will produce rapid formation of water at 357°C.; without the nitrogen peroxide no measurable reaction is obtained below 500°C.

Determination of Flame Temperature. (B. Lewis, H. Seaman and G. W. Jones, J. of Frank. Inst., Vol. 215, No. 2, Feb., 1933, pp. 149-167.) (8.13/26535 U.S.A.)

In continuation of three previous papers on determination of flame temperature of various combustible mixtures, the same methods are used to determine flame temperatures of more complex mixtures such as hydrogen, methane and carbon monoxide with oxygen and air, with added nitrogen and carbon in various amounts.

Results are given in diagrams and numerical tables in comparison with calculated heats of combustion, with some worked out examples.

Six references.

Engines—Design and Performance

Comparison of Aero and Auto Engines, etc. (Dipl.-Ing. Kurz, Autom. Tech. Zeit., Vol. 35, Nos. 10-11 and 13-17, 1932.) (8.20/26536 Germany.)

Comprehensive groups of engines for different purposes are considered and two fundamental characteristics—r.p.m. and inertia forces—are plotted against cylinder volume. The points are widely scattered, but their general run is clearly observable.

The mechanical stressing of various types of car and aero engines is compared. Whilst the aero engine of large and medium power output is generally stressed higher than the racing car engine, the light aeroplane engine of the standard four-cylinder type is less heavily stressed than the engine on a sports car. This probably accounts for the great reliability of the light aeroplane engine.

The New Improved Hornet Engine, Type T.1C. (Autom. Tech. Zeit., Vol. 36, No. 2, 25/1/33, p. 39.) (8.20/26537 Germany.)

The complete engine weighs 395 kg., has an effective cylinder volume of 27.7 litres and develops 700 h.p. at 2,000 r.p.m., with a compression ratio 6/1. A centrifugal fan booster necessitates a fuel of high octane ratio—87. The fin area of the cylinder has been increased, an oil temperature regulator is installed, the exhaust valves are cooled and the crankshaft specially hardened. A Hamilton variable pitch airscrew is fitted.

New Model of Benz Injection Oil Engine. (Z.V.D.I., Vol. 77, No. 1, 7/1/33, p. 29.) (8.25/26538 Germany.)

Instead of the former central injection, the needle valve and chamber are placed at an angle and enter the cylinder near the wall, giving space for larger valves with increase of volumetric efficiency.

One reference.

New Ceramic Materials. (W. Steger, Z.V.D.I., Vol. 77, No. 4, 28/1/33, pp. 81-87.) (8.283/26538 Germany.)

Tables are given of mechanical strength, thermal expansion and heat conductivity of porcelain clays, rare earths, quartz, etc.

A new clay, with the trade name Sinterkorund, has good electrical insulation with a heat conductivity nearly ten times that of porcelain, a combination of qualities desirable in sparking plugs.

The Use of Water Injection in Internal Combustion Engines. (H. R. W. Schreiber, Autom. Tech. Zeit., Vol. 36, No. 2, 25/1/33, pp. 32-33.) (8.29/26540 Germany.)

In hot bulb engines of low efficiency water injection reduces the temperature and acts definitely as a catalyser with improved combustion of the fuel oil.

In high efficiency internal combustion engines corrosion and crankcase oil dilution outweigh possible advantages. Useful applications of water injection are restricted to steady full load conditions.

Jet Propulsion with Reference to Thrust Augmentors. (G. B. Schubauer, N.A.C.A. Tech. Note No. 442.) (8.297/26541 U.S.A.)

A summary is given of the principles and possibilities of jet propulsion. At ordinary aeroplane speeds the relative inefficiency of propulsion by jet in comparison with airscrew propulsion is decisive.

For flight in the stratosphere rocket propulsion efficiency is equal to that of the airscrew at about 800 m.p.h., but the difficulties of starting, landing and controlling the combustion render the whole scheme illusory in the present state of technical development. The problem of increasing the jet efficiency by multiple nozzles is discussed at length and experimental characteristics of a variety of types are given in tables graphically.

At ordinary flying speeds there is a slight improvement in efficiency which leaves the jet still far inferior to the airscrew.

Dimensioned sketches show the details of simple and multiple nozzles used in the investigation, and a photograph shows the experimental mounting.

Twenty-three references.

Engines—Accessories

Resonance Torsional Oscillation Damper with Solid Damping for Crankshafts of Diesel Engines. (W. Popoff, Z.V.D.I., Vol. 77, No. 1, 7/1/33, pp. 19-23.) (8.36/26542 Germany.)

The damper consists of a hollow cylinder of rubber, surrounding the shaft, with its ends clamped to discs rigidly attached to the shaft. The damper is tuned by slipping additional rubber rings over the cylinder, till resonance is obtained under working conditions.

Numerical results are given graphically and in tables, and show the beneficial effects of damping in several installations. Four oscillograms are reproduced.

Seven references.

Irregular Firing and Torsional Oscillation. (M. Scheuermeyer, Werft-Reederei-Hafen, No. 5, 1/3/33, pp. 59-61.) (8.36/26543 Germany.)

Fourier series are formed to express the periodic torques, vector diagrams are drawn and resulting torque variations are tabulated and shown graphically.

Whirling of a Journal in a Sleeve Bearing. (D. Robertson, Phil. Mag., Vol. 15, No. 96, Jan., 1933, pp. 113-130.) (8.37/26544 Great Britain.)

Osborne Reynolds' theory of lubrication applies to steady motion. Extensions to the case of whirling shafts require much more elaborate treatment on account of the periodic changes in depth and velocity of lubricant. Critical reference is made to subsequent work.

The author states the usual assumption, and forms the numerous expressions required in the subsequent analysis. The results are compared with experiments and agree in important respects. At still higher speeds discrepancies appear which may be due to whipping and to turbulence in the lubricant.

Eight references.

Improvements in Light Alloy Piston for Motor Car Engine. (Z.V.D.I., Vol. 77, No. 2, 14/1/33, p. 54.) (8.38/26545 Germany.)

The ring grooves of a Silumin piston are made of a special cast iron, cast into the piston head. The wear is considerably reduced and new rings can be fitted without remachining the grooves.

Engines—Cooling

The Principles of Air Cooling. (D. R. Pye, Airc. Eng., Vol. 5, No. 48, Feb., 1933, pp. 31-33; also March and April.) (8.40/26546 Great Britain.)

The flow of air in the so-called boundary layer is discussed with reference to modern experimental and mathematical work. Observed velocities are given graphically as functions of position, semi-empirical expressions in current use are quoted, and applications to heat transference are considered, all with reference to smooth surfaces of simple form.

Estimates of the rate of heat dissipation imposed on the cylinder cooling surface give a round figure of 50-60 per cent. of the b.h.p. The provision of fins exposed to the air increases the head resistance; the best compromise is discussed with numerical illustrations.

Reference is made to the analogy between transference of heat by conductivity and of momentum by viscosity, and of both by eddy connection in turbulent flow, and formulæ, at best of a semi-empirical nature, are given in a form suitable for numerical evaluation in c.g.s. units, as the inconsistent units of English engineering are confusing in problems of any physical complexity. The importance and difficulty of this part of the subject are indicated by the space given to it.

Even for simple mathematical forms the thermo-hydrodynamical problem is intractable, and the scheme given by the author for application to engine design is based on comprehensive technical experience.

Useful practical principles are given for the guidance of designers.

Heat Transmission and Cylinder Wall Temperature in High Temperature Liquid Cooling. (H. Oestrich, Z.F.M., Vol. 24, No. 4, 28/2/33, pp. 109-113. D.V.L. Report 312.) (8.44/26547 Germany.)

With high temperature liquid cooling the actual amount of heat to be dealt with by the radiator is appreciably less than with water cooling. The difference is entirely due to the higher temperature of the cylinder, the surface of which acts as a supplementary radiator.

Engines—Lubricants and Lubrication

Oil Testing Machines. (Autom. Tech. Zeit., Vol. 36, No. 1, 10/1/33, pp. 13-15.) (8.540/26548 Germany.)

The results obtained from oil testing machines can only be appreciated by trained experimenters.

In the machine developed for research purposes at the Technical High School of Karlsruhe, bearing temperatures and loads are kept constant and the coefficient of friction is plotted over a wide speed range, including the regions of complete and partial fluid lubrication. This so-called " Stribeck " curve is applied to classify oils. For acceptance tests a modified Suthau machine is recommended, in which constant speed is maintained, a fixed quantity of oil is introduced and observation is made of the time required for a specified increase in resistance as indicated by the deflection of a pendulum.

Comparative figures obtained by the latter machine are for castor oil 5 hours, for mineral oil 1 hour, and for glycerine 20 minutes.

Oil Discoloration in Use. (Autom. Tech. Zeit., Vol. 36, No. 1, 10/1/33, pp. 19-20.) (8.540/26549 Germany.)

Discoloration of oil in an internal combustion engine depends on initial fluorescence and by itself is no indication of deterioration or loss of lubricating power.

The Present Position of Scientific Bearing Design. (O. Schweickhart, Autom. Tech. Zeit., Vol. 36, No. 1, 10/1/33, pp. 1-5.) (8.580/26550 Germany.)

Falz has introduced simplifications into the lubrication theory of Gumbel and Everling. Deformations of bearings or shaft are more important in determining the life of the bearing than the so-called *PV* factor. Misapplied hydrodynamic theory imposed relatively long bearings to reduce end leakage. It appears that much shorter bearings with relatively small deformation give better results.

Twenty references.

Engines—Fuels

Gas and Light Oil from Lignite Tar. (A. Sander, Z.V.D.I., Vol. 77, No. 4, 28/1/33, pp. 100-101.) (8.60/26551 Germany.)

Tar and water are sprayed through small orifices into a reaction chamber maintained at a temperature between 800° and 1,000°C. under atmospheric pressure. After leaving the chamber the gases are rapidly cooled, by water injection, to 300°C., with consequent deposition of pitch and asphalt.

Subsequent cooling is carried out by stages in air condensers. Temperature control in the reaction chamber determines a predominantly gaseous or liquid yield; 1 kg. of tar will yield up to 2 cubic m. of gas and 200 grs. of liquid fuel.

Two references.

New Process for Alcohol Production. (K. W. Geisler, Z.V.D.I., Vol. 77, No. 5, 4/2/33, pp. 126-128.) (8.606/26552 Germany.)

Apart from methods of fermentation ethyl alcohol is produced commercially from wood or ethylene, and from acetylene by addition of free hydrogen. The last method is being investigated in France. Ammonium sulphate is produced as a by-product by treating ethyl sulphuric acid with ammonia. The latter is obtained from the H_2 contained in coke oven gas.

Anti-Knock Research. (C. B. Veal and others, S.A.E. Jrnl., Vol. 32, No. 3, March, 1933, pp. 105-119.) (8.645/26553 U.S.A.)

The policy of the Co-operative Fuel Research Committee is stated. The laboratory equipment and test methods are described in relation to comparative road tests.

Sectional sketches are given of the front and side elevations of the test engine and of experimental gear for fuel intake control. Graphical records are shown of results in road tests and in the laboratory. Some rather unsystematic conclusions are drawn, and further test direction is indicated.

Eighteen references.

Engines—Injection Systems

Bosch Carburettors. (Autom. Tech. Zeit., Vol. 36, No. 1, 10/1/33, pp. 12-13.) (8.701/26554 Germany.)

The carburettors are fitted with a cold starting device controlled by a second float, which prevents flooding of the engine. In a modified form, a sealed flat chamber is used and the autovac dispensed with, the carburettor performing its own lifting of the fuel.

The article is illustrated by a photograph and three sectional diagrams with names of parts.

Process of Guttulation (Atomisation) of Jet in Diesel Engines without Compressor. (O. Klusener, Z.V.D.I., Vol. 77, No. 7, 18/2/33, pp. 171-172.) (8.705/22.2/26555 Germany.)

Each drop of fluid is exposed to the pressure of the relative wind, which tends to deform it against the surface tension which tends to maintain the spherical form. The known distribution of pressure on a sphere is plotted and the subsequent deformation of the drop is considered. Probable diameters and speeds of drops are correlated with temperature and pressure in graphical charts.

Experimental points given by Fr. Sass are marked on the chart and confirm at least the order of magnitude of the predicted values.

Guttulation (Atomisation) of Liquid Jets. (H. H. Holroyd, J. Frank. Inst., Vol. 215, No. 1, Jan., 1933, pp. 93-97.) (22.2/26556 U.S.A.)

The volume of the drop is expressed as the ratio [(surface tension × square of jet dia.) ÷ (density of fluid × square of jet velocity)] multiplied by an undetermined function of the Reynolds number.

Experimental tables show that with this parameter the function of Reynolds number changes slowly increasing jet pressures. (The effect of air forces does not receive consideration so that the author's physical reasoning may require some modification.)

Engines—Exhaust Systems

Silencers for Motor Car Engines. (E. Lehr, Z.V.D.I., Vol. 77, No. 1, 7/1/33, pp. 26-27.) (8.721/26557 Germany.)

Apparatus is described for analysing the frequency of the sound emitted by the exhaust of an engine run under various conditions. Measurements of noise intensity and pressure amplitude were made with various types of silencers. The best results were obtained by combining two types of silencers, one in which the gas passes through a series of expansion chambers, the expansion from one chamber to the next being sudden. This is effective in destroying notes of low frequency. The second type of silencer is of the so-called absorption type, *i.e.*, a tube of constant cross-section is lined with a porous material which silences the high frequency note.

Two references.

Flow in Cross-Section of Inlet Valve of High Speed Internal Combustion Engines. (K. Schlaefke, Autom. Tech. Zeit., Vol. 36, No. 2, 25/1/33, pp. 28-31.) (8.725/26558 Germany.)

Simplifying assumptions are made and the air velocity through the valve throat is computed for every 2° of crank angle.

The maximum velocity and the corresponding crank angle depend on the compression ratio. With increasing compression ratios increasing maximum values are reached at decreasing crank angles.

Engines—Transmission

Clutch Design. (E. E. Wemp, S.A.E. Jrnl., Vol. 32, No. 3, March, 1933, pp. 92-103.) (8.765/26559 U.S.A.)

The problems of design include spring pressure and cover plate, disc facing and distortion, manual operation, automatic centrifugal action, free wheeling and fluid coupiings. Vacuum control is discussed. Drawings are reproduced of thirteen types of clutch.

Armament

Ballistics of Rifles. (H. Gerlich, Army Ordnance, Vol. 13, No. 76, Jan.-Feb., 1933, pp. 215-219.) (9.16/26560 U.S.A.)

The author makes remarkable claims in respect of bullet speeds. A previous claim to maximum muzzle velocity of 5,710ft. per sec. has been criticised by a German authority as impossible, but the author now produces test figures showing a muzzle velocity of 4,445ft. per sec. and states that similar results were obtained officially (in U.S.A.).

Photographs of penetration of armour plate by the author's rifle bullets are reproduced.

The Combustion Problem of Internal Ballistics. (A. D. Crow and W. E. Grimshaw, Phil. Mag., Vol. 15, No. 99, March, 1933, pp. 529-553, and No. 100, April, 1933, pp. 729-752.) (9.16/26561 Great Britain.)

The whole problem of internal ballistics is reconsidered in the light of developments to date. Expressions are formed for the pressure density relation, the rate of burning, the transformation of energy into kinetic energy of travel or spin, friction loss and heating.

The solution of the system of differential equations in non-dimensional form forms a lengthy contribution to methods of numerical solution which is unsuitable for abstraction.

Night Bombing—Past, Present and Future. (Lieut.-Col. Hébrard, Rev. F. Aér., No. 42, Jan., 1933, pp. 5-60; No. 43, pp. 123-150; No. 44, pp. 245-275.) (9.3/26562 France.)

Night bombers may operate on the battlefield against railheads and dumps immediately supplying the fighting troops, or finally against the enemy civilian population, particularly where engaged in war production.

The desired characteristics of bombing aircraft vary with the different objectives. Special equipment is required for recognition of the objective by searchlight or flash bomb. Developments in photography will extend the scope of night work, especially in detecting the movements of large masses of troops by night.

For a defensive measure first place is given to the fast fighters. Reference is made to development of listening posts by Great Britain, suggesting that searchlights will not be used, but that bombers will be located acoustically and fighting squadrons directed accordingly.

Gunnery and Bombing (Naval)—Ballistics. (L. Thompson, J. Frank. Inst., Vol. 215, No. 2, Feb., 1933, pp. 119-132.) (9.33/26563 U.S.A.)

General principles are considered in relation to attacks by bombers from a carrier ship against effective defence by fighters and anti-aircraft guns.

An attempt is made to assess the weighting of different factors and to establish probability of loss and of hit. Formulæ are developed, but stress is laid on the uncertainty of the relative weights of the numerous factors.

A comparison is made with long range fire by heavy naval battery.

Armour v. Bullets. (G. P. Wilhelm, Army Ord., Vol. 13, No. 76, Jan.-Feb., 1933, pp. 207-210 and 242.) (9.57/26564 U.S.A.)

A number of technical data are given in respect of high resistance steels and high penetration bullets.

The effects on concrete shelters, steel helmets and tank armour are discussed.

Alkan Cinematic Target. (Rev. F. Aer., No. 43, Feb., 1933, pp. 219-227.) (9.62/26565 France.)

A description is given of equipment for training in navigation and bombing by sighting on a moving projection of a landscape, illustrated by six diagrammatic sketches with 78 numbered details.

The O.P.L. Camera Gun. (Rev. F. Aer., No. 42, Jan., 1933, pp. 107-111.) (9.63/26566 France.)

The camera gun resembles in appearance the Hotchkiss machine gun. It is intended for anti-aircraft practice and takes account of the motion of the target aircraft, the time of flight of the bullet and the curvature of the trajectory.

Fennel Range-Finder. (R. Werkmeister, Z. Instrum., Vol. 53, No. 2, February, 1933, pp. 82-84.) (9.64/26567 Germany.)

The instrument is intended for accurate survey work. Distance ranging from 50-100 m. can be measured to an accuracy of ± 2.5 cm. with a single observation.

Materials—Characteristics

Manufacture and Use of Light Alloys. (W. C. Devereux, J.R. Aer. Soc., Vol. 37, No. 266, Feb., 1933, pp. 145-167.) (10.231/26568 Great Britain.)

The tensile strength and Brinell hardness of four alloys are shown as a function of temperature up to 350°C. Friction tests on cast piston alloys show relative friction as a function of temperature up to 220°.

Fatigue tests up to 40 million reversals show the high fatigue strength of " Y " alloy and " Hiduminium " in comparison with 2.L.8. Data from impact tests and heat treatment are tabulated.

Special Light Alloys for Aircraft. (W. C. Devereux, Airc. Eng., Vol. 5, No. 47, Jan., 1933, pp. 6-12.) (10.231/26569 Great Britain.)

Extensive information is given from the practical experience of the author with Y-metal, hiduminium and other known trade alloys.

Photographs are reproduced illustrating casting and stamping problems.

Three machines for friction fatigue and repeated impact tests are shown. Metallurgical peculiarities of specimens under varied heat and mechanical treatment are exhibited by metallographical photographs and by graphical charts of tensile strength, Brinell hardness, elongation, as functions of temperature and number of stress reversals, etc.

Copper-Beryllium Alloy. (Sci. Am., Vol. 148, No. 3, March, 1933, p. 170.) (10.234/26570 U.S.A.)

The American Brass Co., Bridgeport, Connecticut, has exhibited a new alloy copper +1 to 2¼ per cent. beryllium with elastic limit 170,000lb. per sq. in. (75 tons), susceptible of heat treatment with high electrical conductivity and resistant to corrosion.

Instrument for Measuring Flexural Characteristics of Textiles. (H. F. Schiefer, Bur. Stan. J. Res., Vol. 10, No. 5, May, 1933, pp. 647-657.) (10.402/26571 U.S.A.)

A strip of fabric is mounted so that it can be bent by couples at each end of the free length into a circular arc, the minimum angle subtended at the centre of the arc being kept proportional to the thickness of the material, so that the strains in the extreme inner and outer surfaces are equal. The torque work required to produce the strain is plotted against the angle for bending in the planes of the warp and the filling. There is marked hysteresis on relaxing the bending strain.

An interpretation of the results in terms of trade qualities of " feel " and " handling " is suggested.

Seven references.

Materials—Defects and Treatment

Fatigue Strength of Nitrided Test Pieces. (R. Mailander, Z.V.D.I., Vol. 77, No. 10, 11/3/33, pp. 271-274.) (10.120/26572 Germany.)

The advantages of nitriding apply not only to ordinary metal forms, but to regressive edges with small radii such as are produced by grooves, notches and screw threads.

A number of test results are reproduced in illustrations. The relative merits of cadmium and zinc protection are discussed.

Twelve references.

New Process of Welding by Gas or Electric Arc. (E. Kalisch, Z.V.D.I., Vol. 77, No. 13, 1/4/33, pp. 355-356.) (10.140/26573 Germany.)

The absorption of carbon during welding may harden the material locally and reduce the extension under tensile test. A process of annealing is applied which redistributes the excess carbon more uniformly. Four photographs show the metallurgical processes. (German Patent D.R.P.a.K.120073.)

The Effect of Alcoholic Fuels on Aluminium and its Alloys. (O. Bauer and G. Schikorr, Z. Metallk., Vol. 25, No. 2, Feb., 1933, p. 44.) (10.262/26574 Germany.)

Corrosion effects are entirely due to the presence of water in alcohol fuels or mixtures. They become active when the water content exceeds one per cent. The corrosion was uniformly distributed over the alloy and was practically the same for pure aluminium as for the alloy tested.

Cohesive Strength. (W. Kuntze, Z.V.D.I., Vol. 77, No. 2, 14/1/33, pp. 49-50.) (10.660/26575 Germany.)

In the standardised tests for cohesives, too little attention is given to the shape of the test pieces, the results for which may have little direct application under complex stresses in practical applications.

Four references.

Nail Tests. (H. J. Ströer, Z.V.D.I., Vol. 77, No. 1, 7/1/33, pp. 13-18.) (10.90/26576 Germany.)

Nails are retained in position by tangential friction produced by the normal pressure of material. In wood, the pressure due to displacement of longitudinal fibre is more effective than that due to transverse fibres.

It is advisable that the nail be well pointed, roughened, and driven in at an angle, especially if the wood is moist. Experimental values are given in tables and graphically, and bring out the importance of nail section and point.

Photographs of nine sectioned specimens show the greater or less disruption of the wood fibres by the different sections.

Eight references.

Testing Apparatus, etc.—Altitude Chambers

Effect of Altitude on Gas Appliances. (J. H. Eiseman, F. A. Smith and C. J. Merritt, Bur. Stan. J. Res., Vol. 10, No. 5, May, 1933, pp. 619-637.) (11.60/26577 U.S.A.)

The investigation is directed to the behaviour of gas jets in various domestic appliances to ensure safety in installations at great heights above sea level. A reduction of 3 to 4 per cent. in gas rate for each 1,000 feet above sea level is prescribed.

The low-pressure test chamber and the analysis of the gases are cognate to aeronautical problems.

Five references.

Airships

Motion of an Airship under Certain Conditions. (D. H. Williams and A. R. Collar, J.R. Aer. Soc., Vol. 37, No. 265, Jan., 1933, pp. 35-75.) (12.10/26578 Great Britain.)

Consideration is restricted to the motion of the R.101 in a vertical plane under disturbing forces imposed by control surfaces, change of airscrew thrust, internal changes of trim and buoyancy and external air forces due to gusts.

The mathematical equations of longitudinal stability are intractable save for small disturbances, and graphical and numerical methods are required for large disturbances. Six characteristic derivatives are required in the equations of motion, and are given graphically.

The trajectories are worked out from point to point for a variety of conditions and show the path subsequent to the disturbance.

Some of the effects are quite unexpected in relation to their causes, and show that apparently obvious correcting manœuvres may well accentuate the departure from steady flight and precipitate a disaster.

The authors conclude that problems of airship stability should be worked out in advance, for comparison with test observations.

Seven references.

Airship Development Abroad. (S.-Ldr. R. S. Booth, J.R. Aer. Soc., Vol. 37, No. 268, April, 1933, pp. 366-380.) (12.10/26579 Great Britain.)

The main constructional features of the American and German airships are reviewed. Of special interest is the statement that the short life of the gas bags on the British ships R.100 and R.101 was due to the outer covering being faulty and thus providing insufficient protection. If properly installed, a gas bag has a useful life of several years.

Airship Problems. (K. Arnstein, Z.F.M., Vol. 24, No. 1, 14/1/33, pp. 1-13.) (12.10/26580 Germany.)

A note is given on the historical development of rigid airships.

A detailed descriptive technical account is given of the numerous aerodynamical, aerostatical, structural and propulsive problems involved. A general arrangement sketch and twenty photographs show numerous details.

Two references.

Technical Notes on the "Graf Zeppelin." (C. Dollfus, L'Aéron., No. 164, Jan., 1933, pp. 15-20, and No. 165, Feb., 1933, pp. 39-42.) (12.30/26581 France.)

The author was a passenger from Friedrichshafen to Pernambuco and back and comments favourably on the technical equipment and handling of the ship. Fourteen photographs are reproduced.

The airship steers better without the rear airscrew, the wake of which affects the controls, and for this reason the rear engine is generally kept in reserve. The engine builders were given a free hand as to engine weights with high reliability and low consumption as the chief consideration.

The weight is 4lb./h.p. at 450 h.p. and 1,450 r.p.m. at which the engine will operate continuously for 2,000 to 3,000 hours without overhaul. The gas used is H_2 and Blaugas, stored at refuelling stations in short fat cylinders.

The electrical installation consists of two 30 h.p. petrol engines driving two 25 k.w. generators, all housed in a separate gastight gondola, insulated from the rest of the airship. The loss of lifting gas through the ballonets is less than 50 m.^{3} per day (total capacity of ship 70,000 m.^{3}).

The author urges co-operation with the Zeppelin Co. by the erection of landing masts and airports in France. In this way American passengers are saved a possibly unnecessary journey to Friedrichshafen.

Wireless

High Power Broadcasting Equipment in Germany. (A. Semm, Z.V.D.I., Vol. 77, No. 10, 11/3/33, pp. 257-264.) (13.0/26582 Germany.)

A descriptive technical account is given of installations at Muhlacker (Stuttgart), Breslau, Berlin and Hamburg.

Thirteen photographs show the external appearance of parts of the equipment.

Eight references.

Audio Transformer. (M. Pawley, J. Frank. Inst., Vol. 215, No. 2, Feb., 1933, pp. 133-147.) (13.2/26583 U.S.A.)

A selective amplifier circuit is shown in diagram containing an audio transformer with variable resistance in the primary and a variable capacitance in the secondary.

Elementary expressions give the relations between resistance, capacitance, voltage, amplification and frequency. Characteristic curves are shown graphically.

Numerical examples are worked out and oscillogram records are reproduced to illustrate the selectivity of the circuit.

Elimination of Background "Noise" in Sensitive Pulse Amplifiers. (L. F. Curtiss, Bur. Stan. J. Res., Vol. 10, No. 2, Feb., 1933, pp. 151-154.) (13.2/26584 U.S.A.)

From author's abstract:—Even after due care has been taken to reduce disturbances in the first two stages, a great improvement can be effected by suitable modification of the final or output stage. This consists in using several output tubes, preferably pentodes, in parallel, and selecting an operating point on the characteristic curve such that small fluctuations in the voltage applied to the

control grids produce practically no change in the plate current and yet all pulses which exceed these fluctuations in the desired direction are reproduced in the plate current. Although this arrangement involves some distortion of very small pulses, the gain in the legibility of the oscillograph record is sufficient to compensate for this slight disadvantage. The results obtainable under various conditions are illustrated by reproductions of oscillograph records.

Equipment for Audio-Frequency Amplifiers. (H. Sohon, Proc. Inst. Rad. Eng., Vol. 21, No. 2, Feb., 1933, pp. 228-237.) (13.2/26585 U.S.A.)

From author's abstract:—A new type peak voltmeter is described that makes continuous measurements of the highest peak values attained by the signal.

An automatic control circuit is described which reduces the amplification of a special amplifier when the output voltage reaches a certain amount, thereby keeping the subsequent equipment from being overloaded.

Analysis of Parallel Resonance. (R. Lee, Proc. Inst. Rad. Eng., Vol. 21, No. 2, Feb., 1933, pp. 271-281.) (13.2/26586 U.S.A.)

From author's abstract:—Vector diagrams are developed for various conditions of tuning parallel circuits, and from the geometry of the diagrams mathematical relations are derived. These relations are then plotted for use in tuning operations. Two examples are given of the practical application of the analysis.

North Atlantic Ship-Shore Radiotelephone Transmission 1930-31. (C. N. Anderson, Proc. Inst. Rad. Eng., Vol. 21, No. 1, Jan., 1933, pp. 81-101.) (13.31/26587 U.S.A.)

From author's abstract:—Contour diagrams are given which show the variation of signal fields with distance and time of day for the various seasons on approximate frequencies of 4, 9, 13 and 18 megacycles. Curves are also shown which enable the data to be applied more generally for other conditions of noise and radiated power.

Cause and Elimination of Night Effect in Radio Range-Beacon Reception. (H. Diamond, Bur. Stan. J. Res., Vol. 10, No. 1, Jan., 1933, pp. 7-34.) (13.4/26588 U.S.A.)

An approximate analysis is given of the effects produced at night on waves propagated by loop antenna rotation of the plane of polarisation of horizontal components of the electrical wave, which produces an effective rotation of the beacon pattern in space.

Continuous reception records show variations in apparent direction exceeding $\pm 30°$ within a few minutes and reaching $\pm 45°$.

The application of vertical antennæ reduced these variations to the order of $\pm 3°$.

Reference is made to earlier British developments on similar lines.

Eight references.

The Cathode Ray Oscillograph. (R. A. Watson Watt, J. Sci. Inst., Vol. 10, No. 2, Feb., 1933, pp. 37-43.) (13.5/26589 Great Britain.)

The fundamental merit of the cathode ray oscillograph lies in the elimination of inertia and corresponding time lag for recording speeds up to half that of light.

Important applications are described and four oscillograms are reproduced.

Grid Controlled Mercury Vapour Tube. (A. C. Seletzky and S. T. Shevki, J. Frank. Inst., Vol. 215, No. 3, March, 1933, pp. 299-326.) (13.5/26590 U.S.A.)

The tube is essentially a triode operating in an atmosphere of mercury vapour. A diagram of connections is shown and the elementary physical relations are fully

stated. The characteristics are illustrated by 10 oscillograms and the reduced values are given in graphical charts.

Ellipse Diagram of a Lecher Wire System. (A. Hikosaburo, Proc. Inst. Rad. Eng., Vol. 21, No. 2, Feb., 1933, pp. 303-311.) (13.6/26591 U.S.A.)

The circuit for Lecher wire systems is shown diagrammatically and the vector equations are formed and discussed.

In graphical representation the current through the end of the system is the inverse of a radius vector drawn from a determinate origin to the periphery of an ellipse. An analogy with the circle diagram of an induction motor is pointed out.

Ultra-Short Wave Propagation. (J. C. Schelleng, C. R. Burrows and E. B. Ferrell, Proc. Inst. Rad. Eng., Vol. 21, No. 3, March, 1933, pp. 427-463.) (13.6/26592 U.S.A.)

From authors' abstract:—Part I of this paper describes a method of measuring attenuation and field strength in the ultra-short wave range. A résumé of some of the quantitative experiments carried out in the range between 17 megacycles (17 metres) and 80 megacycles (3.75 metres) and with distances up to 100 kilometres is given for (1) " Optical " paths over sea water and (2) " Non-optical " paths over level and hilly country. The absolute values of the fields measured were always less than the inverse distance value. Over sea water the fields decreased as the frequency increased from 34 megacycles (8.7 metres) to 80 megacycles (3.75 metres), while the opposite trend was found over land.

Part II gives a discussion of reflection, diffraction, and refraction as applied to ultra-short wave transmission. It is shown (1) that regular reflection is of importance even in the case of fairly rough terrain, (2) that diffraction considerations are of prime importance in the case of non-optical paths, and (3) that refraction by the lower atmosphere can be taken into account.

The existence of optimum frequencies is pointed out and it is emphasised that they depend on the topography of the particular paths, and that different paths may therefore have widely different optimum frequencies.

Twenty-one references.

Ultra-Short Wave Transmission Phenomena. (C. R. Englund, A. B. Crawford and W. M. Mumford, Proc. Inst. Rad. Eng., Vol. 21, No. 3, March, 1933, pp. 464-492.) (13.6/26593 U.S.A.)

From authors' abstract:—The results of a series of transmission experiments made in the range 3.7 to 4.7 metres and over distances up to 125 miles are reported. These observations were chiefly confined to the region reached by the directly transmitted radiation and are found in good agreement with the assumption that such transmission consists mainly of a directly transmitted radiation plus the reflection components which would be expected from the earth's contour.

The almost universal standing wave diffraction patterns have been studied and sample records are given. The methods of measuring field intensity are described in an appendix. No long-range transmissions, such as harmonics of distant (greater than 500 miles) short-wave stations would yield, have been observed.

Seven references.

Measurement of Frequency of Short Waves. (B. Hoag, Proc. Inst. Rad. Eng., Vol. 21, No. 1, Jan., 1933, pp. 29-36.) (13.6/26594 U.S.A.)

A Lecher wire system, short circuited by a Tonks bridge, with impedance approximately equal to that of the input oscillator, develops an e.m.f. which is periodic in the difference between the wave length and the length of the shorted wires.

The galvanometer deflection produced by a rectified current exhibits this periodicity and enables a number of wave length determinations to be made. The mean values for wave lengths from 20 to 60 cm. are given to three significant figures.

Propagation of Wave Lengths between Three and Eight Metres. (L. F. Jones, Proc. Inst. Rad. Eng., Vol. 21, No. 3, March, 1933, pp. 349-386.) (13.6/26595 U.S.A.)

From author's abstract:—A description is given of the equipments used in an airplane, dirigible, automobile, and indoors to measure the propagation characteristics of wave lengths between about three and eight metres. The majority of observations were of television transmissions from the Empire State Building.

It is shown that any modulation frequency is partly or completely suppressed if propagation to the receiver takes place over two paths differing in length by half of the hypothetical radio wave length of modulation frequency.

Four references.

Propagation of Waves Below Ten Metres in Length. (B. Trevor and P. S. Carter, Proc. Inst. Rad. Eng., Vol. 21, No. 3, March, 1933, pp. 387-426.) (13.6/26596 U.S.A.)

From authors' abstract:—Observations of the two transmitters on the Empire State Building in New York City, on 44 and 61 megacycles, were made in an airplane over Long Island. These tests show the nature of the interference patterns set up by the combination of the direct and reflected rays. With low transmitting and receiving antennæ, field strength measurements with distance were taken for both horizontal and vertical polarisations over Long Island sand on 41.4 and 61 megacycles. Similar tests were made over salt water with low antennæ on 34.8 and 59.7 megacycles.

Another airplane test was made on 34 megacycles with a higher transmitting antenna and increased power up to a distance of 200 kilometres. The intervening territory in this run was partly land and partly salt water.

The experimental data are discussed in comparison with the theoretical curves determined from optical principles. The experimental results are shown to conform in general with the predictions from theoretical considerations.

Photo-Electric Emission in a Magnetic Field. (R. Schmid, Ann. d. Phys., Vol. 16, No. 6, March, 1933, pp. 647-656.) (13.7/26597 Germany.)

A magnetic field, parallel to the electric field of an open photo-electric cell, was found to increase the photo-electric emission.

A full technical description is given of the relatively simple apparatus, and some physical effects are discussed.

Electro-Physics. (N. R. Campbell, J. Inst. Elect. Engrs., Vol. 72, No. 434, Feb., 1933, pp. 153-159.) (13.7/26598 Great Britain.)

A concise review is given of progress in atomic physics. Applications to thermionic amplifiers, photo-electric cells, the electron microscope, piezo-electric clock control, and electric conduction are of general interest.

Electro-Motive Force of Copper Oxide Photo Cells as a Function of Light Intensity and Wave Length. (A. Goldmann and M. Lukasiewitsch, Phys. Zeit., Vol. 34, No. 2, 15/1/33, pp. 66-73.) (13.7/26599 Germany.)

The experimental method and installation are described in detail.

Various forms of the empirical equations are discussed, and close fits are obtained for observed values with red, green, and blue light. The e.m.f. is remarkably little affected by the wave length within the visible spectron.

Ten references.

Shielding at Radio Frequencies. (L. V. King, Phil. Mag., Vol. 15, No. 97, Feb., 1933, pp. 201-223.) (13.9/26600 Great Britain.)

Formal solutions are obtained in Legendre and Bessel functions for spherical and circular cylindrical shields, and simplified for various conditions.

At radio frequencies a simple exponential function with a shape factor is obtained.

The shape factor varies from 4 with a cylindrical shield to 6 for a spherical shield, and for any reasonable shape a mean diameter may be assumed with a shape factor between 4 and 6.

Electro-Magnetic Shielding. (W. Lyons, Proc. Inst. Rad. Eng., Vol. 21, No. 4, April, 1933, pp. 574-590.) (13.9/26601 U.S.A.)

Author's abstract:—The paper describes a method used in measuring the ratio of magnetic field intensities within conducting cylindrical and spherical shells to that outside, values being given for various frequencies between 1,000 and 30,000 cycles per second of the exciting field and various lengths and radii. A theoretical derivation of a shielding formula is given for a thin spherical shell and a cylindrical one of infinite length. Satisfactory agreement between theory and observation is found in the case of the sphere and in cylinders of lengths greater than their diameters.

Photography

Aerial Survey in Relation to Economic Geology. (D. Gill, J. Roy. Aer. Soc., Vol. 37, No. 267, March, 1933, pp. 227-287.) (14.14/26602 Great Britain.)

Cost and organisation are discussed briefly.

Applications for geological survey involve a number of special points and are still unsystematic. A reasoned scheme is suggested and covers equipment, choice of seasons and time of day, selection of scale, formation of mosaics and interpretation of geological features, all in relation to the dominating question of cost.

Thirty references.

Air Survey. (Lieut. J. S. A. Salt, J. Roy. Aer. Soc., Vol. 37, No. 267, March, 1933, pp. 209-226.) (14.14/26603 Great Britain.)

The geometry, technique and equipment required for air survey are dealt with concisely. Photographs show an R.A.F. automatic magazine camera installation and a Barr and Stroud stereoscopic comparator. Questions of organisation, policy and finance were raised in the subsequent discussion.

The Galliss-Ferber System of Rectification of Air Photographs. (E. Robin, Rev. F. Aer., No. 44, March, 1933, pp. 281-298.) (14.40/26604 France.)

The Galliss-Ferber machine for rectifying air photographs is described. No use is made of stereoscopy, but a method of stereoscopic illumination is employed. About 30 square kilometres of country can be covered by a pair of photographs 18 x 18 cm. from an altitude of 20,000 feet. Three pairs can be rectified in the apparatus per day. To cover a stretch of 100,000 square kilometres (1/5 the area of France) requires 6,700 couples taken in 84 flights of 4 hours each. The rectification would occupy about one year if six sets of apparatus are employed.

Sound, Noise Reduction, etc.

Acoustic Measuring Instruments for Practical Use. (W. Jackel, Z.V.D.I., Vol. 77, No. 4, 28/1/33, pp. 98-99.) (15.20/26605 Germany.)

A technical description is illustrated by three photographs and a diagram of connections. The pressure exerted by the sound wave is measured directly in

dynes/cm.^{2}, through a ribbon microphone with suitable rectification and amplification.

Another instrument dealing with the measurement of reverberation times, stores the energy electrically in a thermo element and measures it ballistically.

Seven references.

Gear Wheels as Sources of Sound. (A. Soden, Z.V.D.I., Vol. 77, No. 9, 4/3/33, pp. 231-238.) (15.3/26606 Germany.)

The kinematical conditions of contact are analysed in respect of tooth form and material. Diagrams show the profile of eight types of tooth profile with the rates of rolling and gliding of the point of contact, and the mechanical force applied. Methods of inspection are discussed and illustrated.

Oblique teeth are considered as an effective basis of reducing impact and noise. The dynamical measurement of sound intensity, as compared with subjective estimation, is illustrated by the reproduction of 15 oscillograph records. Numerous points remain obscure.

Twelve references.

Fundamental Investigation on Sound Absorption. (E. Wintergast and H. Klupp, Z.V.D.I., Vol. 77, No. 4, 28/1/33, pp. 91-95.) (15.3/26607 Germany.)

Fabrics stretched in one or two layers and fibre plates were placed at one end of a tube and a source of sound was operated at the other end of the tube. The maximum and minimum amplitude due to interference between incoming and reflected sound waves was measured by a travelling microphone, and the coefficient of absorption was determined therefrom.

The absorption of simple materials is dependent on sound frequency. Any attempt to widen the field of response reduced the absorption maximum. Best results over wide ranges were obtained by drilling a fibre plate with a large number of 5 mm. holes spaced 25 mm. apart. The plate itself is 18 mm. thick and placed 35 mm. from a solid wall; the intervening space was filled with slag wool.

The use of two layers of stretched fabrics placed close to the wall gives a higher degree of absorption, but is less effective at low frequencies.

Numerical results are given graphically in 12 diagrams and a table.

Three references.

The Problem of Noise from the Standpoint of the Engineer. (K. W. Wagner, Z.V.D.I., Vol. 77, No. 1, 7/1/33, pp. 1-9.) (15.3/26608 Germany.)

Recent developments in electro acoustics render possible accurate measurement of sound and noise intensity. The sound intensity in terms of air pressure may vary between 10^{-4} and 10^3 dyn./cm.^{2}. The noise intensity depends on the physiological characteristics of the human ear and is expressed on a logarithmic scale of decibels, the connection between air pressure and ear response being of the form

$$\text{Noise intensity in decibels} = cx \text{ by } 10\ p/ps.$$

p = air pressure of standard note producing equal ear response.

ps = air pressure of standard note at threshold of response.

Expressed on this scale, the ear response varies between 0 (threshold) and 150 phons or decibels, according to the frequency and the pressure of the sound waves. This scale is definite so long as the sounds are free from overtones, but difficulties arise when instruments are required to deal with complex sounds in the same way as the ear.

It is then necessary that the recording instrument in addition to measuring air pressure should also analyse the sound and add effects of the components in the same way as the ear. An instrument is described which does this fairly

satisfactorily for most sounds occurring in practice. In the case of explosive sounds, however, such as engine exhaust noises, a different procedure is adopted in which an impulse meter integrates the effect of short sound impacts. Examples are given in the use of such instruments for measuring engine noises, including those produced by gears.

Numerical results are given graphically and in tables. Numerous applications of sound damping in technical problems are illustrated by diagrammatic perspective drawings.

Eleven references.

Transmission of Sound through Partitions. (A. H. Davis, Phil. Mag., Vol. 15, No. 97, Feb., 1933, pp. 309-316.) (15.38/26609 Great Britain.)

For materials with poor elastic qualities such as paper, sail cloth, fibre board, the controlling parameter is the mass per unit area, but with very light partitions, such as thin paper, the damping effect becomes sensible. For mahogany panels and brick wall, resonance effects become important.

Comparison of experimental results with a formula given by Rayleigh brings out discrepancies which may be reduced by taking into account the more important modes of resonance of the partition regarded as an elastic plate.

Application of the Thermophone to Measurements of Threshold Sound Intensity. (W. Geffcken and L. Keibs, Ann. d. Phys., Vol. 16, No. 4, Feb., 1933, pp. 404-430.) (15.38/26610 Germany.)

The intensity of the sound wave produced in a closed space by a wire, of low heat capacity, traversed by an alternating current, can be calculated exactly from a formula given by mathematical physical theory, with one empirical coefficient.

The mathematical physical theory is worked out in detail and the conclusion is reached that it is the best method for exact determination of small sound intensities.

Aircraft—Unorthodox

Future Problems of Sailing Flight. (W. Georgii, Z.F.M., Vol. 24, No. 5, 14/3/33, pp. 125-136.) (17.40/26611 Germany.)

The performances of glider pilots have approached the limits imposed by the meteorological conditions in Germany. More extensive performances should be possible in the tropics. In the last competition at the Rhon previous direction and distance records were not broken, but better tuition has greatly improved the performance of the average pilot under normal weather conditions.

Wing Beats. (J. D. Batten, J.R. Aer. Soc., Vol. 37, No. 266, Feb., 1933, pp. 168-176.) (17.50/26612 Great Britain.)

A description is given of a mounting for wing spars permitting the beating of the wings with recuperation of the kinetic energy by a torsional spring.

The details are illustrated by sketches and photographs of model.

Meteorology and Physiology

Weather by Teletype. (Sci. Am., Vol. 148, No. 3, March, 1933, p. 169.) (19.0/26613 U.S.A.)

Teletype instruments are distributed at weather reporting stations along 13,000 miles of airway. Each station reports in rapid sequence and the messages are received on the tape by all other stations in the telephone cable circuit. Equipment for automatic re-transmission is provided at important airports.

A high standard of accuracy in short range forecasting is maintained.

Wind Pressure on Model of Empire State Building. (H. L. Dryden and G. C. Hill, Bur. Stan. J. Res., Vol. 10, No. 4, April, 1933, pp. 493-523.) (19.15/26614 U.S.A.)

The model is 5ft. high on scale 1/250.

A manometer was connected to orifices distributed over the model and gave pressure distribution, from which forces and moments over any section of the building could be calculated, at every ten degrees of orientation about a vertical axis. The results are given in tables and graphically.

Seventeen references.

Proposed Physiological Standard of Intensity of Periodic Motions. (Z.V.D.I., Vol. 77, No. 12, 25/3/33, p. 323.) (19.29/26615 Germany.)

A logarithmic standard is proposed with a unit designated " Pal " (Greek παλλειγ to shake) analogous to the decibel or " Phon " of acoustics.

High and low frequency motions are distinguished as vibrations and oscillations, the former being perceived chiefly through the skin, the latter by the semicircular canal.

Two scales are discussed, but there appear to be greater difficulties in propounding a simple correspondence between the mechanical phenomena and the physiological sensation than in the case of sound perception.

Aerodromes—Landing and Housing

Grasses for Airports. (Sci. Am., Vol. 148, No. 3, March, 1933, p. 184.) (20.20/26616 U.S.A.)

The United States Department of Agriculture has planted 34 different grasses for observation as to suitability for planting on aerodromes to prevent formation of dust, mud, pools of rain water and to avoid erosion of soil by rain.

Airport Development. (N. Norman, J.R. Aer. Soc., Vol. 37, No. 265, Jan., 1933, pp. 1-34. See Abstract 24120.) (20.20/26617 Great Britain.)

A comprehensive statement is given of the principal requirements of a fully equipped first class airport. Most of the 28 illustrations refer to U.S.A. airports.

Areas of 200 acres and areas from 600 to nearly 1,000 acres have been reserved for development in some U.S.A. cities. Absence of landing surfaces with natural turf imposes surfaced runways from 400ft. to 500ft. wide by 2,500ft. long, four such runways giving eight landing directions spaced angularly at 45°. Buildings, equipment, handling, appliances, doors, lighting, fire protection, etc., are considered.

A discussion follows.

Lighting—Accumulators

Carbon Zinc Accumulator. (Z.V.D.I., Vol. 77, No. 2, 14/1/33, p. 55.) (21.00/26618 Germany.)

The negative electrode is a hollow zinc cylinder, the inside surface being covered with a preparation of cellulose and the inside space filled with graphite powder soaked in zinc iodide.

The positive electrode is a carbon rod running through the graphite powder. The whole is hermetically sealed.

In charging, the zinc iodide decomposes, the iodine being absorbed by the graphite and the zinc deposited on the cylinders.

During discharge the reverse process takes place, the discharging voltage falling from 1.2 to 1.1 volts per cell.

Aerodynamics and Hydrodynamics

Slow Motion of Fluid. (W. R. Dean, Phil. Mag., Vol. 15, No. 101, May, 1933, pp. 929-936.) (22.10/26619 Great Britain.)

A previous discussion of slow fluid motion past a plane barrier projecting into the fluid at right angles to the boundary is carried further by investigation of the pressure field near the projection.

The differential equation of motion is given in the simplest non-dimensional form as a bi-harmonic equation with the stream function as variable and a solution is adopted from the theory of elasticity.

The method is approximate and the solution fails at the edge of the projection. No really satisfactory experimental measurements of flow near the boundary are available, but the author makes such use of attempted measurements as is possible. The conclusion is reached that there is a finite slip near the edge.

(It is difficult to see how this conclusion can be drawn from the analysis. It might, of course, be included in the assumed boundary conditions.)

Resistance of Small Spheres in Air. (G. Monch, Phys. Zeit., Vol. 34, No. 2, 15/1/33, pp. 77-79.) (22.10/26620 Germany.)

Stokes' formulæ for the rate of fall of spheres in air require correction when the radius becomes small enough to affect the average value of impact pressure of the molecules in accordance with the kinetic theory of gases. A number of correction formulæ are examined and values of empirical constants are compared.

The experimental values found by the author lie very accurately on the curve given by Mattau's values of the coefficient and are 2 or 3 per cent. above the curve given by Millikan's coefficient, which apparently would change the latter's value of the charge of an electron in the same proportion.

Seven references.

Resistance of Small Spheres in a Viscous Fluid. (E. Wasser, Phys. Zeit., Vol. 34, No. 7, 1/4/33, pp. 257-278.) (22.10/26621 Germany.)

A critical review of the subject is carried out. The formula given by Stokes (1851) has been the subject of very numerous mathematical and experimental investigations both for steady and alternating motion. When the diameter is no longer large compared with the maximum free path, Brownian movements begin to appear and an excursion into the kinetic theory of gases becomes necessary. Numerous empirical and semi-empirical formulæ are quoted and discussed.

Applications of experimental results are shown graphically and confirm the accuracy of the equations within certain limits, outside which interpretation of the results becomes more difficult.

Important applications are considered.

Eighty references.

Separation by Settling of Suspended Particles under Gravity. (L. Schiller and A. Naumann, Z.V.D.I., Vol. 77, No. 12, 25/3/33, pp. 318-320.) (22.10/26622 Germany.)

The settling of small particles suspended in a fluid is applied as an industrial process, the basis of which is the resistance of bodies in slow motion. The formulæ given by Stokes for the fall of small spheres with modification by Oseen and Goldstein are compared with experiments.

Numerical values of non-dimensional parameters are tabulated and shown graphically as unicursal curves. Recent determinations of viscosity and density of air and water as functions of temperature are given graphically.

Heat Transference in Free Convection. II. Solution of the Boundary Layer Equation in Steady Motion. (R. Hermann, Phys. Zeit., Vol. 34, No. 5, 1/3/33, pp. 211-214.) (22.10/26623 Germany.)

The author introduces Grashof's parameter $gl^3\beta\vartheta/\gamma^2$ (β coefficient of thermal expansion) in a transformation of Boussinesq's equations. A method of approximate solution in the neighbourhood of a horizontal circular cylinder is indicated, and numerical tables are given. Observed temperatures are plotted for a particular value of κ/γ and give a satisfactory fit. As four arbitrary coefficients are introduced, this is not surprising.

Twelve references.

Speed of Ascent of Air Bubbles in Liquids. (T. Bryn, Forschung, Vol. 4, No. 1, Jan.-Feb., 1933, pp. 27-30.) (22.10/26624 Germany.)

Observations were made with small, medium and large bubbles in liquids of various viscosities. The rate of ascent of large bubbles is governed entirely by the Laplace coefficient being independent of the viscosity of the liquid.

The ascent of small bubbles is affected principally by conditions in the surface of the bubble, *i.e.*, how far and at what rate fresh liquid enters the surface. Under certain conditions a small spherical bubble may have considerably less resistance than a solid of equal dimensions.

Application of the Principle of Momentum in Hydrodynamics. (W. Müller, Ann. d. Phys., Vol. 16, No. 5, March, 1933, pp. 489-512.) (22.10/26625 Germany.)

The expression "Impulssatz," translated literally "momentum theorem," usually refers to a special aerodynamical application of the principle of momentum to determine the lift on a wing.

The hydrodynamical equations are developed in a vector notation which is not always self-consistent, with applications to turbine blades, wings, airscrews and plates with rotation as well as translation.

Loss of Air Pressure in Granular Layers. (W. Barth and W. Esser, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 82-86.) (22.10/26626 Germany.)

A sectioned sketch shows the arrangement of the test apparatus. A current of air passes through a measured depth of granulated material and the pressure drop is observed.

On plotting resistance coefficients against Reynolds number a series of unicursal curves is obtained lying in a narrow belt. The functional relation between the curves and the size of the grains is not very clear.

Comparison of experimental results of different authors gives a similar result.

Ten references.

Recent Results in the Investigation of Turbulence. (L. Prandtl, Z.V.D.I., Vol. 77, No. 5, 4/2/33, pp. 105-114.) (22.10/26627 Germany.)

After a recapitulation of his own analogy between the movement of eddying masses carrying momentum along mean paths and the movement of molecules in the kinetic theory of gases, the author proceeds to discuss Nikuradse's results for rough tubes.

The well-known v. Kármán relations between distance from the wall and velocity involving 1/7th root of the former, at higher Reynolds numbers the 1/8th and 1/9th roots, is generalised in a form of a logarithmic expression, which contains all these approximations as particular cases.

The analogy with the convection of heat is considered, and reference is made to G. I. Taylor's result that the analogy holds good when the lines of vorticity are parallel to the streamlines and fails when they are transverse which leads to

a modification of the definitions, so that eddy motion is subdivided into two component kinds, according as the general vorticity is parallel to or transverse to the streamlines. (This amounts to a very considerable, if not a fundamental, change in the author's original position.)

The artificial roughening of the walls introduces a new geometrical parameter by means of which the results for all amplitudes of roughness in relation to the tube diameter, are reduced to a unicursal curve which, however, still involves several empirical coefficients.

A considerable unification of experimental work has been attained, but the subject remains semi-empirical.

Thirty-eight references.

Contribution to Theory of Turbulent Flow. (F. Magyar and F. Kraemar, Phys. Zeit., Vol. 34, No. 6, 15/3/33, pp. 241-245.) (22.10/26628 Germany.)

The authors suggest that the elimination of the pressure and potential forces by cross differentiation (forming the curl) of the equations of fluid motion yields the form of the equations most amenable to analysis. The introduction of a stream function in two-dimensional flow gives a formal simplification, but this is not considered to be more tractable. Simplifying assumptions are made and a form of solution is assumed, and the corresponding disturbance of steady flow is shown graphically and resembles at the boundary a result given by Richardson and Taylor.

No definite result is obtained, but the point of view may indicate a suitable line of attack.

Heat Transference from a Horizontal Plate to Boiling Water. (M. Jakob and W. Linke, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 75-81.) (22.2/6.72/26629 Germany.)

The electric heating apparatus is described, with three sketches showing position of thermo couples.

A characteristic curve of vertical temperature shows a drop from 109°C. at the hot plate to 101°C. at 0.2 cm. above it, 100.5°C. at 1 cm. and 100.4°C. at 6 cm. (on the water surface). The steam above the water surface is at 100°C. The rate of heat transference is H.19,300 cal./m.^{2}h. Other characteristic curves show a coefficient of heat transference as a function of hot plate temperature.

The observed mechanism of transference was the formation of steam bubbles rising in well-defined columns from more or less permanent "hot spots." The number of columns was roughly in proportion with the rate of heat transference.

The transference plotted against plate temperature on logarithmic scales is nearly linear from $H=20$ to $H=10^5$, and thereafter there is a sharp fall in the relative temperature increase required.

Non-dimensional representation is applied, Nusselt's, Grasshof's and Prandtl's parameters are introduced and various empirical expressions are fitted to the experimental curves.

A wide range of experimental determination of heat transference by natural correction from neutral and horizontal cylinders, planes, cubes and spheres, lies along a unicursal curve with little scattering except in the lower range.

Twelve references.

Heat Transference in Flow through Pipes. (E. Hofmann, Phys. Zeit., Vol. 34, No. 5, 1/3/33, pp. 208-211.) (22.2/6.72/26630 Germany.)

The introduction of both Péclet's and Reynolds' parameter is required in comparing experimental results on a non-dimensional basis.

A large number of experimental results is assembled in a graphical chart representing empirical equations of a usual type.

Eight references.

Spiral Flow of Fluids in Pipes. (K. Schuster, Werft-Reederei-Hafen, No. 3, 1/2/33, pp. 36-37.) (22.2/26631 Germany.)

Eight types of industrial gas conduits are sketched with diagrammatic representations of flow. A photograph shows the pitch of the spiral, as marked by a thin strip of indicating fluid. Resistances are shown graphically as a function of flow speed.

Experiments on Flow Loss in Bent Pipes. (W. Spalding, Z.V.D.I., Vol. 77, No. 6, 11/2/33, pp. 143-148.) (22.2/26632 Germany.)

Flow through a number of bends at angles from 45° to 135° was investigated in the hydrodynamic laboratory of Danzig Technical High School—previous results of Nippert (V.D.I. Research Publication No. 320) were extended. It was generally found that the losses in the bend could be reduced by increasing slightly the cross section of the pipe at the bend.

Viscous Fluid Motion through Pipes with Cores. (N. A. V. Piercy, M. S. Hooper and H. F. Winny, Phil. Mag., No. 99, March, 1933, pp. 647-676.) (22.2/26633 Great Britain.)

Expressions are worked out for steady flow, in " slow " motion by the methods of rational hydrodynamics.

Experimental results for co-axial circular cylinders are in satisfactory agreement below the critical velocity.

Axial flow between confocal elliptical cylinders is also discussed mathematically. Critical speeds were observed experimentally, and a number of results are given graphically and in tables.

The extreme sensitivity of the equilibrium to eccentricity of the cylinders may explain the comparative failure of previous experiments.

Coefficients of resistance in turbulent flow were determined experimentally and extensive data are given in tables and graphically.

Critical Velocity in Pipes. (A. H. Gibson, Phil. Mag., Vol. 15, No. 99, March, 1933, pp. 637-647.) (22.2/26634 Great Britain.)

An extension of Reynolds' well-known experiment is described. The coloured filament is adjusted so as to flow parallel to the axis at different radial distances. The critical velocity is shown graphically as a function of the radial distance.

The interpretation of the experimental work is not clear. In particular the last paragraph revives the old fallacy that dynamical similitude can be affected by the choice of moving axes in contradiction with Newtonian Mechanics.

It is suggested that the radial rate of variation of energy is important.

Flow in Nozzles and Diaphragms at Small Reynolds Numbers. (M. Hansen, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 64-66.) (22.2/26635 Germany.)

Experimental values of the discharge coefficient are shown graphically for different nozzle shapes.

The desirable quality of a constant discharge coefficient, down to the lowest possible Reynolds, appears to be associated with a sharp edge at the minimum diameter.

Four references.

Flow of Water in a Fine Annular Clearance between Coaxial Cylinders, with Rotation of the Inner Cylinder. (R. J. Cornish, Proc. Roy. Soc., Vol. 140, No. A.840, 1/4/33, pp. 227-240.) (22.2/26636 Great Britain.)

The dimensions of the annular cylindrical clearance were:—

	Mean dia.	Radial depths.	Axial lengths.
Apparatus I	6	0.0107 to 0.0176	15 cm.
Apparatus II	10	0.0233	28 cm.

The inner cylinder had a range of angular speeds from 0-2,000 r.p.m.

Below the critical velocity the terms in the hydrodynamical equations corresponding to axial and co-axial flows are separable, the axial flow is independent only on the pressure gradient and independent of the rotation.

The torque does not appear to have been measured, but the observed critical angular velocity with decreasing axial velocity approaches an asymptotic value in line with G. I. Taylor's experiments, to which reference is made.

Since dynamical similitude depends on both radii and on angular and axial speed, these four quantities must appear in appropriate non-dimensional parameters, of which a large variety may be formed.

Four graphical representations are given of relations between sets of three such non-dimensional parameters, the critical axial velocity appearing as a singular line, on a contoured surface.

A number of empirical expressions are quoted for flow above the critical speed, but beyond having non-dimensional parameters and thus satisfying dimensional requirements, they are purely empirical.

The results have applications to pressure lubrication.

Seven references.

Theory of Air Flow. (N. A. V. Piercy, Airc. Eng., Vol. 5, No. 47, Jan., 1933, pp. 14-16.) (22.4/26637 Great Britain.)

The elementary equations of viscous fluid motion are derived in a manner which is directed to the elucidation of difficulties met with in the study of standard text books.

Reduction of Resistance to Flow by Guide Vanes. (K. Frey, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 67-74.) (22.4/26638 Germany.)

The types of flow modified by vanes are shown in 40 sketches and include guide vanes in channels, single and double slots for wing profiles and single, double and triple vanes of the Townend ring type.

Resistance coefficients are plotted against the Reynolds number. The phenomena involved are complex and obscure, as appears in the discussion of the results in their application to design, but the extensive range of numerical values facilitates the selection of a suitable arrangement, within the range of the experiments.

Fifteen references.

Air Pressure on a Cone Moving at High Speed. (G. I. Taylor and J. W. Maccoll, Proc. Roy. Soc., Vol. 139, No. A.838, 1/2/33, pp. 278-311.) (22.4/26639 Great Britain.)

A solid right circular cone moves in air at speed above that of sound. The appropriate hydrodynamical equations are developed on the assumption that pressure, density and velocity in the neighbourhood of the conical surface are functions of the angular polar co-ordinate only. The velocity field is, therefore, irrotational. The relations are taken as adiabatic so that temperature need not appear explicitly.

The differential equation of motion thus obtained is non-linear, involving the second derivative of the axial velocity and the first power, square and cube of the

first derivative with respect to the cone angle. Taking the cone angle as initial polar co-ordinate, the initial velocity=zero, the equation is integrated numerically step by step.

Meyer's equations, applied numerically, give the pressure distribution, including the discontinuity across a shock wave.

The projectile velocity at which a shock wave travels with the point of the projectile is greater than the speed of sound in air by a factor which increases with the cone angle.

Pressures are calculated and show comprehensive agreement with wind channel resistance measurement and with results obtained for photographs of waves of compression.

Von Kármán's approximate solution is found to be in satisfactory agreement for small cone angles with discrepancies increasing as the cone angle increases.

Measurement of Gas Flow with Nozzles and Orifices Operating at Small Reynolds Numbers. (H. G. Giese, Forschung, Vol. 4, No. 1, Jan.-Feb., 1933, pp. 11-20.) (22.5/26640 Germany.)

The range of Reynolds number was from $R=8$ to $R=50{,}000$. There is a general decrease in the flow coefficient as R decreases below 100. Above this value rounded nozzles show a continuous increase and nozzles with sharp edges decrease with increasing R. By suitably rounding off the orifice plate a substantially constant coefficient was obtained from $R=600$ to 110,000.

Influence of Viscosity on the Coefficient of Flow through Throttles. (F. Kretzschmer, Forschung, Vol. 4, No. 2, March-April, 1933, pp. 93-95.) (22.5/26641 Germany.)

Empirical formulæ are given a non-dimensional form. Results are plotted against Reynolds number for different throttling ratios. Similarity is found with the form of the empirical expression for resistance in a constricted pipe. Beyond a certain value of the Reynolds number the term involving viscosity becomes unimportant.

An Adjustable Orifice for Measurement of Gas or Air Delivery. (Z.V.D.I., Vol. 77, No. 6, 11/2/33, pp. 155-156.) (22.5/26642 Germany.)

The adjustable orifice, resembling a photographic shutter, was calibrated against the standard V.D.I. throttle plate and showed variations not exceeding ± 1.5 per cent. over the range of opening.

Materials—Elasticity and Plasticity

Diagonal Gyrometer in Chladni Figures. (R. C. Colwell, J. Frank. Inst., Vol. 215, No. 2, Feb., 1933, pp. 169-177.) (23.0/13.81/26643 U.S.A.)

The usual solution is considered in forms which contain a linear factor corresponding to a diagonal.

Numerous experimental figures are reproduced and discussed numerically in reference to the appropriate forms of the solution.

Vibrations of a Chladni Plate. (R. C. Colwell, Phil. Mag., Vol. 15, No. 97, Feb., 1933, pp. 317-324.) (23.0/13.81/26644 Great Britain.)

Rayleigh's differential equation of motion is written down. Ritz's methods of approximate solutions are discussed.

First and second approximations are obtained and compared graphically and experimental figures of similar types are reproduced.

Temperature Coefficient of Elastic Constants. (G. H. Keulegan and M. R. Houseman, Bur. Stan. J. Res., Vol. 10, No. 3, March, 1933, pp. 289-320.) (23.0/26645 U.S.A.)

Young's modulus and the modulus of rigidity were determined for a range of temperatures from $-50°C.$ to $+50°C.$ and are tabulated for forty-five specimens. Chromium, nickel, high carbon and silicon steels show variations in the modulus of rigidity from 12 to 21 per cent.; stainless steels from 9 to 35 per cent. The changes in Young's modulus are roughly half as great. Light and heavy alloys show much smaller variations.

Loops were obtained in the temperature strain diagrams under constant load, the lower branch corresponding to decreasing temperature.

Investigation of the Geometrical and Physical Conditions of Polished Surfaces. (G. Schmerwitz, Phys. Zeit., Vol. 34, No. 4, 15/2/33, pp. 145-158.) (23.10/26646 Germany.)

Small changes in the thickness of a body are difficult to measure directly. It is possible to estimate the magnitude of surface irregularities by comparing variations of radius of curvature of the surface. Using a special apparatus designed by Zeiss, the author has investigated in this manner a series of cylindrical and spherical bodies of approximately 2 mm. diameter, which had previously received the most careful polishing treatment. The wire showed the greatest departure from a circular contour; steel balls and especially glass balls showed a constant diameter to within $.1\mu$. The author has been able to demonstrate some variation of surface contour with time. These variations amount to a few thousandth μ and are due to a form of Brownian movement of the surface layers.

Applications of the Theorem of Three Moments. (V. Belfield, Phil. Mag., No. 99, March, 1933, pp. 562-574.) (23.30/26647 Great Britain.)

Portal frames and T frames with rigid joints are reduced to equivalent continuous girders and stress problems solved by applications of the theorem of three moments. A neat application is made to the problem of a beam under simple loading.

Stability of a Framed Strut. (L. Seltenhammer, Sitzung-Berichte, Vol. 142, No. 1-2, 1933.) (23.30/26648 Austria.)

The bending moment is considered in both the principal planes of the section. The length of the frame is subdivided into an arbitrary number of panels, with a corresponding number of equations $(4m)$.

The methods of finite differences are applied to shorten the extensive computations of step-by-step solutions.

Summations are obtained which give satisfactory approximations. Numerical results are tabulated and compared with those of other methods.

Struts. (R. Rodger, Flight, Vol. 25, No. 8, 23/2/33, pp. 178 f-g.) (23.30/26649 Great Britain.)

Southwell's strut formula has been transformed as a function of stress instead of load. A numerical table and graphical chart are given for rapid computation.

Bending of Grid Girders. (S. Timoshenko, Z.A.M.M., Vol. 13, No. 2, April, 1933, pp. 153-159.) (23.40/26650 Germany.)

Consideration is given to girders with equal parallel spars and stiffening cross-pieces.

Linear cross distributors of load are assumed from mid-point to mid-point of the cross-pieces, and a solution is obtained for the rib deflections in two elementary functions which are tabulated numerically.

Fourier expansions may be assumed for the elastic line, and the coefficients determined from the strains. General expressions are obtained and simplified for special cases.

The case of a single spar is first considered, and the method is generalised for multiple spars. A numerical example is worked out.

Experimental Determination of Forces and Moments in Statically Indeterminate Structures. (F. C. Lea, Phil. Mag., Vol. 15, No. 101, May, 1933, pp. 881-904.) (23.40/26651 Great Britain.)

The elementary principles of the method of minimum strain energy are discussed; Mannell's theorem of reciprocal displacements is illustrated by simple applications, and a method of obtaining moments from slopes and deflections is prescribed.

Principles of dynamical similitude are formulated, and experimental methods are described and applications to models are worked out. Comparisons between experiment and calculation show agreement close enough to give confidence in the method, notwithstanding difficulties arising from the lack of isotropy in timber structures.

Calculation of Stresses in Braced Frameworks. (R. V. Southwell, Proc. Roy. Soc., Vol. 139, No. A.839, 3/3/33, pp. 475-507.) (23.40/26652 Great Britain.)

Author's abstract:—Stress determination in frameworks has been developed mainly by graphical methods, and in consequence there has been a tendency to fix attention on problems in two dimensions. An alternative (analytical) method of treatment has been found useful in relation to the structural problems of aeronautics, which are largely three-dimensional; it has the further advantage that problems can be treated in a general manner, and solutions of wide applicability obtained.

An example is given in this paper; exact solutions can be found for a tabular framework (generally representative of a rigid airship hull, or of a fuselage of " monococque " construction) when definite (self-equilibrating) forces are specified as acting on the joints. This problem (on account of the high order of redundancy of the framework) would be quite intractable by conventional methods; but here no appeal is made to considerations of strain-energy, solutions being constructed by synthesis from " type solutions " which are fully investigated.

In the concluding section of the paper a procedure is described whereby its solutions may be extended to " pseudo-redundant " frameworks, in which some of the constituent members are incapable of sustaining compression. It is shown that the procedure will give sufficiently accurate results under the conditions which immediately precede failure—namely, when many such members have become inoperative.

Miscellaneous

Manœuvres of British Tank Brigade. (B. H. Liddell-Hart, Army Ordnance, Vol. 13, No. 76, Jan.-Feb., 1933, pp. 220-225.) (26653 U.S.A.)

A critique of the 1932 exercises gives details of the performances attained under the conditions of manœuvres.

Aerial Offensive in Maritime Warfare. (Lieut. Barjot, Rev. F. Aér. No. 42, Jan., 1933, pp. 61-90.) (26654 France.)

Serre (France) considers attack on enemy ships to be the principal object of an aerial offensive. Fioravanzo (Italy) gives greater importance to the demolition of the fleet base. The more restricted the theatre of war the more important the aerial offensive becomes. The author favours the latter view.

Naval—The "Deutschland." (Werft-Reederei-Hafen, No. 6, 15/3/33, pp. 85-86.) (26655 Germany.)

Development of design is discussed in reference to guns, directors, torpedoes, aircraft, spotting, under-water protection, and radius of action.

Two photographs of the "Deutschland" are reproduced.

Eleven references.

Animal Flight. (R. E. Snodgrass, J.R. Aer. Soc., Vol. 37, No. 266, Feb., 1933, pp. 113-144.) (26656 Great Britain.)

An analysis of insect wing structure and wing motion is based on information collected at the Bureau of Entomology, U.S.A. Dept. of Agriculture.

Numerous anatomical diagrams are reproduced.

Thirty-five references.

Time-Keeping. (F. Hope-Jones, J. Sci. Inst., Vol. 10, No. 2, Feb., 1933, pp. 43-49.) (26657 Great Britain.)

Application of an impulse to the second pendulum only once per half minute has increased the accuracy to within a few thousandths of a second, enabling the effects of the earth's rotation to be observed, while comparison with a quartz crystal control at the Bell Telephone Laboratories has brought out the effect of lunar motion of local gravity of the order of 1/5,oooth second.

Pressure of Saturated Water Vapour from 100° to 374°. (N. S. Osborne and others, Bur. Stan. J. Res., Vol. 10, No. 2, Feb., 1933, pp. 155-188.) (26658 U.S.A.)

A careful account is given of the apparatus and accessories for providing and maintaining pure air-free water at desired temperature, and measuring the corresponding pressure. Comprehensive tables of results are expressed in various current units as well as in standard international units.

The error is estimated as not exceeding 0.03 per cent., except near the critical range where it may be greater.

The result should be a valuable check on existing steam tables.

Condensation and Evaporation—Recent Notions and Experiments Using Steam. (M. Jakob, Z.V.D.I., Vol. 76, No. 48, 26/11/32, pp. 1161-1170.) (26659 Germany.)

Read at the V.D.I. Scientific Conference, Berlin, October, 1932.

Condensation may form films or drops of fluid, the latter accompanied by greater heat transfer than the former. The formation of drops is determined mainly by the magnitude and direction of the steam's velocity, but surface tension also plays a part.

The rapidity of evaporation at a hot surface is mainly governed by the stirring action of the superheated steam.

By control of the motion of the water it was found possible to obtain a very high rate of heat transfer (approximately 13,000 k.cal./m.^{2}/h.°C.).

Nineteen figures, twenty-three references. The article has been translated.

Investigation on a Differential Transmission Dynamometer. (W. Kautter, Ing. Arch., Vol. 4, No. 1, Feb., 1933, pp. 35-42.) (26660 Germany.)

The transmission dynamometer was designed for operation up to 1,500 r.p.m. under torques up to 5 kg.m. weight × 1 m. The efficiency was determined electrically by a modified Hopkinson test.

The friction torque loss amounts to less than 0.2 kg.m., and after calibration the instrument was reliable to within ½ per cent.

It is cheaper and more robust than a torsion dynamometer of equivalent accuracy.

Six references.

https://doi.org/10.1017/S0368393100109253 Published online by Cambridge University Press