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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 Ministère 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.

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Aircraft Design

Mutual Interference of Airscrew and Body. (W. R. Andrews, Flight, Vol. 24, No. 44, 27/10/32, pp. 1008 f-g.) (5.11/25001 Great Britain.)

Empirical formulæ are fitted graphically to N.P.L. experimental values.
Further experimental data are required for design purposes.
Three references.

The Do.X Flying Boat. (C. Dornier, L'Aéron., No. 162, Nov., 1932, pp. 336-350.) (5.12/25002 France.)

The designer assembles information scattered over several publications and years and gives new data on wing loading and hull distortion. Comparison shows the superiority of water-cooled engines under full power demands at low air speeds even for short periods.

The 500 h.p. Jupiter is rated at 310 h.p. (62 per cent.) for taxying at low air speeds, while the 630 h.p. Curtiss Conqueror is rated at 520 h.p. (82½ per cent.).

Excellent photographs are reproduced.

Large Flying Boats. (C. Dornier, Luftacht, No. 7, July, 1932, pp. 278-285.) (5.12/25003 Germany.)

The performance of the Do.X is compared with other large craft, particularly Junkers G.38 and the Short "Calcutta," not unfavourably to the latter.

Improved performance is to be expected from the application of improvements in design and materials to any future craft of these types.

Aeroplane Design and Maintenance. (J. G. Lee, S.A.E. Jrnl., Vol. 31, No. 4, Oct., 1932, pp. 412-420.) (5.14/25004 U.S.A.)

Analyses of running costs and sources of accident are given from U.S.A. practice.

Photographs illustrate devices for increasing accessibility, which is the chief factor in reducing maintenance and justifies capital expenditure.

A discussion follows.

American Aircraft Construction. (K. H. Ruhl, Z.V.D.I., Vol. 76, No. 33, 13/8/32, pp. 807-808.) (5.14/25005 Germany.)

Modern U.S.A. commercial aircraft attain higher speeds by clean design and use of retractable carriages.

They compare favourably with older types on the basis of fuel consumption per ton mile, but have higher landing speeds and higher initial cost.

The author holds that the reduction of flying time will attract sufficient new traffic to justify the initial cost.

Buckling of Spars. (A. Teichmann, Z.F.M., Vol. 23, No. 17, 14/9/32, pp. 511-519.) (5.15/25006 Germany.)

The methods of Berry and Muller-Breslau are applied numerically and two families of curves enable values to be read off.

Two lines are drawn, along which the error may reach 3 per cent. and 5 per cent. respectively of the accurate value. A number of formulæ are collected in useful tabular form.

The method is extended to more complicated structures.

Nine references.

Apparatus for Investigating Vibration. (W. Späth, Z.V.D.I., Vol. 76, No. 14, 2/4/32, pp. 348-349.) (5.17/25007 Germany.)

The apparatus has four out-of-balance masses on shafts driven by two 3 h.p. motors. Forces up to 2000 kg. with a frequency up to 60 Hertz can be excited. Applications to ships and land vehicles are discussed briefly.

Five references.

Stresses in Monospar Bracing. (S. C. Redshaw, Flight, Vol. 24, No. 44, 27/10/32, pp. 1008a-d.) (5.25/25008 Great Britain.)

Lateral stiffness is secured by kingpost and bracing wires, the latter forming an octohedron. A numerical example is worked out.

Wing Construction. (H. J. Stieger, J.R. Aer. Soc., Vol. 36, No. 262, Oct., 1932, pp. 790-827.) (5.25/25009 Great Britain.)

Monoplane wing design is the principal subject of the paper. An analysis of aeroplane weights separates items which are controlled or influenced by the aeroplane designer from those—chiefly engine weights—which are outside his sphere.

Numerical data put the elementary account of the forces on wings largely on a numerical basis. Various types of monoplane wing construction are illustrated by perspective sketches. A sketch and photographs show details of a monospar construction favoured by the author. A somewhat similar Fokker monospar wing for a huge monoplane is also shown in a photograph.

The discussion shows that the author's ideas are to some extent controversial, but it appears to be agreed that monoplane construction is at least approaching biplane construction in a general comparison of flying qualities.

Variable Wing Aeroplanes. (Luftwacht, No. 7, July, 1932, pp. 273-276.) (5.254/25010 Germany.)

The wing surface may be varied by increasing either span or chord. The variable span aeroplane produced and flown by the Technical High School, Breslau, has about 16 per cent. increase of wing surface. It is stated that the starting run is reduced by $\frac{1}{2}$. The variable span machine of Makhonine (France) is designed for a 73 per cent. increase in wing area. Test details are not available.

An aeroplane combining both methods is under construction. A small high speed wing of normal construction is supplemented by a fabric wing of variable span operated like a roller shutter.

Seven references.

Test Aeroplane with Variable Wing Surface. (W. Schmeider and G. Neumann, Z.F.M., Vol. 23, No. 17, 14/9/32, pp. 505-507.) (5.254/25011 Germany.)

A specification is given of main dimensions, power load and speed.

The surface is increased from 12.75 m^2 by 19.6 per cent. to 15.25 m^2.

The weight of the moving parts is given as 25 kg. No stress calculations are given.

A sketch and photographs show the method of increasing the surface by increasing the chord width along about two-thirds of the span.

The additional surface is added at the trailing edge and is of triangular shape. The speed ratio is 140 km/h. to 60 km/h.

(No numerical comparison with a normal aeroplane is given.)

Airscrews

Flow through an Airscrew. (H. C. H. Townend, Phil. Mag., Vol. 14, No. 92, Oct., 1932, pp. 700-712.) (5.6/25012 Great Britain.)

The method of observing the configuration of flow by the refraction of a beam of light by hot air filaments was described by the author in R. and M. No. 1349. Applications to the flow through an airscrew are described and illustrated by photographs which confirm previous observations by other methods.

The new method appears to give a greater possible precision. In particular the method of trailing threads in the stream is shown to be completely misleading in unfavourable conditions, such as the rapid change of direction near the nose of a wing.

Principle of Variable Pitch Airscrew. (H. J. Dudenhausen, Autom. Tech. Zeit., Vol. 35, No. 17, 10/9/32, pp. 420-422.) (5.64/25013 Germany.)

The advantages of variable pitch are discussed.

The design of a hub is discussed and illustrated by sectional diagrams. The pitch is automatically controlled by the reaction of springs and centrifugal force.

Autometer Variable Pitch Propeller. (Gobereau and Maujole, L'Aéronautique, No. 157, June, 1932, pp. 180-182.) (5.658/25014 France.)

The airscrew hub is loosely mounted on an extension of the crankshaft. A centrifugal governor acts through a link and changes the blade pitch by rotation about the radial axis.

Further control in flight is proposed by pumping oil into the governor weights and increasing their mass.

It is stated that promising flight tests have been carried out.

Instruments

Scientific Instruments and Aeronautics. (H. E. Wimperis, J. Sci. Inst., Vol. 9, No. 11, Nov., 1932, pp. 337-341.) (6.0/25015 Great Britain.)

Aeronautics has borrowed freely and adapted instrumental equipment from other branches of technology and has devised new instrumental combinations for its own needs without offering immediate assignable return on its borrowings.

The aeroplane furnishes a moving platform subject to high accelerations and intense vibrations and the instrument is so intimately affected thereby, both in physical principle and in mechanical detail, that satisfactory designs emanate almost exclusively from establishments where test flying is carried out.

A classical difficulty is the establishment of the true vertical with respect to the earth's surface, since no instrument can distinguish gravity from linear acceleration.

The gyroscope offers the most obvious solution in principle, but its application is difficult in a frame which departs from steady motion so abruptly as an aeroplane in stormy flight.

An interesting example of adaptation is afforded by the compass, in which the disconcerting " Northerly turning error " of a magnetic compass, of high natural frequency suitable for shipboard, is reduced to reasonable proportions by using a needle of low natural frequency.

The serious effect of vibration of the supporting pin as transmitted to the needle through the bearing cup of the needle was eliminated by interchanging pin and cup—Sir H. Darwin's elegant solution of trouble arising in a mechanical detail.

Accelerometers have an essential part in testing aeroplanes which are subject to acceleration several times greater than that of gravity, in aerobatic flight.

It is not easy to forecast the ultimate terms of repayment by aeronautics of its instrumental debt to other branches of engineering science.

New Askania Integrating Machines. (J. Picht, Z. Instrum., No. 7, July, 1932, pp. 289-299.) (6.0/25016 Germany.)

A technical description of several new mechanical integrating devices is illustrated by photographs and diagrams.

The elementary mathematical principles are discussed in application to types of single, double and triple integrals.

The Theory of the Frahm Vibration Indicator. (W. Meyer, Ann. d. Phys., Vol. 15, No. 1, Oct., 1932, pp. 1-27.) (6.104/25017 Germany.)

A number of flexible steel rods, loaded at the free end and clamped at the other end, are mounted in a box which can be fixed to a vibrating structure.

A mathematical investigation is given of the forced vibrations imposed by external periodic disturbances. Conversely, the observed response of the rods gives a measure of the periods and amplitudes of an external disturbance.

Scratch Extensometers. (Ind. and Eng. Chem., News Edn., Vol. 10, No. 20, 20/10/32, p. 259.) (6.262/25018 U.S.A.)

A photograph shows the instrument small enough to be held in the palm of the hand and weighing less than an ounce. A white diamond cutting point scratches records on a steel strip.

Apparatus for Determining Moments of Inertia. (W. Späth, Z.V.D.I., Vol. 76, No. 13, 26/3/32, p. 326.) (6.28/25019 Germany.)

The massive body is placed horizontally on a cradle mounted on a vertical spindle and oscillating under spring control. The position is adjusted until a minimum reading indicates that the c.g. lies in the axis of the spindle. A photograph shows the instrument with an ogival shell mounted for testing.

Three references.

On the Measurement of Oscillations in Technical Processes. (E. Lehr, Z.V.D.I., Vol. 76, No. 44, 29/10/32, pp. 1065-1073.) (6.48/25020 Germany.)

A wide range of instruments is discussed. The field of research in civil and in mechanical engineering includes machinery under the action of continuous or periodic forces and foundations and buildings subjected to sudden non-periodic disturbances.

An indicator of engine stresses measures the torsion of a crankshaft under load over the whole length or over the various crank throws.

76 references (covering the last five years).

Design of Automobile Steering Gear. (R. Wichtendahl, Autom. Ind., Vol. 67, No. 14, 1/10/32, pp. 416-422; also Autom. Tech. Zeit., No. 17, 10/9/32, pp. 409-410.) (6.55/25021 U.S.A.)

Undue yawing (" shimmy ") vibrations in a new design led to systematic investigation of the geometry of seven steering gear linkages. Notable differences are shown graphically.

Tyre pressure and shock absorber setting were also varied systematically.

A three component vibration recorder was designed and applied under road conditions and a fair practical solution was obtained by trial and modification.

The ultimate dynamical causes have not been completely elucidated.

Automobile Steering Linkage. (H. Lenk, Autom. Tech. Zeit., Vol. 35, No. 12, 25/6/32, pp. 294-299.) (6.55/25022 Germany.)

The kinematics of the steering gear linkage is discussed in terms of differential geometry, and the characteristics are exhibited graphically.

The Employment of Extensometers in Aircraft Construction. (G. Ivanow, L'Aéron., No. 157, June, 1932, pp. 187-191.) (5.18, 6.56/25023 France.)

The Huggenberger extensometer is shown attached by wire springs, wire clip or electromagnet to the strained part. The wire attachment is useful for measuring the deformation of large thin sheets, such as metal wing coverings. The instrument is accurate and easy to use on the ground, but unsuitable for flight tests.

A D.V.L. instrument is recommended for flight tests and records the deflection directly by fine diamond scratches on a glass or celluloid plate.

Measurements of Acceleration and Retardation in Motor Cars. (Gastberger and Geisenhof, Autom. Tech. Zeit., Vol. 35, No. 16, 25/8/32, pp. 385-388.) 6.73/25024 Germany.)

Descriptions are given of a number of accelerometers controlled by gravity or by springs. The ambiguous interpretation of readings of gravity controlled instruments is briefly discussed.

Photo-Elasticity. (M. M. Frocht, Sci. Am., Vol. 147, No. 5, Nov., 1932, pp. 280-283.) (6.86/25025 U.S.A.)

The popular historical summary is beautifully illustrated, but weak in physics. A process of annealing " Bakelite " and the use of monochromatic light have, in the author's hands and opinion, made stress optical methods really practicable for the first time.

(The peculiarities of commercial " Bakelite " have long been familiar to physicists—the relatively high but unstable photo-elastic sensitivity, the vagaries of annealing and the natural colour tints which obscure the interpretation of the stress optical colours and make the use of monochromatic light rather a necessity.)

Engines, Thermodynamics

Thermodynamics (*Velox Boiler Calculations*). (Engineering, Vol. 134, No. 3486, 4/11/32, p. 539.) (8.10/25026 Great Britain.)

A paradoxical calculated efficiency of 102 per cent. is explained by the inconsistency of the steam tables used. An inconsistency is quoted from a standard book of reference.

Catalytic Oxidation of Engine Exhaust Gases. (Chem. Absts., Vol. 26, No. 22, 20/11/32, p. 6104.) (8.15, 8.723/25027 U.S.A.)
U.S. Patent 1875024, *Aug.*, 1932.

An apparatus is described for oxidising Co in the exhaust gas by metal catalysts, such as Ni, Co, Mn or Fe.

Engines, Design

Development of the Light Oil Engine for Motor Cars and Aeroplanes. (W. Schwerdtfeger, Autom. Tech. Zeit., Vol. 35, No. 14, 25/7/32, pp. 348-350.) 8.2/25028 Germany.)

An output cefficient is defined as the product of power by m.e.p. divided by the cylinder volume.

Data are compiled in four tables comprising 21 air-cooled aero engines, 29 water-cooled aero engines, 26 motor car engines and 22 motor lorry engines.

The weights are also plotted against r.p.m. and show heavy scattering of the points.

Two of the motor car engines have the 2-stroke cycle and the formula of reduction takes this into account.

General tendencies only are indicated.

The D.K.W. 15 h.p. Light Aeroplane Engine. (Luftwacht, No. 11, Nov., 1932, pp. 469 and 477.) (8.20/25029 Germany.)

The D.K.W. firm have adapted for aeroplane work their standard 2-stroke light car engine. The power plant weighs 90lb. including 5/2 reducing gear and develops 15 h.p. at 3000 r.p.m.

A photograph (p. 469) shows a Messerschmitt M.33 light aeroplane equipped with this engine. The airscrew axis is mounted above the parasol wing and driven by a cardan shaft. The engine is housed in the cockpit.

The conventional fuselage is replaced by a single steel tube carrying the airscrew at the forward end and the tail unit at the after end. High airscrew efficiency is attained.

2-*Stroke* (*Carburettor*) *Engine without Scavenge Loss.* (P. Schauer, Autom. Tech. Zeit., No. 15, 10/8/32, pp. 372-375.) (8.21/25030 Germany.)

The Schauer 2-stroke has two pistons working in almost parallel cylinders and operating on a common crank (so-called U-type).

The pistons are of unequal diameter, the smaller one acting mainly as exhaust valve for the cylinders and inlet valve for the crankcase, the larger one controlling the transfer ports from crankcase to cylinders. These ports are shaped to give the explosive mixture a rotary motion, so that centrifugal forces impose a distribution of the fresh mixture round the cylinder wall during the scavenging period, while the non-rotating core of exhaust gases is driven out axially.

The effectiveness of the device is taken to be confirmed by specific fuel consumptions approaching the results of the 4-stroke cycle over a certain speed range. Outside this range increasing specific fuel consumption indicates more serious mixture losses during scavenging.

(Abstractor's Note:—Since the spinning fluid passes round the V, the conservation of angular momentum will produce complicated fluid motions very different from the clear-cut separation of new charge from exhaust gases suggested by the inventor.)

Supercharged Marine Engines. (Autom. Ind., Vol. 67, No. 15, 8/10/32, pp. 450-451.) (8.235/25031 U.S.A.)

A technical descriptive account is given of the supercharging equipment of the holder of the world's motor boat record.

The power was increased from 1000 h.p. at 2340 r.p.m. to 1450 h.p. at 2400 r.p.m., each of two compressors feeding one bank of six cylinders. The compressors were geared up in the ratio 1.86.

In a further development the compressors were geared up to twice the engine speed and increased the output to 1650 h.p. at 2600 r.p.m. A number of technical details are given.

A photograph and section drawing show the general arrangement.

Engines, Diesels, Etc., and Accessories

Experiments on the Diesel Engine. The Reaction Kinetics of Ignition. (K. Neumann, Z.V.D.I., No. 32, 6/8/32, pp. 765-770.) (8.10/25032 Germany.)

During the delay period in the ignition process the fuel receives heat by radiation, conduction and oxidation.

An attempt is made to separate these effects. Air density affects heat transfer, oxidation and, in a striking manner, the ignition temperature. It is held that ignition is initiated in the gaseous phase, contrary to general opinion.

Good fits are obtainable with experimental curves, by judicious choice of arbitrary coefficients. None the less the article shows that there is a physical and chemical basis amenable to thermodynamic investigation which may serve to correlate the vast body of experimental data accumulated in numerous research institutes.

High Performance Diesel Engine. (Z.V.D.I., Vol. 76, No. 34, 20/8/32, pp. 819-820.) (8.25/25033 Germany.)

Messrs. Sulzer have developed a new series of 3-cylinder, 2-stroke engines, with air injection, giving from 1500 h.p. single acting to 6000 h.p. double acting at 300/400 r.p.m. With a patent welded steel plate construction for the crankcase the low weight of 25lb. per h.p. is attained for I.M.E.P. less than 100 lb./sq. in.

The same engine adapted for solid injection gives 5 per cent. less b.h.p.

Saurer Light Diesel Engine. (Autom. Tech. Zeit., No. 10, 25/5/32, pp. 253-254.) 8.25/25034 Germany.)

The engine has 4-cylinder 100 by 130 m/m. giving 55 h.p. at 2400 r.p.m., with Acro air chamber ignition and Bosch fuel pump. The cylinders have easily replaceable cast-iron liners. The crankshaft derives high stiffness from circular webs housing bearings of stiff construction. A vibration damper is fitted.

Electrical Accessories for Aircraft Engine. (W. Brintzinger and B. Bruckmann, D.V.L. Report No. 291, D.V.L. Year Book, 1932.) (8.28/25035 Germany.)

Battery ignition and magneto ignition are compared in detail. Magneto installation of the new Bosch Inductor type is considerably lighter for equal reliability than battery ignition. Automatic variation of ignition timing is obtained from two independent interruptors displaced relative to one another, and one or other of which is shorted, to give the required timing.

New insulating porcelains have greater heat conductivity than mica. This property increases the working temperature range of the plug and reduces the fouling difficulties.

Nine references.

Magneto Interchangeable with Coil Ignition. (Autom. Absts., Vol. 10, No. 11, Nov., 1932, p. 436; Motor Transport, 24/9/32, p. 3.) (8.28/25036 U.S.A.)

The Scintilla Magneto Co. have produced a new vertical drive magneto which is of similar dimensions with and can replace the normal coil ignition combined make and break and distributor.

Pressure Combustion for Steam Boilers Working in Conjunction with Gas Turbines. (W. G. Noack, Z.V.D.I., Vol. 76, No. 42, 15/10/32, pp. 1033-1039.) (8.294/25037 Germany.)

The exhaust gases leaving the Brown Boveri Velox Boiler drive a gas turbine with a direct coupled compressor which compresses the fuel gases and combines pressure combustion with high gas speeds. The whole installation is light and compact.

Installations in Continental works have shown an overall boiler efficiency of the order of 90 per cent.; are light and compact and start from cold in a few minutes. The characteristics may well enable the steam turbine to maintain active competition with Diesel engine installations.

Notes on Notch Effects. (G. Storz, Autom. Tech. Zeit., Vol. 35, No. 13, 10/7/32, pp. 324-325.) (8.35/25038 Germany.)

One condition of the success of the Maybach engines fitted to the Graf Zeppelin was the avoidance of sharp regressive edges.

Details of construction are shown in 13 sketches, in each of which the maximum feasible radius is given to re-entrant edges.

In one case the strength of the shaft was as low as 28 per cent. after cutting ordinary screw threads and as high as 58 per cent. with specially large radius at the re-entrant angle.

A lengthy discussion follows, in which modified diagrams of a similar nature are reproduced.

Torsional Vibration Damper, Vickers. (Sandner Patent). (Engineer, Vol. 154, No. 4001, 16/9/32, pp. 286-7; also Engineering, Vol. 134, No. 3486, pp. 531-2.) (8.36/25039 Great Britain.)

A photograph and sketches of section and side elevation illustrate a brief technical account of principles and design. A loose flywheel is coupled through gear wheel pumps which discharge oil against spring loaded valves when the relative acceleration of shaft and flywheel exceed a determinate figure.

Torsionograph diagrams show three undamped vibrations and one damped with notable reduction of amplitude.

A Method for Reducing the Temperature of Exhaust Manifolds. (A. W. Schey and A. W. Young, U.S.A. Technical Note No. 390. Reviewed in L'Aéronautique, No. 160, Sept., 1932, p. 283.) (8.420/25040 France.)

The exhaust pipe is designed so that the exhaust gases suck in fresh air which reduces the temperature of the collector on a radial engine by more than 100°C. There is an increase in the noise of the exhaust.

Engines, Lubricants

Lubricating Oil. (Chem. Absts., Vol. 26, No. 19, 10/10/32, p. 5201.) (8.5/25041 U.S.A.)

U.S.A. Patent No. 1867695, *July, 19th,* 1932.

Improved lubrication is obtained by the addition of app. 1 per cent. of Pb. salts of oleic and sulforicinoleic acids to the lubricating oil.

U.S.A. Patent No. 1867968, *July, 19th,* 1932.

Diphenylene oxide is a suitable lubricant for high temperature cylinder lubrication.

U.S.A. Patent No. 1868053, *July 19th,* 1932.

Hg. Cyanide in glycerol is mixed with the lubricant in order to prevent pre-ignition in an internal combustion engine (the chemical presumably influences the formation of hot spots).

Regenerated Lubricating Oil. (R. Ascher, Autom. Tech. Zeit., Vol. 35, No. 1, 10/1/32, p. 20.) (8.54/25042 Germany.)

Lubricating oil during use undergoes changes, mainly due to the formation of active products which, up to a point, improve the quality or oiliness of the oil.

Comparative Tests of Lubricating Oils in Combustion Engines. (Dipl. Ing. Kelling, Z.V.D.I., Vol. 76, No. 45, 5/11/32, pp. 1099-1102.) (8.54/25043 Germany.)

The quality of lubricating oil is " rated " by measuring the wear of the piston rings in an engine run under standard conditions of load, speed and duration. The wear is estimated by the loss in weight. A table shows appreciable differences between various oils.

Engines, Fuels, Etc.

Device for Mixing Fuels. (F. Neuroth, Z.V.D.I., Vol. 76, No. 45, 5/11/32, pp. 1109-1110.) (8.6/25044 Germany.)

In using a mixture of two fuels (*e.g.*, benzol and petrol) it is convenient to keep the original fuels in separate tanks and mix as required.

When the mixing is carried out by two constant speed centrifugal pumps, the relative delivery may be affected by partial gasification in the pipe line under reduced pressure.

This difficulty is avoided by using the special throttling device here described.

Fuel. (Chem. Absts., Vol. 26, No. 21, 10/11/32, p. 5750.) (8.6/25045 U.S.A.) *Canadian Patent* 325188/9, *August 16th*, 1932. *Standard Oil Co.*

The patent refers to the stabilisation of vapour phase cracked spirit with reference to gumming. Suitable inhibitors are aminophenol and phenylenediamine.

Hydrogenation of Petroleum. (P. J. Byrne, E. J. Gohr and R. T. Haslam, Ind. and Eng. Chem., Vol. 24, No. 10, Oct., 1932, pp. 1129-1135.) (8.602/25046 U.S.A.)

The production of hydrogen of high purity from natural gas (CH_4) with many details of equipment, maintenance or output is of minor interest to countries without supplies of natural gas. The output in a working year was 250,000 cubic metres.

The hydrogenation of crude low quality distillates is also described at length and extensive data are tabulated. Gasolines thus produced have high octane numbers and the resulting lubricating oils are of high grade. The solvent naphthas are applied as diluents for lacquers, paints, varnishes and as solvents for resins.

The paper offers a survey of the development of large scale hydrogenation in the U.S.A. and, in particular, of the production of safety fuel for aviation.

Combustion of Fuel Air Mixtures. (Prof. Wawrziniok, Autom. Tech. Zeit., No. 10, 25/5/32, pp. 263-266, continued in Nos. 11-14.) (8.64/25047 Germany.)

A numerical example is worked out to illustrate the heat balance in thermochemical equations and numerical results are given for these cases.

A method of determining the excess air from the exhaust gases is developed and the experimental installation is described and illustrated by a general arrangement diagram.

Thirteen comprehensive tables show the experimental results of combustion of different fuels with a varying excess of air. The composition of explosive

mixtures and exhaust gas is given and a thermal balance is worked out. The results are also shown graphically.

A further table contains a summary of the results of bomb experiments.

Details on Operating Oxy-Hydrogen Motor. (Autom. Absts., Vol. 10, No. 11, Nov., 1932, p. 429; P. M. Sanders, Motor Transport, 8/10/32, p. 10.) 8.640/25048 U.S.A.)

In the Erren oxy-hydrogen engine the hydrogen is introduced under pressure through a mechanically operated valve which renders impossible early firing during admission.

The rapid combustion of the hydrogen makes the engine less sensitive to combustion head design and plug position than the slower burning of ordinary fuel.

Some Problems Connected with High-Speed Compression Ignition Engine Development. (C. B. Dicksee, J.R. Aer. Soc., Vol. 36, No. 261, Sept., 1932, pp. 733-787.) (8.645/25049 Great Britain.)

Knock under certain conditions of operation of compression ignition engines may be due to vaporisation of fuel oil during the delay period. The distillation characteristic of a fuel oil in conjunction with its ignition temperature is a standard of suitability in this respect. This view is not generally accepted by other experimenters in the subsequent discussion.

Apparatus for Testing Gas Containers. (G. Loeck, Z.V.D.I., Vol. 76, No. 33, 13/8/32, p. 804.) (8.682/25050 Germany.)

For visual inspection of the inner surfaces an optical system, with lamp, is inserted through the neck of the container. The field of view is large and ease of manipulation is studied.

Flexible Tubing. (G. Hatzinger, Z.V.D.I., Vol. 76, No. 23, 4/6/32, pp. 563-565.) (8.684/25051 Germany.)

Aircraft pipe line installations are subjected to fatigue failure of the tubing by vibration. Fabric tubes are free from such failure, but are heavier than aluminium tubing.

A light flexible joint for aluminium tubing has a packing piece of Durit rubber pressed between the conical pipe ends and locked by a wire clip or lock nut. Aluminium pipes jointed in this manner weighed 80lbs. less than copper piping with soldered joints in a Dornier twin-engine flying boat.

Engines, Injection Systems

Influence of Induction and Exhaust Pipe Length on Distribution. (O. Klüsener, Autom. Tech. Zeit., Vol. 35, No. 12, 25/6/32, pp. 299-301.) (8.7/25052 Germany.)

A sketch shows the intake and distribution pipes of a four-cylinder engine.

Elementary expressions for pressure drop are formed for the variations in pressure and diagrams show the fourth and eighth harmonics, above, below and at resonance.

Calculated and observed deliveries of gas to the cylinders as functions of intake pipe length are compared graphically and both exhibit a maximum where the resonance effect is additive, but there is a considerable difference in the corresponding length of intake pipe, on account of the simplifying assumptions made.

Similar consideration is given to variation of pressure in the exhaust system.

Difficulties of interpretation are briefly discussed.

Engines, Pumps, Etc.

Piston Compressors for Scavenging and Supercharging. (L'Aéron., No. 157, June, 1932, pp. 163-169.) (8.745/25053 France.)

The centrifugal fan supercharger, in spite of intensive development work by a number of leading engine manufacturers, remains definitely unsuitable above 15,000 feet. For high altitude flying positive blowers of various types become necessary. The article describes a double-acting piston blower, bore 29 cm., stroke 10.5, with two opposed pistons driven at engine speed (1700 r.p.m.); swept volume 27 litres.

Both inlet and discharge valves are automatic; as many as 672 flap valves are fitted. The construction is thus necessarily vulnerable and the efficiency obtained so far is low. If in spite of this drawback the designer finds justification for heavy research expenditure the need for a supercharger operating above the 15,000 feet limit of the centrifugal fan must be urgent.

Flow and Valve Motion in High-Speed Compressors. (E. Lanzendörfer, Z.V.D.I., Vol. 76, No. 14, 2/4/32, pp. 341-345.) (8.745/25054 Germany.)

An experimental valve is shown in cross section. The ratio of the actual flow to the ideal adiabatic flow is taken as the characteristic of delivery and these are exhibited graphically.

The valve position and the pressure distribution are shown for a cycle.

Thirteen references.

Valve Operation by Oil Pressure. (W. Stieber, Z.F.M., Vol. 23, No. 18, 28/9/32, pp. 536-539.) (8.745/25055 Germany.)

In the proposed design the valve is opened and closed by a double-acting piston fitted to the stem and operated by oil pressure. One pump, with spring loaded piston, maintains constant pressure on the closing side; a second pump driven by the camshaft imposes timed impulses on the opening side. A number of valves may be operated simultaneously without a multiplication of rockers, push rods and springs.

The simplification is marked in application to the swash plate drive. A description is given of various forms of oil gear operated valves, including valve gear for swash plate drive, which still appears somewhat complicated. The compressibility of the oil produced difficulties at the relatively low speed of 1200 r.p.m. and failure occurred from the formation of air bubbles, especially as the oil became hot.

The gear is considered unsuitable for aero engines, but may be successful on large stationary engines.

Engines, Transmission

Elastic Shaft Couplings. (W. Muller-Keuth, Z.V.D.I., Vol. 76, No. 36, 3/9/32, pp. 869-870.) (8.765/25056 Germany.)

The Elcard coupling consists of two toothed sections which engage with a cylindrical connection piece. The latter is split in the middle and the drive is transmitted through flat spring steel strips which take up the torque elastically for any likely angular displacement.

Screw Gauging. (G. Berndt, Z. Instrum., No. 7, July, 1932, pp. 307-319, and No. 9, Sept., 1932, pp. 408-416.) (8.769/25057 Germany.)

A discussion is given of the geometrical and mechanical principle of gauging multiple thread screw cutters in development of Valentine's published method.

In the second part a wide range of observed figures is given with a discussion of errors and corrections.

Engines, Starting Systems

Starting Engines by Compressed Air. (H. Heck, Autom. Tech. Zeit., Vol. 35, No. 15, 10/8/32, pp. 375-376.) (8.78/25058 Germany.)

Reference is made to the steady progress in France of compressed air starting.

Photographs and sectional diagrams show details of a piston compressor and driving motor.

The name plates of the apparatus are English.

Armaments

Range Finders with Invar Base. (F. Ackerl, Z. Instrum., No. 9, Sept., 1932, pp. 393-400.) (9.64/25059 Germany.)

The instrument is described and illustrated by photograph and sketch.

Extensive tables of observed and measured distances are given.

In topographical work, the mean error for four observations is .015 per cent. for distances of the order of 100 m.

Materials, Characteristics

Alloy Steels. (E. Eichwald, Autom. Tech. Zeit., No. 15, 10/8/32, pp. 363-369.) (10.1/25060 Germany.)

Particulars of 155 German alloy steels are tabulated. The values given include:—

1. Elastic properties.
2. Heat treatment.
3. Chemical constituents.
4. Name of firm producing steel.

A chrome nickel molybdenum steel for crankshafts shows a yield point at 72 tons/sq. in. with an ultimate tensile strength of 90 tons/sq. in.

Centrifugal Steel Moulds. (S. L. Conner, Sci. Am., Vol. 147, No. 3, Sept., 1932, pp. 160-162.) (10.1/25061 U.S.A.)

A descriptive technical account is given of the application of centrifugal moulds to production of cast steel cylinder for 3in. A.A. guns. Photographs show the whirling machine, moulds, pouring ladle and castings.

Radial analyses at breech, mid-barrel and muzzle are given and show a favourable distribution of carbon content caused by segregation under centrifugal forces.

A great saving in time and a marked improvement in quality are claimed. The method may have application to engine cylinders.

Two-Ply Stainless Steel. (S. L. Ingersoll, Autom. Ind., Vol. 67, No. 13, 24/9/32, pp. 392-3.) (10.102/25062 U.S.A.)

A brief descriptive account is given of a process of rolling a sheet of stainless steel on a plate of mild steel. Gas or electric welding methods are applied, and it is stated that a perfect weld is obtained.

Numerous difficulties were met with in developing the method.

The cost is favourable and numerous applications are suggested.

Tensile Properties of Some Ferrous Alloys at High Temperatures. (W. Kahlbaum and L. Jordan, Bur. Stan. J. Res., Vol. 9, No. 3, Sept., 1932, pp. 327-332.) 10.103/25063 U.S.A.)

A low carbon manganese steel, five nickel chromium iron alloys, three tungsten chromium vanadium steels and four molybdenum chromium vanadium

steels tempered at temperatures ranging from 790°C. to 840°C. were tested at temperatures ranging from 20°C. to 540°C. As a rough average the proportional limit fell two-thirds and the ultimate strength by one-third.

The detailed results are tabulated and the somewhat unsystematic results are discussed.

Creep in Chromium Vanadium Steels at High Temperatures. (W. Kahlbaum and L. Jordan, Bur. Stan. J. Res., Vol. 9, No. 3, Sept., 1932, pp. 441-455.) (10.103/25064 U.S.A.)

The composition and heat treatment of the specimens are given.

The results are exhibited graphically and show creep for times ranging up to 1000 hours for temperatures ranging up to about 600°C.

Cracking and Fracture in Rotary Bending Tests. (F. Bacon, Engineering, Vol. 134, No. 3480, 23/9/32, pp. 372-376.) (10.104/25065 Great Britain.) Paper read before British Assn., York, 7/9/32.

A full account is given of the apparatus and a number of specimens are shown in plan and section in dimensioned sketches. To simulate working conditions more closely the amplitude of the load can be given a long period variation.

A wide range of the somewhat erratic phenomena of development of cracks and final rupture is considered critically. Test curves of endurance are reproduced. The study of the history of a crack is facilitated by " heat-tinting " and the result of such an analysis is given in a diagram representing the history of a case.

Elongation Line Method for Determining the Distribution of Stresses in Engine Parts Under Alternating Stress. (O. Dietrich and E. Lehr, Z.V.D.I., Vol. 76, No. 41, 8/10/32, pp. 973-982.) (10.104/25066 Germany.)

The firm of Maybach, builders of the airship engine, have prepared a varnish which is applied to working parts of engines and which cracks when the surface is strained under load.

The extension under static load is measured with an extensometer clamped to the engine part with a base line of 2 mm. to 15 mm. Illustrations exhibit the cracking of the varnish as an indication of stresses in crankshafts, connecting rods and pistons.

Fifteen references.

Iron-Cored Coils for Radio Frequencies. (Wireless World, Vol. 31, No. 11, 16/9/32, pp. 272-3.) (10.105/25067 Great Britain.)

Under German patents a magnetic dust, " Ferrocart," is packed between paper laminations to form the core of induction coils which are compact and easily screened. Rights of manufacture have been arranged in this country. (See " Nature," Nov., 12th, 1932, p. 748.)

Materials, Defects and Treatments

Flakiness in Structural Steels. (W. Eilender and H. Kiessler, Z.V.D.I., Vol. 76, No. 30, 23/7/32, pp. 729-735.) (10.12/25068 Germany.)

Flaking of steel is due to internal strains and stresses concomitant with local recrystallisation, accentuated by unequal cooling, in the final stages. Accurate control of heat treatment before final rolling and forging is required.

Steel Hardening by Nitrogen. (Tech. Aéron., No. 124, 1932, pp. 99-105.) (10.12/25069 France.)

The French Hispano-Suiza firm were early in adopting the process on a large commercial scale and some account of their experiences is given. In particular, nitrogen hardening of cylinder liners increases their life and reduces oil consumption substantially.

Nitrogen Hardening of Alloy Steels. (O. Meyer and W. Eilender, Z.V.D.I., Vol. 76, No. 13, 26/3/32, pp. 317-320.) (10.12/25070 Germany.)

Consideration is restricted to the newer processes of surface hardening of special steels by exposure to gases giving off nitrogen at comparatively low temperatures. Specifications are given of a steel hardened by the old methods of cementation by simultaneous introduction of carbon and nitrogen through suitable materials, and of the steels suitable for the modern process of nitrogen hardening, one exhibiting extreme surface hardening without internal strain, the other moderate hardening with greater malleability.

The chemical physical processes involved in hardening these and other successful steels are discussed in considerable detail.

Excessive carbon content hinders the diffusion of nitrogen and undesirable quantities of vanadium, chromium and molybdenum carbides may be formed.

The introduction of titanium as a supplementary metal has given remarkable degrees of hardness.

Methods of reducing the somewhat lengthy time of diffusion of nitrogen are considered, in particular by heating by alternating current. An increased quantity of nitrogen is diffused in a given time, but the depth of the nitrated layer is not much affected.

Twenty-two references.

Heat Treatment. (J. Geschelin, Autom. Ind., Vol. 67, No. 10, 3/9/32, pp. 291-2 and 316.) (10.12/25071 U.S.A.)

A full schedule of steel specifications and heat treatments is given by the courtesy of C. B. Brull, Director of the Citroen Co.'s laboratories.

Water-Cooled Electrodes (for Spot Welding). (G. N. Sieger, Autom. Ind., Vol. 67, No. 16, 15/10/32, p. 481.) (10.140/25072 U.S.A.)

It is stated that water-cooled electrodes designed by the author have longer life and give more consistently accurate welds. Sketches illustrate his views on correct and incorrect design.

Steel Dies, Gas-Cut and Welded. (E. Chapman, Autom. Ind., Vol. 67, No. 17, 22/10/32, pp. 530-532.) (10.140/25073 U.S.A.)

Seven photographs illustrate the building up of steel dies by welding, from parts cut out by gas jet flame. It is stated that the weight and cost are reduced.

Structural Changes of Alloys. (Z.V.D.I., Vol. 76, No. 30, 23/7/32, p. 724.) (10.26/25074 Germany.) Symposium of papers submitted to German Society for Metal Research, June, 1932.

Consideration is given to the so-called " incubation " period in annealing and ageing duralumin. In certain cases the polarisation microscope revealed regions of strain in the vicinity of crystalline precipitates.

The Behaviour of Light Alloys under Static and Alternating Loads at High Temperatures. (W. Schwinning and E. Strobel, Z. Metallk., Vol. 24, No. 6, June, 1932, pp. 132-137, and No. 7, July, 1932, pp. 151-153.) (10.26/25075 Germany.)

Pure aluminium and lautal are compared at temperatures up to 300°C. Lautal (4 per cent. Cu, 1 per cent. Si) is quenched at 500°C. and reheated to 150°C. It has better mechanical properties than duralumin under alternating stresses and at high temperature.

The History of the Development of Aluminium Alloys Capable of being Rolled and the Theory of the Hardening Process. (G. Sachs, Z.V.D.I., Vol. 76, No. 34, 20/8/32, pp. 829-830.) (10.26/25076 Germany.)

Duralumin alloy, of which the original (1909) patent has just expired, holds its position against a large number of aluminium alloys since produced and susceptible of heat treatment and forging.

It has been found that the heat treatment produces mixed crystals and that subsequent ageing produces a roughening of the crystal lattice work by changes in the atomic structure.

A New Aluminium Light Alloy "Chlumin." (Z. Instrum., No. 8, Aug., 1932, p. 377.) (10.26/25077 Germany.)

Good anti-corrosion qualities are claimed for a new Japanese aluminium alloy of high chromium content, susceptible of heat treatment and generally resembling duralumin in its properties.

Investigation of Tension-Corrosion Cracks in Light Alloys. (P. Brenner, Z. Metallk., No. 7, July, 1932, pp. 145-151.) (10.26/25078 Germany.)

Cracks may be due to intercrystalline corrosion. An alloy, not subject to intercrystalline corrosion, may undergo general surface corrosion with far less serious reduction of strength.

Light Metal Castings—Statical and Fatigue Strength. (W. Saran, Z. Metallk., No. 8, Aug., 1932, pp. 181-184, and No. 9, Sept., 1932, pp. 207-210.) (10.261/25079 Germany.)

Part I.

Seven aluminium alloys and one magnesium alloy were submitted to comparative tests under steady loads from small strains up to rupture.

The figures obtained under tensile heading and torsion loads are tabulated and shown graphically against the permanent residual strain.

The methods of applying alternating tests are discussed and figures for the lower ultimate strengths are given.

Part II.

In Part II. results of systematic fatigue tests on "K-S," "Alufont" and "Elektron" are exhibited graphically.

Static tests are shown in a comparative table with the five other alloys.

No simple relation is found between static and fatigue test results.

Other properties are shown graphically and include hysteresis loops in tests of "Elektron."

Activities of the Material Test Department of the D.V.L. (Luftwacht, No. 10, Oct., 1932, pp. 435-436.) (10.262/25080 Germany.)

Corrosion of Light Alloys.

Whilst ordinary dural and silumin undergo considerable reduction in ultimate tensile and extension, after six months exposure to open air sea-water corrosion, dural plat, K.S. alloy and hydroalumin (a new aluminium alloy) suffered no appreciable loss in mechanical properties.

Activities of the Material Test Department of the D.V.L. (Luftwacht, No. 10, Oct., 1932, pp. 435-436.) (10.400/25081 Germany.)

Mechanical Properties of Wood.

The mechanical properties of wood and its consistency as a structural material are considerably improved by previous doping and subsequent lamination and glueing. The plywood construction is especially to be recommended when stresses at right angles to the wood fibre are imposed. The inclusion of one or two laminations will increase four or five fold the mechanical properties of ordinary unlaminated wood sections.

Tests of Aeroplane Fabrics. (K. Schraivogel, Z.F.M., Vol. 23, No. 16, 27/8/32, pp. 489-494, and No. 17, 14/9/32, pp. 519-522.) (10.402/25082 Germany.)

D.V.L. Report 289.

The characteristics of fabrics are in general variable from piece to piece and unstable with time in the same place.

Treatment with cellulose preparations improves the immediate test figure and the durability.

Flax and cotton are the principal materials. The high cost and mechanical defects of silk offset the low specific weights.

Microscopic examination gives a preliminary idea of the quality of the fibres. Variation of characteristics with moisture content is the most serious defect of textiles.

A description is given of the various testing appliances used and the observed characteristics of eight materials are tabulated, six of linen, one of cotton and one of silk.

Test figures from some other sources are collected in another table.

Nineteen references.

Safety Glass. (B. C. Foy, Sci. Am., Vol. 147, No. 3, Sept., 1932, pp. 164-165.) (10.406/25083 U.S.A.)

A descriptive account is given of the production of multiplate glass in America, with some technical details and photographs.

Shear Moduluses of Timber Sheets and Plywood. (H. Hertel, L.F.F., Vol. 9, No. 4, 21/6/32, pp. 135-144.) (10.42/25084 Germany.)

D.V.L. Report 287.

Numerical values of the shear modulus obtained in previous work are plotted graphically. Details of the test apparatus are shown in a photograph. The methods of making the observations are specified and elementary elastic theory is applied to reducing the results and obtaining the shear modulus. Extensive data are collected in tables and exhibited graphically.

Examples of numerical reduction are worked out and specifications and tests for commercial birch plywood are given.

Properties of Impregnated and Laminated Woods. (P. Brenner and O. Kraemer, L.F.F., Vol. 9, No. 4, 21/6/32, pp. 145-152.) (10.42/25085 Germany.)
D.V.L. Report 288.

Methods of impregnating wood are discussed and figures for walnut, ash and beech show generally increased density and compressive strength, reduced tensile strength and much reduced absorption of moisture.

The properties of laminated wood are investigated and figures are tabulated for walnut, ash, beech and birch, for compressive tensile bending and torsional stresses and moduluses.

Eight photographs of fractures are reproduced and discussed.

Glued joints are also considered. Average quality and reliability are much increased by treatment and lamination.

Six references.

Surface Protection of Aeroplane Fabrics. (K. O. Schmidt, Z.F.M., Vol. 23, No. 18, 28/9/32, pp. 549-550.) 10.424/25086 Germany.)
D.V.L. Report 277.

Instructions are given for applying dope and for testing the finished fabric for strength and durability. Painting with a brush gives better results than spraying.

For European climates five coats suffice, but for tropical climates nine coats should be applied. To get a smooth finish some surface grinding is required after applying three or four coats. The last coat should be pigmented and polished. Research is proceeding on a fire-proof dope.

The Preparation and Utilisation of Finely Ground Materials in Industry. (R. Meldau, Z.V.D.I., Vol. 76, No. 28, 9/7/32, pp. 673-677.) (10.9/25087 Germany.)

Preparation by dry grinding and subsequent sorting is cheaper than by washing, heating or chemical processes. Friction between dust particles may produce explosion by discharge of static electricity in an explosive mixture. The milling of potassium stearate and palmitate produces fog by electrical repulsion of the small particles. Stone dust in a gaseous (mine) explosion may absorb enough heat to stop the chemical reaction. Soot may increase the heat by oxidation; application is made to the breaking up of ice in the spring for river navigation.

Thirty-seven references.

Wind Tunnels

The Brunswick Wind Channel. (S. Hoerner, Z.F.M., Vol. 23, No. 16, 27/8/32, pp. 486-487.) (11.10/25088 Germany.)

A brief technical description is illustrated by a general arrangement sketch and two photographs.

The channel is of the open jet closed return type and has a nozzle diameter of 1.3 m., velocity 12 m/s. to 55 m/s., motor power 120 kw.

Airships, Balloons, Etc.

High Altitude Balloon of Piccard. (C. Dollfus, L'Aéron., No. 160, Sept., 1932, pp. 267-268.) (12.19/25089 France.)

The balloon, constructed in Germany, is spherical, capacity 14,000 m^3. The fabric is rubberised cotton, of specific weight 60 gr./m^2. The gondola with passengers and equipment weighs 1200 kg. There is no balloon net; the gondola is attached by ropes to a circumferential fabric panel at about one-third balloon height.

The balloon, at ground level, is filled to about one-fifth capacity. In the first ascent the gondola was painted black and the internal temperature rose to 40°C. under the sun's rays.

In the second ascent the gondola was painted white and the internal temperature fell to 0°C. Landing even in calm weather subjected the passengers to considerable shocks. Buffers of willow twigs are proposed as landing shock absorbers.

Mooring Mast for Airships. (Aviation, Vol. 31, No. 11, Nov., 1932, p. 453; also Sci. Am., Vol. 147, No. 6, Dec., 1932, p. 358.) (12.33/25090 U.S.A.)

A photograph is reproduced of a telescopic, self-propelling mooring mast for U.S. airships. After the airship is moored the mast retracts from 160 feet to 75 feet before towing the airship into dock.

Airships. (Sci. Am., Vol. 147, No. 3, Sept., 1932, pp. 172-173.) (12.39/25091 U.S.A.)

Photographs show the aeroplane hook-on device of the Akron and the framework of the Macon under erection.

The financial problems of an airship service are briefly discussed.

Portable and Fixed Gas Generators for Filling Pilot Balloons. (F. Petz, Z. Instrum., No. 8, Aug., 1932, pp. 365-368.) (12.44/25092 Germany.)

The portable generator weighs 120 kg. and produces three cubic metres of hydrogen per hour by the action of caustic soda on silicon. The cost of chemicals is about one mark per cubic metre.

At a fixed station a supply of gas is best maintained by a small electrolytic generator working continuously on the mains, with a gasometer for storage.

Wireless

The 5th International Electrical Congress, 1932. (Z.V.D.I., Vol. 76, No. 39, 24/9/32, p. 944.) (13.0/25093 Germany.)

Although great progress has been made in the construction of pupinised telephone cables, submarine telephony is still limited to relatively short distances, since intermediate amplifiers cannot be fitted. Long distance ocean talks are made entirely by wireless. It is estimated that the total radiated power of the world's broadcasting stations amounts to 4,000 kw. which corresponds to an input of at least 25,000 kw.

Frequency Distribution of Atmospheric Noise. (R. K. Potter, Proc. Inst. Rad. Eng., Vol. 20, No. 9, Sept., 1932, pp. 1512-1518.) (13.1/25094 U.S.A.)

Author's Abstract:—A relation between atmospheric noise intensity and frequency is estimated upon the basis of noise measurement data covering the frequency range between 15 and 60 kilocycles, and two and 20 megacycles.

Eight references.

Wavelength Characteristics of Coupled Circuits. (R. King, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1368-1400.) (13.2/25095 U.S.A.)

Author's Abstract:—The wavelength characteristics of a simple circuit and of a coupled circuit regenerative oscillator having distributed circuit constants are derived for the case of small resistance and compared with experimental results. A comparison is made with analogous characteristics of circuits with lumped constants and of the electron oscillator.

Sixteen references.

Characteristics of Damped and Undamped Circuits. (M. Osnos, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 103-108.) (13.2/25096 Germany.)

The principal physical relations are summarised and the corresponding mathematical formulæ are collected in a form suitable for design calculations.

Three references.

Study of Harmonics in Tuned Circuits. (P. H. Osborn, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 813-834.) (13.2/25097 U.S.A.)

When the power output is proportional to the square of the grid voltage and the tube is biased to the cut-off point, the wave approximates to half a sinusoid. With high grid excitation biased beyond the cut-off, the current wave is peaked and extends over less than half a cycle. The latter arrangement gives rise to more intense harmonics.

The observed characteristics of three tubes are reproduced.

The elementary theory of harmonics is developed and formulæ are obtained suitable for numerical calculations.

Disturbances in Receivers. (J. W. Alexander, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 82-88.) (13.2/25098 Germany.)

Fourier's analysis is applied to elucidate the theory of disturbances. So-called Fourier sound spectra are obtained experimentally for different sources of disturbance.

Maximum permissible values of disturbances are derived for rectifier, driving motor and buzzer.

Reduction of Output Disturbances. (J. O. McNally, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1263-1283.) (13.2/25099 U.S.A.)

From Author's Abstract:—This paper discusses the disturbance currents in the output circuits of indirectly heated cathode triodes, introduced by the use of alternating current in the heaters. It indicates that the disturbance currents are introduced into the output circuit by (1) the electric field of the heater, (2) the magnetic field of the heater current, and (3) the resistance between heater and grid and between heater and plate, and the capacitance between heater and grid and heater and plate.

Disturbance currents of the frequency of the heater supply, and of double this frequency are shown to be produced by the magnetic field. The double-frequency component is shown experimentally to be proportional to the square of the heater current. The following means of reducing the magnetic field are discussed: (1) the adoption of a heater "geometry" which produces a smaller field in the space between the cathode and the plate, (2) the use of a magnetic shield around the heater system, and (3) the use of a lower current, higher voltage heater.

Ten references.

Linear Distortions in Broadcast Receivers. (A. Clausing and W. Kautter, Proc. Inst. Rad. Eng., Vol. 20, No. 9, Sept., 1932, pp. 1456-1480.) (13.2/25100 U.S.A.)

Author's Abstract:—This paper shows how the selectivity as well as the processes in the detector and low-frequency part cause distortion in broadcast receivers. The chief cause of poor fidelity must be sought in the selectivity of the tuning means. This can be raised to high values by increasing the number of tuning circuits and by improving the quality of the coils (sharpness of tuning). The need for many selection means and sharpness of tuning depends less on the desire for greater amplification than on the necessity of being able to make a good separation of radio transmissions which are close together. The usual

tuning circuits show, qualitatively, the same character of frequency drop independent of the number and sharpness of tuned circuits. Therefore in order to separate side frequencies that are comparatively close together (neighbouring transmitters), frequencies must be considerably weakened which are indispensable for tone-true reproduction. Consequently this paper shows methods which, in the low-frequency part, equalise, for the most important frequencies, what is lost in the high-frequency part. These methods will become unnecessary only when it becomes possible to build cheap, reliable radio-frequency band filters with constant band width but variable average transmission range. This is not as simple as the names applied to all possible designs would lead us to believe.

Eight references.

Measurement of Echoes from the Ionised Layer. (G. Goubau and J. Zenneck, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 77-82.) (13.30/25101 Germany.)

A brief description is given of a sender for waves of 500 m. to 1,000 m., with a photograph and diagrams of connections of the sender and of the make and break control for signals of very short duration. A similar description is given of the photographic receiving apparatus, in which the circular path of a spot of light is interrupted by the direct signal and by the echoes.

A series of photographs is reproduced on a strip of film, each exposure showing a completed circle record with disturbances inward along radii, the angular spacing showing the time between main signal and echo. (See Abstract 22620.)

Six references.

Phase Shift in Radio Transmitters. (W. A. Fitch, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 863-883.) (13.31/25102 U.S.A.)

A mathematical theory of phase shifting is worked out and leads to very lengthy expressions.

The cathode ray oscillograph was applied to determine phase shifts experimentally and three oscillograms are reproduced.

Problems in Selective Reception. (M. V. Callendar, Proc. Inst. Rad. Eng., Vol. 20, No. 9, Sept., 1932, pp. 1427-1455.) (13.32/25103 U.S.A.)

From Author's Abstract:—The equations for magnification and phase differences introduced by one or more simple tuned circuits are first obtained in a convenient form, corresponding expressions are obtained for the band-pass circuit, and a note is appended upon circuits with reaction.

The two rival systems of selective tuning, viz., the band-pass and the simple sharp tuner with audio tone correction, are compared as regards their ability to deal with the direct and also the heterodyne interference from unwanted neighbouring transmissions; the probability of frequency and harmonic distortion in the resulting reception under practical operating conditions is also discussed and it is shown in particular that the band-pass system is inferior on at least two of these four heads.

Eight references.

Theory of the Electro Magnetic Loud Speaker. (M. Kluge, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 108-111.) (13.32/25104 Germany.)

An idealised arrangement is discussed mathematically and the results are adapted to practical conditions. Some of the conclusions are opposed to current design.

Sixteen references.

Field Intensity Measurements. (S. S. Kirby and K. A. Norton, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 841-862.) (13.32/25105 U.S.A.)

Measurements made at 2.4 km. showed no appreciable absorption by the ground above 300 m. in wavelength, but below this wavelength absorption increases rapidly and intensities at 100 km. to 400 km. are only one per cent. in comparison with the intensity of cylindrical radiation.

The conductivity and dielectric coefficients east and west of the Alleghenny Mountains were determined and used to draw fair curves of intensity along which the observations lie without serious scattering.

Note on Reception at Distances Exceeding 12,000 *km.* (L. V. Berkner, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1324-1327.) 13.32/25106 U.S.A.)

From Author's Abstract:—Aural observations of broadcast stations were made during the operations of the Byrd Antarctic Expedition, in New Zealand and between New Zealand and Antarctica. Interference between very widely separated stations on the same frequency is mentioned.

Four references.

Reception of Frequency Modulated Radio Signals. (V. J. Andrew, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 835-840.) (13.32/25107 U.S.A.)

Author's Abstract:—The simplest method consists in analysing the signal into a carrier and side bands and calculating the response of the tuned circuit to each component. The maximum power response is found to be 0.09 of the response with an amplitude modulated transmitter of the same power. There is an inherent discrimination in the receiver against the lower modulation frequencies which just balances a similar discrimination in the transmitter against the higher modulation frequencies.

Action of Short-Wave Frame Aerials. (L. S. Palmer and L. L. K. Honeyball, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1345-1367.) (13.4/25108 U.S.A.)

The transmitter employs wavelengths between 7.54 and 8.80 metres, and the receiving frame is capable of expanding or contracting. Tuning is accomplished by shunting the frame with a copper strip in parallel with a condenser. The results of the measurement are compared with theory and it is concluded that max. frame current only results when the frame is both tuned and formatised.

Three references.

The Damping of Mechanical Oscillations in High Tension Wire. (Z.V.D.I., Vol. 76, No. 39, 24/9/32, p. 946.) (5.42, 13.4/25109 Germany.)

A description is given of dampers which reduce forced oscillations impressed by the wind on h.t. cables from dangerous amplitudes to negligible magnitude.

Braun Tubes at very High Frequencies. (H. E. Hollmann, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 97-103.) (13.5/25110 Germany.)

A photograph shows new constructional details. The deviation of the cathode stream is calculated and exhibited graphically for constant and alternating fields.

The sensitivity of a Braun tube is shown as a function of the frequency and as a function of the anode potential.

Phase alterations are recorded photographically.

Five references.

Current Rectification at Metal Contacts. (S. P. Chakravarti and S. R. Kantebet, Proc. Inst. Rad. Eng., Vol. 20, No. 9, Sept., 1932, pp. 1513-1534.) (13.5/25111 U.S.A.)

From Author's Abstract:—Six different contacts of dissimilar metals, Bi-Fe, Cu-Fe, Cu-Sn, Sn-Zn, Ze-Fe, and Pb-Sn, were studied for their rectifying properties. As far as possible small lengths of cylindrical rods with circular section were used. Their tips barely touched each other, producing an imperfect contact at which rectification was found to take place best.

An attempt is made to explain the rectifying property by assuming that a thermo e.m.f. develops at the contact and that the resistance of the contact itself varies with terminal voltage.

Fifteen references.

Water-Cooled High Power Vacuum Tube. (I. E. Mouromtseff, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 783-807.) (13.5/25112 U.S.A.)

The concentration of the load in a single tube is preferable to distribution over a number of tubes in parallel. This has led to the design of tubes with an output of 100 kw.-200 kw. The principal new design element is a water-cooled grid, built up of flat molybdenum discs disposed in a column.

Five photographs show the general arrangement and a number of details. The principal dimensions can be inferred from the description. The characteristics of the tube are given in eleven diagrams.

Recent Trends in Receiving Tube Design. (J. C. Warner, E. W. Ritter and D. F. Schmit, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1247-1262.) (13.5/25113 U.S.A.)

Author's Abstract:—This paper gives a brief summary of the important steps in receiving tube design over the past ten years. The significance of new forms of grids and in particular the suppressor grid are discussed. Characteristics of new radio-frequency tubes containing suppressor grids are shown. Improvements in cathode and grid designs are illustrated by the characteristics of a new triode as well as two triple-grid tubes. A new tube for Class B audio amplification is described, together with a mercury vapour rectifier for supplying power to the Class B. amplifier.

Five references.

Voltage Dividers for Cathode Ray Oscillographs. (M. F. Peters, G. F. Blackburn and P. T. Hannen, Bur. Stan. J. Res., Vol. 9, No. 1, July, 1932, pp. 81-114.) (13.5/25114 U.S.A.)

The mathematical theory of capacitance voltage dividers is given and the conditions are stated for avoiding modifications of the characteristics of the circuit by introduction of the divider. A photograph shows the arrangement of the capacities.

Thirty-five oscillographs are reproduced.

Diagrams of connections and calibration curves are given.

Gas-Filled Cathode Ray Tubes. (M. von Ardenne, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1310-1323.) (13.5/25115 U.S.A.)

A non-mathematical discussion of design problems is given, illustrated by excellent photographs and by characteristic diagram. The most suitable plate voltage should not exceed 5,000 volts for slow electrons. Initial concentration of ions is imposed by a Wehnelt cylinder. Disturbance due to ionic oscillations is reduced by a grounded metal strap round the tube. Gases of less molecular weight, particularly hydrogen, give sharper definitions at high radio frequencies.

Properties of fluorescent screens are discussed. The characteristics of the Braun tube are shown graphically.

Four references.

Recent Development of Radio-Beacons. (E. Kramer, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 88-92.) (13.6/25116 Germany.)

A brief historical account is given of developments, chiefly in U.S.A., with a map of existing air lines and beacons in that country.

Combinations of directional senders are considered in respect of the form of signals received along different radial directions.

Delimitation of Landing Grounds by Electro Magnetic Field for Blind Landing. (H. Gromoll, H.F. Technik, Vol. 40, No. 2, Aug., 1932, pp. 41-47.) 13.6/25117 Germany.)

A circular leader cable carries an alternating current of about five amperes at 2,500 cycles per second fundamental frequency and harmonics producing an approximately rectangular wave profile.

The vertical component is received by a horizontal frame aerial in the aeroplane, is amplified and rectified, giving an effective e.m.f. of one millivolt at 500 metres height and limited by a valve to a maximum of 10 millivolts.

There is an abrupt change in the phase of the vertical component along a surface of revolutions extending upwards and outwards from the leader cable, and the indication of this change by the instrument enables the pilot to locate the landing ground.

Nine references.

Radio Communication in Amsterdam on a Wavelength of 7.85 Metres. (P. J. H. A. Nordlohne, H.F. Technik, Vol. 40, No. 2, Aug., 1932, pp. 47-55.) (13.6/25118 Germany.)

An experimental system was maintained for a year, on a wavelength which was not reflected from the ionised layer.

A technical description is given of sender and receiver, with three photographs. The range in space is limited and interference between distant stations is eliminated.

The range between 7.5 metres and 7.8 metres wavelength can carry more stations without undue interference than the range from 200 to 2,000 metres. Applications to police, fire stations, fleets, armies, etc., are suggested.

Ten references.

Short-Wave Measurements in Wireless. (K. Schlesinger, H.F. Technik, Vol. 40, No. 2, Aug., 1932, pp. 68-72.) (13.6/25119 Germany.)

Reference is made to characteristic difficulties arising in combinations of instruments from capacity and reactance in the connections.

Shielding, use of concentric connectors, balancing of the earth effect by a differential condenser are applied to prevent couplings by earth currents.

Couplings with zero capacity and some special instruments are described and illustrated.

A New Type of Ultra-Short-Wave Oscillator. (I. E. Mouromtseff and H. V. Noble, Proc. Inst. Rad. Eng., Vol. 20, No. 8, Aug., 1932, pp. 1328-1344.) (13.6/25120 U.S.A.)

Author's Abstract:—A new oscillator for generating ultra-short waves, in which the conventional tank circuit is replaced by a portion of concentric transmission line, is described. Electrically, the tube structure forms an integral part

of the transmission line. For this the quantity VC/L for the tube must be the same as for the rest of the line, C and L being capacity and inductance per unit length of the line. A comparison of the closed oscillating circuit with the "standing wave oscillator" shows distinct advantages of the latter in the region of ultra-short waves. The mode of connecting the load to the oscillator is discussed. Some of the oscillator characteristics are given for wavelengths of five and three metres with 15 and 12 kw. output, respectively. Mention is made of a marked physiological effect of ultra-short-wave fields.

One reference.

Direct Ray Broadcast Transmission. (T. L. Eckersley, Proc. Inst. Rad. Eng., Vol. 20, No. 10, Oct., 1932, pp. 1555-1579.) (13.6/25121 U.S.A.)

From Author's Abstract:—The paper is written with a view to enabling predictions to be made as to the field strength of direct-ray transmission on wavelengths between 60 metres and 2,000 metres.

The main part of the paper is concerned with daylight transmission. The question of night transmission and the influence of the Heaviside layer is considered briefly at the end.

Copper-Oxide Rectifier Used for Radio Detection and Automatic Volume Control. (L. O. Grondahl and W. P. Place, Proc. Inst. Rad. Eng., Vol. 20, No. 10, Oct., 1932, pp. 1599-1614.) (13.7/25122 U.S.A.)

From Author's Abstract:—A new type of radio detector has been developed which depends for its action on the rectifying properties of the boundary between copper and cuprous oxide formed on the copper at a high temperature.

The circuits developed possess unique advantages in that harmonic distortion is practically eliminated, a stage of audio-frequency amplification is eliminated and automatic volume control is achieved without the necessity of using an auxiliary tube.

Seven references.

Time Lag in Photocells. (N. R. Campbell, Phil. Mag., Vol. 14, No. 91, Sept., 1932, pp. 465-486.) (13.7/25123 Great Britain.)

Vacuum photocells are free from time lag, gas-filled cells under certain conditions show time lags of the order of 1/6000 sec. The time lag may be inferred from the behaviour of the cell when exposed to fluctuating light or measured directly as in an apparatus described. After testing a number of different cells the author reaches the conclusion that the result cannot be correlated satisfactorily by any known theory. In the words of the author it seems of little use to investigate time lag till more is known of the Townsend discharge.

Visual Test Devices. (O. H. Schuck, Proc. Inst. Rad. Eng., Vol. 20, No. 10, Oct., 1932, pp. 1580-1598.) (13.80/25124 U.S.A.)

From Author's Abstract:—A device for showing on a screen the frequency-response curve of a tuned circuit, tuned transformer, amplifier or complete radio set is described in this paper. The action of the device is practically instantaneous, and the effect of circuit adjustments may be seen immediately.

Five references.

A New Electrical Method of Frequency Analysis and Its Application to Frequency Modulation. (W. L. Barrow, Proc. Inst. Rad. Eng., Vol. 20, No. 10, Oct., 1932, pp. 1626-1639.) (13.80/25125 U.S.A.)

From Author's Abstract:—The resolving power of the method is very high, allowing component voltages of only two cycles per second frequency difference to be clearly resolved.

A simple expression for the spectrum of a wave with both amplitude and frequency modulation is derived, which allows an immediate oversight of the changes in side band magnitude occurring when one type of undesired modulation accompanies the other. Finally, the relation of the oscillogram of superposed constant frequency and search voltages to Lissajou's figures is pointed out, and a comparison with diatonic harmony made.

Eight references.

Vibrations of Quartz Plates. (R. B. Wright and D. M. Stuart, Bur. Stan. J. Res., Vol. 7, No. 3, Sept., 1931, pp. 519-553.) (13.81/25126 U.S.A.)

A summary of crystal elasticity is given with reference to quartz.

Glow discharge patterns and dust patterns for similar modes showed little resemblance.

The optical method is not considered to be readily adaptable. (See Abstract 24917.)

Over eighty photographs of patterns are reproduced. Improvements in the practical mounting of quartz plates and rods are suggested.

Piezo-Electric Shotgun Pressure Indicator. (C. T. Ervin, Army Ordnance, Vol. 13, No. 74, Sept./Oct., 1932, pp. 99-101.) (13.81/25127 U.S.A.)

A descriptive technical account is illustrated by photographs and a diagram.

Two oscillograms are reproduced, one showing a calibration record, the other two superposed explosion pressure records with damped and undamped elements.

Vibrations of Quartz Plates. (R. C. Colwell, Proc. Inst. Rad. Eng., Vol. 20, No. 5, May, 1932, pp. 808-812.) (13.81/25128 U.S.A.)

A comparison is made between the nodal lines in a quartz plate and the Chladni lines on brass plates, by means of selected examples. Dissimilarities are noted as might have been expected, since quartz crystals have six elastic constants, while brass may be considered as an isotropic material with only two elastic constants.

Metal Shielding Against Alternating Magnetic Fields. (H. Kaden, H.F. Technik, Vol. 40, No. 3, Sept., 1932, pp. 92-97.) (13.9/25129 Germany.)

A mathematical analysis is given for parallel plates and a sphere, and the numerical results are exhibited in eight diagrams.

Ten references.

Photography

The D.V.L. Zeiss Photochronograph. (L'Aéron., No. 157, June, 1932, p. 179.) (14.28/25130 France.)

Enough film is carried for eight complete records of landing and starting. The trajectory of the aircraft can be plotted with accuracy for distances from the apparatus of 100 to 300 metres.

Infra-Red Spectra. (W. F. Meggers and C. C. Kiess, Bur. Stan. J. Res., Vol. 9, No. 3, Sept., 1932, pp. 309-326.) (14.50/25131 U.S.A.)

A new dye, xeno-cyanine, is used to render photographic plates sensitive to infra-red light.

A mass of new ultra-red wavelengths is tabulated for Ti, Fe, Co, Ni and Zr. Many projected lines are observed for the first time.

Aerial Photographs of Very Distant Objects. (L'Aéron., No. 160, Sept., 1932, p. 269.) (14.50/25132 France.)

Photographs taken in California by the U.S. Navy at an altitude of 16,000 feet with special sensitised plates and filter show the curvature of the horizon, distant about 300 miles. The plates were 18 by 24 mm., exposure 1/25 sec. The method may have applications to long range survey of enemy territory.

Photography. (D.V.L. Reports.) (Luftwacht, No. 7, July, 1932, p. 287.) 14.50/25133 Germany.)

By the use of infra-red plates with suitable colour filters in a zenith camera the light of the sky is intercepted and infra-red rays from the sun reflected by the aeroplane are recorded. In this way a number of positions of the aeroplane can be recorded on the same plate by successive exposures. The need of a sky absolutely clear of cloud imposes a severe restriction. (See Abstract 22542.)

Craft Location

Theodolites. (D.V.L. Reports.) (Luftwacht, No. 7, July, 1932, p. 287.) (15.10/25134 Germany.)

In conjunction with the Askania and Zeiss firms several new self-recording theodolites have been designed. The observer keeps the aeroplane in view and the altitude and azimuth are recorded photographically at intervals (see Abstract 24919). One altitude and two azimuths or two altitudes and one azimuth are sufficient for a fix. Two instruments give three redundant readings as checks and ensure a high order of accuracy. In another arrangement synchronised photographs from the wing tips yield accurate data for determining speed near the ground during start and landing.

Influence of Atmospheric Conditions Upon the Audibility of Fog Signals. (B. R. Hubbard, Phys. Berichte, No. 18, 15/9/32, p. 1658; J. Acoustical Soc. of America, Vol. 3, No. 1, Part 1, 1931, pp. 111-125.) (15.20/25135 Germany.)

The reception measurements of fog signals emitted from a lightship are compared with the calculated effects of temperature and of wind gradient in a vertical direction.

Acoustical Methods of Position Fixing. (G. Foges, Z.F.M., Vol. 23, No. 17, 14/9/32, pp. 508-510.) (15.20/25136 Germany.)

An aeroplane flying on radio direction is notified of the proximity of the aerodrome by a rapid increase in radio signal intensity. It then transfers to aural signals which are emitted continuously from the ground. The direction is determined by the phase difference of the sound as received by two microphones placed at a distance of 3 m. on the aircraft and connected to the observer by aircups.

The microphones have a resonance period near 1200 Hertz and the frequency of the sound signal is varied periodically through this value, so that the difficulty of maintaining exact tuning is avoided.

Sound filters exclude all tones of lower frequency than 1000 Hertz.

Sound, Noise Reduction, Etc.

Measurement of Noise in Vehicles. (E. Meyer and W. Willms, Z.V.D.I., Vol. 76, No. 41, 8/10/32, pp. 983-987.) (15.20/25137 Germany.)

Exhaust noises and the noise of electric and pneumatic horns were investigated by the Barkhausen and by the Bekos and Kagan apparatus. The explosive

character of exhaust noises (especially from motor bicycles) introduces a factor of unpleasantness apart from intensity.

Determination of the Sound Spectra Produced by Aircraft in Flight. (Phys. Berichte, No. 18, 15/9/32, p. 1658.) (A new acoustic analyser, L. P. Delsasso, J. Acoustical Soc. of America, Vol. 3, No. 1, Part 1, 1931, pp. 167-178.) (15.20/25138 Germany.)

The receiver consists of a microphone and amplifier. A bifilar quadrant electrometer records the e.m.f. wave of resonance frequency, in contrast with the usual procedure of recording the current wave. The resonance frequency is controlled by the tension or inclination of the bifilar suspension.

Suppression of Noise. (G. W. C. Kaye, Engineering, Vol. 134, No. 3478, 9/9/32, pp. 314-316, and No. 3482, 7/10/32, pp. 432-434.) (15.3/25139 Great Britain.)

Paper read before British Association, York, 1/9/32—Abridged.

A useful summary is given of developments in analysis of noise and devices for its reduction or at least its exclusion from a given space.

Some numerical data of sound absorption by various materials are quoted.

Applications for aeroplanes are briefly noticed.

On the Optimum Damping of Sound in Rooms. (H. Benecke, Ann. d. Phys., Vol. 15, No. 3, Nov., 1932, pp. 259-272.) (15.38/25140 Germany.)

In addition to the well-known " reverberation period " the author introduces a new term—the so-called " building up " period, during which the sound reaches approximately two-thirds of its maximum. Optimum damping is obtained when this period is about 0.06 seconds—independently of size of room.

Response during the " building up " period largely controls musical appreciation and accounts for lack of " true quality " in mechanical and electrical sound reproduction.

Passage of Sound through Small Openings. (E. Wintergerst and W. Knecht, Z.V.D.I., Vol. 76, No. 32, 6/8/32, pp. 777-779.) (1538/25141 Germany.)

Transmission of noise through walls has received considerable attention, but transmission through small openings, cracks, keyholes and cable tunnels, has been little studied. The effect of such openings may be surprisingly large, especially at low frequencies. Rules are given for reducing such transmission by suitable choice of position and shape of the orifice.

Accidents and Precautions

Quartz Bulb Fire Indicators. (G. Lockhart, Sci. Am., Vol. 147, No. 3, Sept., 1932, pp. 166-167.) (16.05/25142 U.S.A.)

Fusible fire plugs have ageing defects and a considerable time lag. Quartz bulbs, filled with low freezing point liquid, and designed to burst at a given temperature, have substantially no ageing defects and about half the time lag.

Manufacturing and test operations are described and illustrated.

Aircraft, Unorthodox

Rockets with Gas Nozzles. (L. Kort, Z.F.M., Vol. 23, No. 16, 27/8/32, pp. 483-486.) (17.20/25143 Germany.)

The elementary formulæ of reaction propulsion are developed and the improvement expected from the fitting of a suitably shaped nozzle controlling the expansion of the gases is shown graphically and in numerical tables.

A few test results are tabulated.

High Altitude Flying

High Altitude Flying. (H. Barjot, L'Aéron., No. 157, June, 1932, p. 182.) (19.30/25144 France.)

French Patent No. 722857, 1931.

Two airscrews are mounted in tandem. The forward airscrew of small diameter is used alone for low altitude flying, while the after propeller of larger diameter runs free. At height a clutch is let in and the aeroplane is driven by both airscrews.

Catapults

Catapults. (P. Salmon, J.R. Aer. Soc., Vol. 36, No. 261, Sept., 1932, pp. 704-732.) (20.14/25145 Great Britain.)

The mechanical problem is stated in detail and practical solutions are illustrated by descriptions and numerous general arrangement and detail drawings of various types. Extensive numerical data are given.

Accelerations approaching 3 g. are feasible for trained pilots. In the discussion it was suggested that $\frac{3}{4}$ g. was likely to be a limit for ordinary passengers.

Lighting Accessories

New Accumulator. (Autom. Absts., Vol. 10, No. 11, Nov., 1932, p. 439; Autom. Ind., 8/10/32, p. 449.) (21.00/25146 U.S.A.)

A new alkaline accumulator combines a high e.m.f. of 1.9 volt. with less internal resistance than the Edison battery. The negative pole is of nickel and the positive pole is of conductive nickel oxide. A battery of these cells, as in use on the Irish railways, has a discharge current from 150 to 600 amperes.

Sensitive Speed Control for Electric Motors. (E. Giebe, Z. Instrum., No. 8, Aug., 1932, pp. 345-348.) (21.03/25147 Germany.)

A control mass in sensitive equilibrium under gravity, centrifugal and spring control forces, oscillates in synchronism with the motor revolutions and closes a contact, which affects the field circuit, once per revolution.

The time of contact is affected by the slightest change of speed and in turn regulates the speed to within 0.001 per cent. at 15 r.p.m.

The device is in use at the Physikalische-Technischen Reichsanstalt, Berlin.

Fog

The Transparency of Clouds and Fogs to Visible and Ultra-Red Radiation. (C. Muller, H. Theissing and H. Kiesseg, Z.V.D.I., Vol. 76, No. 39, 24/9/32, pp. 925-929.) (21.22/25148 Germany.)

Measurements of the absorption of sunlight by clouds and fogs were carried out simultaneously at wavelengths ranging from .6μ to 2.2μ by vacuum thermocouple. The sensitivity of the apparatus allowed of rapid observations during the early stages of fog formation. The ratio of distances traversed by radiations of wavelengths 0.6μ and 2.2μ for the same decrement of intensity was of the order of 20:1, which gives a measure of the greater penetrating power of ultra-red rays.

Aerodynamics and Hydrodynamics

Transference of Heat by Radiation and Convection from Vertical Hot Cylinders. (W. S. Kimball and W. J. King, Phil. Mag., Vol. 14, No. 92, Oct., 1932, pp. 570-591.) (22.0/25149 Great Britain.)

Previous semi-empirical results for steady convection currents are further discussed and formulated as " Laws," I and II.

I. The mean isotherm between body and ambient air is the locus of maximum convection velocity.

II. Half the heat is transferred within this boundary and half without it.

A further empirical result is promulgated as Law III. In the turbulent region above the critical height the rate of heat transfer is constant and equal to the mean heat transfer in the steady region below the critical height.

The so-called Langmuir film bears an analogy with the Prandtl boundary layer in hydrodynamics. The numerical results and the form of the relations are of interest, but too complex for abstracting in detail.

Apparatus for Demonstration of Superposed Flows. (C. Wieselsberger, Phys. Zeit., Vol. 34, No. 1, 1/1/33, pp. 46-47.) (22.1/25150 Germany.)

Hele-Shaw exhibited experimentally Stokes' theorem of the identity of the streamlines of a viscous film (1898) and those of a perfect fluid in two dimensions.

An extension of Hele-Shaw's results is obtained by introducing into the flow a set of sources and sinks. A streamline is formed which may be replaced by a rigid cylindrical boundary. Alternatively, any rigid cylindrical boundary can be replaced by a suitable distribution of sources and sinks.

Stability of Plane Laminar Flow of a Viscous Fluid. (H. Schlichting, Ann. d. Phys., Vol. 14, No. 8, Oct., 1932, pp. 905-936.) (22.1/25151 Germany.)

The fluid is viscous and the boundaries are parallel planes, one of which is set impulsively in uniform linear motion in its own plane. The velocity distribution in steady laminar motion is a function of the time expressible in terms of the error function and is replaced by a simple parabolic approximation which gives a close fit to the accurate expression.

A periodic disturbance is imposed on the steady flow, after the manner of Rayleigh, and a formal solution is constructed as a sum of four undetermined functions. Solutions are obtained in generalised Bessel functions and a critical value of Reynolds number is sought.

Taking water at 20°C., kinematic viscosity as 0.010 and distance of planes 10 cm., velocity of moving plane any arbitrary constant value, the author finds that the critical Reynolds number is indefinitely great at the instant of setting the plane impulsively in motion, sinks to a minimum value, 19,300, in time about 120 seconds, then increases rapidly again to an indefinitely great value for the final steady motion.

Wave Resistance. (T. H. Havelock, Proc. Roy. Soc., Vol. 138, No. A835, 1/11/32, pp. 339-348.) (22.10/25152 Great Britain.)

From the expressions for the velocity potential due to a simple source the velocity potential of a surface distribution of simple sources is found by integration over the surface. The general results are transformed and applied to express wave resistance in Bessel type integrals.

The corresponding results for a distribution of doublets is obtained by axial differentiation along the normal and the expressions for pressure distribution are developed.

The results are applied to the motion of a solid and certain semi-empirical formulæ in use are shown to be equivalent to assuming a distribution of sources.

Abacs (Nomograms) for Flow of Gases. (H. Richter, Z.V.D.I., Vol. 76, No. 13, 26/3/32, pp. 320-321.) (22.5/25153 Germany.)

An elaborate semi-empirical formula has been established for expressing the flow of a gas through a nozzle in terms of initial pressure, pressure at the throat, ratio of inlet to throat section, compressibility, density, etc.

Three Abacs are reproduced which permit rapid numerical evolution of the formula for specified values of the variables.

Six references.

Materials, Elasticity and Plasticity

Fatigue Strength and Crystal Orientation. (W. Fahrenhorst, K. Matthaes and E. Schmid, Z.V.D.I., Vol. 76, No. 33, 13/8/32, pp. 797-799.) (23.10/25154 Germany.)

Experiments on single crystals showed a definite relation between crystal orientation and fatigue strength. Experiments on electrolytic copper strip, a crystalline conglomerate, gave similar results. Under periodic loads an initial improvement in the mechanical properties was followed by breakdown of the crystal lattice structure, with rapid concomitant deterioration, which was influenced markedly by the orientation of the crystals.

Buckling Strength of Columns. (W. R. Osgood, Bur. Stan. J. Res., Vol. 9, No. 4, Oct., 1932, pp. 571-582.) (23.30/25155 U.S.A.)

Euler formula for buckling has been extended to cases where part of the material is beyond the yield point by a number of authors. Priority is assigned to A. Considère (1889), F. Engesser and F. Jasinski. Reference is made to independent work by v. Karman, Southwell and others.

The mathematical analysis is developed as far as is possible without a prescribed section and yield point.

Numerical cases are reduced and exhibited graphically; the working formula of a bridge building firm is reduced and the stress strain diagram is exhibited, which would make the formula accurate.

Applications of the Polar Diagram. (E. H. Atkin, Flight, Vol. 24, No. 35, 26/8/32, pp. 802e-802h; No. 40, 30/9/32, pp. 918c-918g; No. 44, 27/10/32, pp. 1008e-1008g.) (23.40/25156 Great Britain.)

The method of representing the variation of moment along the span of a beam in polar co-ordinates devised by H. B. Howard, R. & M. 1233, 1928, is applied to a number of examples. The saving in time and labour is evident and the accuracy is, in general, amply sufficient for engineering calculations, though critical cases may require analytical investigation.

Mechanical Tests of Aircraft Structural Materials. (I. J. Gerard, J.R. Aer. Soc., Vol. 36, No. 261, Sept., 1932, pp. 673-703.) (23.50/25157 Great Britain.)

The application of compression tests to determine the buckling load of thin steel is illustrated by photographs and diagrams of the apparatus. The tensile strain stress diagram is considered and two typical curves are reproduced to illustrate the ranges into which it may be divided. Two experimental curves show the effect of temperature of oil and air hardening on the range of the strain stress diagram. A brief reference is made to corrosion. The application of the knowledge thus obtained as the basis of a mathematical theory of elastic structures with modifications for plastic yield is extremely difficult beyond the first approximations. Direct test under loading reasonably equivalent to flight conditions requires somewhat elaborate apparatus.

The author gives a full description of a test plant at R.A.E., in which the loads are applied by hydraulic rams and a system of linkages and levers distributing the forces over the frame of a large wing. The rapidity with which improved results are obtained is considered to justify the cost very fully.

Other methods and apparatus for testing large beams, girders, monocoque bodies, hulls, etc., are discussed and illustrated. A lengthy discussion follows which, with the reply, covers a wide range of problems in this highly specialised branch of aeronautical engineering.

Seven references.

Miscellaneous

Electrical Discharge in Compressed Gases and Liquid CO_2. (O. Zeier, Ann. d. Phys., Vol. 14, No. 4, Aug., 1932, p. 415.) (0/25158 Germany.)

Experiments were carried out in air, nitrogen and CO_2 at pressures up to 120 atmospheres. The discharge voltage between spherical electrodes is a function of the product of gas pressure and electrode distance (Pashen's Law) up to a certain pressure lying between 30 and 50 atmospheres, beyond which the rate of increase of the discharge voltage falls off. These changes are explained by emission of electrons and the development of body charges.

Experiments with liquid CO_2 at high pressure yielded similar results to that of air at the same pressure.

CORRESPONDENCE

The Editor, JOURNAL OF THE ROYAL AERONAUTICAL SOCIETY.

3rd March, 1933.

Sir,—I notice that in Capt. Norman Macmillan's paper on "Air Navigation," under the heading of "Terminology," the length of the kilometre is stated to be the 1/10,000 part of the quadrant. In the interests of accuracy may I point out that it is not.

A kilometre is, of course, 1,000 metres and the metre was originally intended to be equal to the one ten-millionth part of the length of the meridian through Paris from Pole to Equator. Actually, something went wrong with the measurements or calculations, with the result that the metre is now an arbitrary standard, and is defined as the distance apart of two lines on a platinum-iridium bar called the "International Prototype Metre," certain specified temperature conditions being adhered to.

Yours faithfully,

W. O. MANNING, F.R.Ae.S.