ABSTRACTS   AND   NOTICES

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Aircraft Design

Plywood ·Webs for Aeroplane Wing Beams. (G. W. Trayer, N.A.C.A. Rpt. No. 344, April, 1930.) (5.102/12751 U.S.A.)

Author's Summary. A method of arriving at the most efficient and economical web thickness, and hence the most suitable unit shear stress, is presented and working stresses in shear for various types of webs and species of plywood are given. The questions of diaphragm spacing and required glue area between the webs and the flange are also discussed.

Lepere-Weymann Metal Construction. (Luftwacht No. 1, Jan., 1930, p. 41.) (5.102/12752 Germany.)

A set of complete box sections threaded on to the spars build up the complete wing, sufficient rigidity being obtained without internal bracing by longitudinal internal corrugation of the metal strips making up the box section. Overlapping of the strips gives a smooth external surface. The incorporation of a radiator in the wing by placing the cooling tubes inside a wing groove increases the cooling during climb and produces little increase of drag.

The Influence of Size on the Structural Weight of Aircraft. (F. Duncanson, Aircraft Engineer (Supplement to Flight, Vol. XXII., No. 13) 28/3/30, p. 346A). (5.14/12753 Great Britain.)

Approximate relations are given between dimensions and weights of structural parts, and curves are worked out for the various relations involved. The conclusion is arrived at that there is no effective limit to the size of flying boats at present.

(*Abstractor's Note*.—It would be as well to await independent official trials of the real performance and load factor of the Dornier D.O.X. before quoting it in support of a conclusion).

Torsional Strength of Members of Typical Section used in Aircraft Design.
    (G. W. Trayer and H. W. March, N.A.C.A. Rept. No. 334, Mar., 1930.)
    (5.2/12754 U.S.A.)
    Some elementary results are collected from the theory of elasticity, unusual
sections and contour lines of equal strengths are plotted by Prandtl's soap film
method, and the results are tabulated.   The elementary elastic theory of non-
homogeneous materials is considered mathematically.
    A useful bibliography is given.

Forced Vibrations with Combined Viscous and Coulomb Damping.   (J. P. Den
    Hartog, Phil. Mag., Vol. 9, No. 59, May, 1930, p. 801.)   (5.2/12755 Great
    Britain.)
    The differential equations of forced vibrations with viscous damping, with
solid friction damping and with combined damping are written down and solved.
Their validity is discussed and a large variety of numerical relations is given
graphically for varying conditions.   The method and results should be of interest
to structural and engine designers.

Calculation of the Natural Frequency of a Cantilever Monoplane Wing.   (S. R.
    Carpenter, Air Corps Information Circular, Vol. VII., No. 649, 1/3/30.)
    (5.214/12756 U.S.A.)
    Formulæ are developed for estimating frequency in bending and in torsion
of cantilever monoplane wings with stressed skin, which appear to give results
within 10 to 20 per cent. of experimental determinations.   These results may be
considered satisfactory in view of the indeterminate nature of the stresses in the
skin of the wing.

Calculation of Members in the Body and Tail of an Aeroplane.   (E. Seydel,
    L.F.F., Vol. 5, No. 2, 11/10/29, pp. 73 to 106.)   (5.24/12757 Germany.)
    The type of frame first considered is built up of hexahedral cells, taken as
statically determinate.   A brief discussion is given of statically indeterminate cases,
Seven numerical examples are worked out.
    The application of the methods to aeroplane bodies of polygonal form is finally
discussed in general terms.

Regulating Air Commerce.   (K. M. Lane, Aviation, Vol. 28, No. 4, 25/1/30,
    p. 154.)   (5.26/12758 U.S.A.)
    A brief descriptive account is given of methods of specifying load factors,
checking stress calculations, and issuing " Approved Type Certificates."

Calculation of 3-dimensional Aircraft Structures.   (H. Ebner, L.F.F., Vol. 5,
    pt. 2, 11/10/29, pp. 1-72.)   (5.26/12759 Germany.)
    The forces and moments are classified and systematic symbols applied.   The
usual equations available in statics are formed and arranged according to frame
types.   Where the edge of a girder is a broken line difference equations carry the
operation from bay to bay.   Where there is continuous curvature the angular
change takes the form of a continuous integral, for which tabulated coefficients
are given.   Schemes of equations are formed for statically determinate and in-
determinate frames, the latter requiring the principle of least work for solution.
In many cases to a sufficient approximation the indeterminate structure may be
replaced by a statically determinate one.   Numerical cases are worked out, and
the article constitutes a short treatise on the subject.   A bibliography of 22
references is given, all German with the exception of one, to Mayor.

On the Vortex System in the Wake of a Cylinder in a Fluid. (H. Levy and
    S. G. Hooker, Phil. Mag., Vol. 9, No. 57, March, 1930, pp. 489-502.)
    (5.3/12760 Great Britain.)

V. Karman's conditions for the stability of two parallel rows of equally spaced
vortices are quoted along with Heisenberg's extensions. The calculated results
were in fair agreement with experiment on a body towed along a channel with
fluid initially at rest in a tank, for a particular value of Reynolds number.

Fage and Johannsen carried out experiments on a flat plate held in a current
of air in a wind channel. Glauert made certain assumptions and derived expres-
sions correcting some of V. Karman's results for channel effects, claiming good
agreement with experiment in certain respects. The authors analyse the assump-
tions and find them irreconcilable with those of Heisenberg. Further, certain
other results not quoted in comparison are in serious disagreement with experi-
ment.

It is shown that the distribution of vorticity set up by the walls of the wind
channel affects the results. The authors conclude that while V. Karman's results
are substantially confirmed for a body towed in a fluid at rest in a tank, there
is no valid physical basis for the comparison of the results, obtained on Glauert's
assumption, with motion behind a body in a wind channel.

The Turbulence in Front of a Body Moving through a Viscous Fluid. (N. A. V.
    Piercy, Phil. Mag., Vol. 9, No. 60, May, 1930, p. 1038.) (5.3/12761 Great
    Britain.)

The turbulence in front of a moving body in a viscous fluid is investigated
experimentally by means of a hot wire instrument and the existence of a con-
siderable region of instability in front of a strut is inferred. This is associated
with the oscillation of the dead-water point at the nose. An attempt is made
to relate this instability to motion in a cylindrical sheet under inertia forces.

Joukowsky Transformations. (P. Dupont, Bull. Tech., No. 63, Nov., 1929, pp.
    1-74.) (5.3/12762 France.)

Pages 1-54 give a resumé of the Kutta and Joukowsky transformations as
developed by v. Mises and others.

Pages 55-70 express the tangential forces and the resulting moments in the
form of integrals introduced by Blasius.

Pages 71-74 combine the two effects.

Joukowsky Transformations. (M. Girault, Bull. Tech., No. 63, Nov., 1929, pp.
    77 to 121.) (5.3/12763 France.)

Pages 77-94 give geometrical examples of transformations.

Pages 95-101 discuss further the choice of profile and the distribution of
pressure along the median section for a wing with finite aspect ratio.

Numerical tables and curves are given to facilitate computation.

Experimental Examination of the Theory of Lifting Surfaces. (M. Pris, Tech.
    Aer., Vol. 20, No. 8, 15/12/30, p. 234.) (5.3/12764 France.)

The expressions for the induced resistance, induced velocities behind the
wing, influence of tunnel walls, the interaction of biplanes and multiplanes, tur-
bulent resistance at surfaces, and for circulation, are evaluated and compared
with experimental determinations. Comparisons are exhibited graphically and
are on the whole satisfactory, but certain discrepancies are evident.

A note is added on the recuperation by fixed plates of the energy of eddies
trailing from the wing tips. With certain settings an increase of lift and a
decrease of drag are exhibited by the polar curves.

Wing Profile and Performance. (H. Müller, L.F.F., Vol. 5, No. 1, 31/7/29, pp. 1 to 28.) (5.31/12765 Germany.)

The characteristics of an ideal wing in a perfect fluid are summarised and compared graphically with the experimental results of various national laboratories, and in conjunction with formulæ of reduction of performance current in Germany are freely applied to indicate the lines of design for specified performance.

An Essential Characteristic of Conformal Representations of Wing Profiles. (A. Metral, C.R., Vol. 190, No. 2, 13/1/30, pp. 103-105.) (5.31/12766 France.)

Three conditions of validity are laid down for the application of conformal transformation to obtaining wing profiles.

The Effect of Rotation upon the Lift and Moment of a Joukowsky Aerofoil. (W. G. Bickley, Proc. Roy. Soc., A.127/804, 1/4/30, pp. 186-196. See previous abstracts Nos. 10/10932 and 6/8318.) (5.31/12767 Great Britain.)

In the present paper the problem is solved completely for the two-dimensional case of profiles obtained from a circle by a single Jowkowsky transformation.

After recapitulation of the expressions arising from the steam and circulation, the conditions arising from rotation are examined and the additional terms in the flow potential are established.

By combining the results the expressions for flight in a curved path are obtained. The analysis is compact and the final expressions are simple.

Abstractor's Note.—An extension of these elegant results to a wing of finite span at least to a sufficient approximation for practical use, should present no great difficulties.

Effect of Variation of Chord and Span of Ailerons on Rolling and Yawing Moments. (N.A.C.A. Reports No. 298, R. H. Heald and D. H. Strother, and 343, R. H. Heald, D. H. Strother and B. H. Monish.) (5.312/12768 U.S.A.)

The extensive numerical results of these two reports are tabulated and exhibited graphically. No general relations have been derived, but the advantages of upward movement of the proper aileron with no movement of the opposite aileron are pointed out. The mechanical application would present difficulties.

The Magnus Effect in Theory and Experiment. (F. Ahlborn, Z.F.M., Vol. 20, No. 24, 28/12/29, p. 642.) (5.32/12770 Germany.)

Prandtl's qualitative and to some extent quantitative theory of the Rotor left a number of points in need of further explanation.

The present paper shows experimentally observed flow in the axial plane, giving a clear notion of the centrifugal pump action which is possibly as important in setting up the circulation, as the shedding of the initial eddy, and has certainly an important effect on the final quasi-steady motion. In particular Prandtl's limitation that the dead points could at most become coincident, and could not leave the surface, is negatived.

Sketches of the formation of eddies have been made from cinematograph records. The phenomena as a whole are complicated.

The application to the rotor ship is discussed and a detailed reply from Haff is countered with vigour. The depressing failure of the rotor ship might have been avoided had the difference between abstract hydrodynamical theory and viscous fluid motion been kept in mind.

Experimental and Theoretical Investigation of Cavitation in Water. (Z.V.D.I., Vol. 74, No. 9, 1/3/30, p. 264.) (5.32/12771 Germany.)

The experiments were carried out with convergent and divergent channels, wing profiles and spheres. Experiments at Göttingen have shown that very small bubbles are formed in the water in the region of low pressure. These are due to the vaporisation of the water and are carried along by the stream. In certain cases, the bubbles may subsequently collapse giving rise to a considerable pressure impulse. It is probable that the pressure impulses are mainly responsible for the corrosive phenomena on propeller screws.

" Shatter " Oscillations. (E. H. Kennard, Phys. Rev., Vol. 35, No. 4, Feb., 1930, p. 428.) (5.32/12772 U.S.A.)

Forced oscillations were imposed on water in a pipe 31 metres long, connected at the far end to a tank, containing a considerable mass of water and over it air at a pressure of four atmospheres. On increasing the velocity of the stroke, a point was reached at which the fluid was unable to support the negative pressure at the trough of the pressure wave. The mass of the fluid became porous in the neighbourhood and oscillations, much below the speed of sound, were transmitted. The pressure waves consisted of isolated peaks. Tentative mathematical treatment is given. The phenomenon appears to be related to the formation of splashes. The physical discontinuity and the corresponding mathematical discontinuity offer difficulties in discussion of the phenomenon.

Thermal Convection in a Viscous Fluid. (R. W. Babcock, Phys. Rev., Vol. 35, No. 8, 15/4/30, pp. 1008-1013.) (5.32/12773 U.S.A.)

Following Oberbeck (Ann. d. Phys. 1879, p. 271) the differential equation of fluid motion and of heat diffusion are written down substantially in the form given later by Boussinesq (1903) and quoted by Rayleigh (Collected Papers, Vol. VI., p. 1916). The problems of convection between parallel vertical walls and vertical concentric circular cylinders, maintained at different constant temperatures, find simple solutions.

The case is considered of two parallel horizontal planes both maintained at temperatures varying harmonically along a fixed direction, and similar problems are constructed for horizontal circular cylinders.

The author makes no reference to the important problem, observed by Benard and solved by Rayleigh and others, of the criterion and mode of instability in layers of viscous fluid between horizontal plane boundaries kept at different constant temperatures, the lower boundary having the higher temperature. (Jeffreys, Proc. Roy. Soc., A.118, p. 195; Low, Proc. Roy. Soc. A.125, p. 180.)

Distribution of Pressure round a Cylinder in a Current of Water. (P. Dupin and M. Teissié-Solier, C.R., Vol. 190, No. 10, 10/3/30, p. 620.) (5.32/ 12774 France.)

Measurements are given of the distribution of pressures round a cylinder exposed to a current of fluid, and a brief note on turbulent flow is added.

The Existence of Two Families of Eddies behind Immersed Solids. (C.R., Vol. 189, No. 23, 2/12/29, pp. 972-974.) *Formation of Eddies behind Immersed Solids.* (C.R., Vol. 190, No. 6, 10/2/30, pp. 362-365.) J. Courregelongue. (5.32/12775 France.)

A description is given in the first article of an observed phenomenon. Two rows of small eddies with close spacing shed by the body roll up into larger eddies.

In the second article some extremely interesting sketches (p. 364) show as many as ten or more small eddies combining to form a larger one, which then exhibits the usual properties associated with detached eddies.

(*Abstractor's Note.*—The speed of propagation of capillary waves in water (23 cm. per second) appears to be critical. This was first pointed out by von Kármán, at Zurich (1926) International Congress, in answering criticisms of Benard, and fully explained the discrepancies between the experiments of the latter and the mathematical theory of the former. There appears to be a systematic attempt on the part of French writers to ascribe to Benard, whose work was purely experimental, the credit really due to von Kármán, who was the first to put the subject on a mathematical physical basis.)

Alternate Eddies. (P. Dupin and M. Teissié-Solier, C.R., Vol. 190, No. 15, 14/4/30, p. 920.) (5.32/12777 France.)

A number of experimental determinations of the periodicity of eddies formed behind a cylinder are plotted against the quantity $\dfrac{\text{diameter}}{\text{velocity} \times \text{periodicity}}$.

For values of Reynolds numbers above 1,000 this parameter appears to have the approximate value of two-tenths within fairly narrow limits.

The experiments are classified according as turbulence does or does not exist.

Effect of Reduction Gearing on Propeller Body Interference. (F. E. Weick, N.A.C.A. Report No. 338, March, 1930.) (5.33/12778 U.S.A.)

Full scale tests on two metal geared airscrews with diameters of 10 ft. 5 in. and 8 ft. 11 in. were made with two different pitch settings and with large and small bodies. The tables and graphs show an increase of about 2 per cent. efficiency as compared with direct-drive airscrews. This is attributed to the smaller relative size of the body and to the forward setting of the hub.

Theory of Alighting Shocks in Seaplanes, 181st Report D.V.L. (W. Pabst, Z.F.M., Vol. 21, No. 9, 14/5/30, pp. 218-226.) (5.34/12779 Germany.)

The impulsive shock on a flat plate is calculated by the methods of hydrodynamics, along with the increase in the effective mass caused by the fluid moving with the plate, taking into account the elasticity of the water. An experimental determination of the latter is also made for forced oscillations, the effect of aspect ratio being taken into account.

Various systems of springs and masses are considered, in order to take into account the elasticity of the seaplane structure itself, and the appropriate differential equations are formed and solved, the pressure being harmonic. A numerical example is worked out.

Wedge-shaped floats are next considered, and in this case the elasticity of water has a negligible effect.

The calculated values for different speeds are exhibited graphically and compared with the load factor specifications of the D.V.L. For small seaplanes relative stresses up to 8 x gravity are found, a figure which exceeds the specified limit. In large seaplanes the calculated overload falls below the specified limit.

High Altitude Airscrews—German Patent No. 494763. Argus Motoren. (Flugsport, Vol. 22, No. 9, 30/5/30, Patents Supplement, p. 81.) (5.4/12780 Germany.)

A supercharged engine is fitted with one or more airscrews subsidiary to the main airscrew. At low altitudes they run light. At high altitudes they are brought into operation by clutches so that the full power can be absorbed without serious increase of engine speed.

The Joukowsky Circulation Theory of Airscrews. (W. Alexandrow, Fourth
Congress for Air Transport, Rome, October 28th, 1927, Z.F.M., Vol. 24,
No. 20, 28/12/29, p. 633.) (5.41/12781 Germany.)

Extensive priority is claimed on slender grounds for Russian Aeronautical
writers. The usual expressions for torque, thrust and efficiency are formed, and
various approximations of a more or less familiar nature are introduced to render
the mathematical expressions tractable.

The calculated values are compared with experimental results from English
and U.S.A. laboratories.

There appears to be no new result.

Test of an Adjustable Pitch Model Airscrew at Four Blade Settings. (E. P.
Lesley, N.A.C.A. Tech. Note No. 333, Feb., 1930.) (5.43/12782 U.S.A.)

Author's Summary.—The model airscrew is designed for a uniform nominal
pitch/diameter ratio of .7 and the blade settings used correspond to nominal pitch/
diameter ratios of .5, .7, .9, and 1.1 at .6 radius. The tests show that airscrews
of this type may be considerably changed in setting from the designed pitch angles
and yet give excellent performance.

*Full Scale Wind Tunnel Tests with a Series of Airscrews of Different Diameters
on a Single Fuselage.* (F. E. Weick, N.A.C.A. Report No. 339, March,
1930.) (5.45/12783 U.S.A.)

Torque, thrust and efficiency characteristics of four geometrically similar
metal airscrews of diameters 9 ft., 9 ft. 5 in., 10 ft., and 10 ft. 5 in., have been
tabulated and plotted. An increase of the order of 1 per cent. for a diameter
increase of 10 per cent. is shown in the efficiency and power output curves.

Full Scale Wind Tunnel Tests on Metal Propellers of Different Blade Forms.
(F. E. Weick, N.A.C.A. Report No. 340, Feb., 1930.) (5.49/12784 U.S.A.)

Author's Summary.—Five different aluminium alloy propellers having 4
different blade forms were tested on an open cockpit fuselage with a radial air-
cooled engine having conventional cowling. The results show that (1) the
differences in propulsive efficiency due to the differences in blade form were small;
(2) the form with the thinnest airfoil sections had the highest efficiency; (3) it is
advantageous as regards propulsive efficiency for a propeller operating in front of
a body, such as a radial engine, to have its pitch reduced towards the hub.

Aerodynamic Theory and Test of Strut Forms. (R. H. Smith, N.A.C.A. Repts.
Nos. 311 (Part I.) and 335 (Part II.) (5.56/12785 U.S.A.)

Author's Summary.

Part I.—In the 1st part the symmetrical inviscid flow about an empirical
strut of high service merit is found by both the Rankine and the Joukowsky
methods. The results can be made to agree as closely as wished. Theoretical
stream surfaces as well as surfaces of constant speed and pressure in the fluid
about the strut are found. The surface pressure computed from the two theories
agrees well with the measured pressure on the fore part of the model but not so
well on the after part. From the theoretical flow speed the surface friction is
computed by an empirical formula. The drag integrated from the friction and
measured pressure closely equals the whole measured drag. As the pressure drag
and the whole drag are accurately determined, the friction formula also appears
trustworthy for such fair shapes.

Part II.—In the 2nd part five theoretical struts are developed from distributed
sources and sinks and constructed for pressure and resistance tests in a wind
tunnel. The surface pressures for symmetrical inviscid flow are computed for
each strut from theory and compared with those found by experiment. The

theoretical and experimental pressure are found to agree quantitatively near the bow, only qualitatively over the suction range, the experimental suctions being uniformly a little low, and not at all near the stern.

This study is a sequel to Furhmann's research on airship forms, the one being in two dimensions, the other in three. A comparison of results indicates that the agreement between theory and experiment is somewhat better for bodies of revolution than for cylinders when both are shaped for slight resistance. The consistent deficiency of the experimental sections which is found in the case of struts was not found in the case of airships, for which the experimental sections were sometimes above, sometimes below their theoretical values.

Motorless Flight. (Flugsport, Vol. XXII., No. 5, March, 1930, p. 74.) (5.8/12786 Germany.)

A description is given, with illustrations and constructional details, of the high-performance glider " Meiningen."

Motorless Flight. (Flugsport, Vol. XXII., No. 8, 16/4/30, p. 140.) (5.8/12787 Germany.)

Regulations for the 1930 Rhön Gliding Competition. Formal conditions of entry are given, along with the technical condition that the load divided by the aspect ratio shall not be less than 1.1.

A technical committee, a test committee and a meteorological committee control technical questions arising.

Navigation

Reduction of Noise in Aircraft. (H. E. Wimperis, Airc. Eng., Vol. 2, No. 14, April, 1930, p. 79.) (6.261/12788 Great Britain.)

Fechner's law of the relation of sensation to stimulus is stated, and the recently introduced quantitative unit of sound intensity is defined. It is pointed out that when two sources of equal intensity are present the suppression of one source affords negligible relief. The effects of reflection and absorption by walls are discussed. The advantages of walls which externally reflect sound and internally absorb it are brought out. These fundamentals determine the lines along which relief must be sought

Dissipation of the Energy Transmitted by a Sound Wave. (T. Vautier, C.R., No. 27, 30/12/29, pp. 1253-1255.) (6.261/12789 France.)

Expressions are obtained for the dissipation of energy of a sound wave in a pipe. Most of the loss of energy occurs on reflection at the ends, and depends markedly on the wave length. Pipe lengths up to 3,000 metres were used.

Insulation and Absorption of Sound. Method of Measurement. (E. Meyer, Z.V.D.I., Vol. 74, No. 9, 1/3/30, p. 273-279.) (6.265/12790 Germany.)

A special department (The Heinrich Herz Institute) for the study of all oscillation problems has been found at the Technical High School of Berlin. The department deals with mechanical, acoustical and electrical oscillation and the present article refers to the acoustical equipment. Till recently no suitable instruments were available, but microphones are now easily adapted for sound intensity measurements, just as loud speakers act as sources of sound. The microphone employed is of the capacity type and consists of a very thin duralumin diaphragm working in close proximity to a stationary electrode. By using two microphones the coefficient of sound transmission can be measured directly and its dependence on frequency investigated. For sound emission a specially modulated source possessing a certain width of frequency bands has been found useful.

Flight Test Instruments. (J. B. Peterson and G. W. Rounds, S.A.E., Vol. XXVI., No. 3, March, 1930, p. 313.) (6.3/12791 U.S.A.)

The errors are discussed, of altimeters, airspeed indicators, thermometers, revolution indicators. Diagrams are given showing errors found in calibration in typical instruments.

Gyro Compass for Gun-Fire Control. (S. G. Brown, Jnl. of Sc. Inst., Vol. 8, No. 2, Feb., 1930, pp. 40-49.) (6.344/12792 Great Britain.)

A description is given of the application of the author's balanced gyro directional instrument which maintains a fixed direction in space independently of the earth's rotation, for gun-fire control; gyro fly-wheel $4\frac{1}{4}$in. diameter; 11,000 r.p.m.; 12 volt d.c. motor; total weight of instrument 15lbs. Photographs of the instrument and a graphical record of damping after a roll of $15°$, are reproduced. Considerable claims are made.

A New Method of Measuring Short Time Intervals. (W. Phillips, J. Sc. Inst., Vol. VII., No. 4, April, 1930, p. 126.) (6.44/12793 Great Britain.)

An indicating needle is carried by a moving coil, and undergoes a deflection in proportion to the current passing multiplied by the time. The current is measured in milli-amperes and the practical range is from 1/1000 sec. to 30 secs. The calibration depends upon the current passing through the coil.

Device for Measuring the Actual Rate of Flow of Fluid through Pipes. (Autom. Tech. Zeit., Vol. 33, No. 10, 10/4/30, pp. 251-252.) (6.51/12794 Germany.)

The flow meter is of the weir type and is of low resistance. The weir is in the form of a slot in a metal tube. The height of the liquid is measured in a capillary tube, after passing a chemical dye to facilitate reading. The weight is about 5lbs. and the delivery between 30 and 300 litres of fuel per hour. The accuracy is stated to be $\pm\frac{1}{4}$ of 1 per cent. under normal conditions.

Flying in Fog. (J. H. Doolittle, S.A.E., Vol. XXVI., No. 3, March, 1930, p. 318.) (6.6/12795 U.S.A.)

A descriptive account is given of the equipment of a naval training aeroplane for flying with instruments alone. These include an altimeter graded in 10 foot intervals, a directional gyroscope (not North seeking), and Sperry artificial horizon. Extensive radio direction finding equipment was installed including a vibrating-reed radio indicator, with wing tip antenna, in conjunction with a ground radio beacon, audible type, giving a localiser beam with an effective range of four miles.

Signalling with Ultra-Red Rays and their Use in Fogs. ·(Z.V.D.I., Vol. 73, No. 52, 28/12/29, pp. 1859-1860.) (6.61/12796 Germany.)

It has been found that the wave length of ultra red radiation must be less than 2μ in order to obtain the largest range through fog. The best results have been obtained with ultra red rays acting on a compound of thalium oxygen and sulphur known as thalofide. A thalofide cell is exposed periodically by means of a rotating mirror to two neighbouring strips of ground. If the ultra red radiating beacon is included in one of the strips, an electrical circuit is disturbed.

With a 6 cm. rotating mirror, ultra red radiations from a 4-volt pocket lamp were detected with certainty, after passing through 30 cm. of water, at a range of 8m. References are given to experiments on signalling by ultra red rays during the war and this application is considered promising.

Light Beacons for Night Flying. (W. M. Hampton, Airc. Eng., Vol. 2, No. 13, March, 1930, p. 64.) (6.62/12797 Great Britain.)

Visibility and range are discussed for varying weather conditions and for different types of lighting. An expression is given for the intensity required for a given range under varying conditions of absorption, and the results are exhibited graphically. Benford's results (U.S.A.) are reproduced, exhibiting, graphically, the fractions transmitted for different wave lengths and ranges.

The usual view is taken that Neon lights have no advantage in misty weather.

Oblique Absorption of Sound. (P. R. Heyl, V. L. Chrisler and W. F. Snyder, Bur. Stan. Jnl. Res., Vol. 4, No. 2, Feb., 1930, p. 289.) (6.76/12798 U.S.A.)

Author's Summary.—The absorption of sound at oblique angles of incidence has up to the present been purely a matter of theory, no experimental work having been published on the subject. Theoretical discussions have been given, which appear to be in error in an essential point, namely, the overlooking of the probable existence of rotational motion in the region of absorption.

• It is found that the absorption varies with the angle of incidence, but not according to the law which has been deduced from purely theoretical considerations.

The conclusion has been reached that the tube method of measuring absorption is limited in its application to relative comparison of samples of similar nature, and that for absolute values of absorption the reverberation method is the only trustworthy one.

General Elastic Theory-Stress Optical Methods. (E. G. Coker, Engineering, Vol. 129, No. 3352, 11/4/30, p. 465.) (6.95/12799 Great Britain.)

A description with photographs is given of an extensometer indicating by means of a pivoted mirror and a beam of light. It is applied to measure the changes of thickness of specimens under tension, and thereby to determine the Poisson ratio in connection with stress optical measurements.

Critical notes are given on other types of extensometer also.

The Huggenberger Tensometer. (Engineering, Vol. 129, No. 3353, 18/4/30, p. 502.) (6.95/12800 Great Britain.)

A description is given with two photographs and a diagram. Magnification may be 1200 or 300, according to requirements. A specimen stress-strain diagram is given.

Electrical Recorder on the Principle of the Condenser Micrometer. (Z.V.D.I., Vol. 74, No. 8, 22/2/30, p. 243.) (6.95/12801 Germany.)

The condenser micrometer has been developed as a recording instrument by the firm of Siemens, and examples of the instrument are given when used as a torque meter and also for recording tool pressure in a lathe. A bibliography is appended.

The Guggenheim Safety Competition. (Aviation, Vol. 28, No. 6, 8/2/30, p. 236.) Articles by W. G. Brown, R. R. Osborn and E. P. Warner.) (7.0/12802 U.S.A.)

The first article covers the method of making specified test measurement. The second gives a descriptive account of the development of various details of the winning machine, with sketches of details. The third gives a descriptive account of the flying qualities of the winning machine.

A Three-Phase Automatic Pilot.   (W. C. A. Beck, Airc. Eng., Vol. 2, No. 14,
    April, 1930, p. 80.)   (7.4/12803 Great Britain.)

A photograph and diagrams are given of the Boykow gyroscopic control.
Two coupled gyroscopes control the elevators and a single constrained gyroscope
the ailerons, by means of electrical contacts and relays.   A description is given
of the coupling, electrical connections, servo-motor control, and the application
to flying without control by the pilot.

Automatic Steering Tests.   (N. Minorsky, J. Am. Soc. Nav. Eng., Vol. XLII.,
    No. 2, May, 1930, p. 285.)   (7.4/12804 U.S.A.)

A descriptive account is given of the experimental automatic steering con-
trol installed in the U.S.S. New Mexico.   Photographs and diagrams of the
electrical equipment are given and it is concluded that spotting aeroplanes are
actually able to direct course and gunfire.   Consequently the fleet itself may
remain permanently protected from aircraft above as well as from ships on the
surface by smoke screens.

Taking Off and Landing Runs.   (R. S. Stafford, Aircraft Engineer (Supplement
    to Flight, Vol. 22, No. 13), 28/3/30, p. 346e).   (7.51/12805 Great
    Britain.)

Formulæ are developed from wheel and tailskid resistance data of an aero-
plane for the length of rising and landing runs.   The graphical curves given are
convenient for quick estimation.

Aircraft Engines

Small Aero Engines.   (N. N. Tilley, S.A.E. XXVI., No. 3, March, 1930, p.
    346.)   (8.12/12806 U.S.A.)

Photographs and some descriptive details are given of engines developing
from 25 h.p. to 110 h.p.   A summary of the discussion is given.

Siemens SH.20 Radial Engine.   (Flugsport, Vol. 22, No. 9, 30/4/30, p. 156-
    158.)   (8.14/12807 Germany.)

In addition to building the French Jupiter engine under licence the firm of
Siemens have now turned out a large air-cooled radial engine of their own design.
The cylinder construction is of the screwed head type with only two valves per
cylinder.   The crankshaft is built up.   The maximum rating near the ground is
540 h.p. at 1800 r.p.m., just over 17 h.p. per litre of stroke volume.

Correcting Engine Tests for Humidity.   (D. B. Brooks, Bur. St. J. Res., Vol. 3,
    No. 5, Nov. 1929, p. 795.)   (8.18/12808 U.S.A.)

Author's Summary.—Data obtained on a 6-cylinder automobile engine in-
dicate a loss of engine power with increasing humidity proportional to the volu-
metric loss of oxygen content of the atmosphere.   It is shown that power and
fuel consumption may be corrected by subtracting observed water vapour pressure
from atmospheric pressure and using the result in place of barometric pressure
in the usual correction formula.   The humidity correction may be as large as
that due to changes in barometric pressure.

Simple nomograms are presented for obtaining the humidity correction, both
near sea level and at higher altitudes.   An appendix gives methods of com-
putation by these nomograms.

Vibrations Damped by Solid Friction. (S. Thomas, Phil. Mag., Vol. 9, No. 57, March, 1930, pp. 329-345.) (8.22/12809 Great Britain.)

The elementary differential equations of solid friction damping and of combined solid and fluid friction damping are formed and solved, examples are worked out and compared with experimental results, by which the conclusions are generally supported. The method will find applications in the damping of torsional vibrations.

Thermometry in Engine Research. (J. F. Alcock, Air. Eng., Vol. 2, No. 13, March, 1930, p. 57.) (8.25/12810 Great Britain.)

A synopsis is given of the methods of applying thermo-couples to the exploration of the temperature field in aero engines. The calibration of thermo-couples with difficulties of their application to moving parts, and the arrangement of the external circuit is discussed. A diagram of a typical installation is given.

Rate of Heat Transfer from Finned Metal Surfaces. (C. F. Taylor & A. Rehbock, N.A.C.A. Techn. Note No. 331.) (8.3/12811 U.S.A.)

Author's Summary. In general, it has been found that the effectiveness of a given fin does not decrease very rapidly until its distance from adjacent fins has been reduced to 1/9 or 1/10 of an inch. A formula for the heat transfer from a flat surface without fins has been developed, and an approximate formula for the finned specimens is also suggested. Three diagrams with photographs show the general arrangements. Results are embodied in figures 7 to 28.

Transference of Heat, Diffusion and Evaporation. (W. Nusselt, Z.A.M.M., Vol. 10, No. 2, April, 1930, pp. 105-121.) (8.3/12812 Germany.)

The differential equations of heat transference and of diffusion are of the same form. Radiation and absorption must be taken into account in considering heat transference.

When laminar flow prevails, sufficient approximation to exact expressions for velocity, etc., can be obtained. When turbulence appears Prandtl's empirical expression of the mean velocity in terms of the 7th or 8th power of the distance from the wall has proved to be useful and accurate. Reynolds number now appears in the coefficients.

A discussion is given of numerous " formulæ " of application by various writers, some of which are adversely criticised.

Finally a formidable portmanteau formula is introduced for the ratio of heat transference and evaporation coefficient in a cooling tower involving some twenty physical quantities.

(*Abstractor's Note.*—The value of such formulæ, apart from and outside the range of the experimental results on which they are based, is not always apparent. Clearly there is an endless variety of ways in which the " theory " may be fitted to the fact by judicious manipulation of the numerous coefficients.)

The Insulation of Heated and Cooled Surfaces. (J. S. F. Gard & R. S. Robinson, Jnl. Soc. Chem. Indust. Trans. & Comm., Vol. 49, No. 10, 7/3/30, p. 125). (8.3/12813 Great Britain.)

Till recently principally magnesium carbonate and pure cork board were used as non-conductors. Both high and low temperature work in modern times require new materials for insulators, among which aluminium foil with internal air pockets is favourably referred to. The technical requirements of insulators under various conditions and methods of test are described. A bibliography is attached.

The Effect of High Temperature Water Cooling on I.C. Engines. (Dr. Ing. Hecker, Z.V.D.I., Vol. 74, No. 15, 12/5/30, pp. 471-476.) (8.31/12814 Germany.)

Two B.M.W. engines were tested, a 55 h.p. 4-cylinder motor car engine and a 220 h.p. 6-cylinder aero engine. The cooling water mean temperature was kept constant during test, and varied from 20°C. to 120°C. in a serious of tests. With constant mixture the car engine power increased about 2 per cent. and the specific fuel consumption about 3 per cent., while the aero engine power was unaffected and the consumption decreased by about 3 per cent.

Cowling Tests—Performance of Aeroplane with Different Engine Cowlings. (O. W. Schey, E. Johnson, and M. N. Gough, N.A.C.A. Tech. Note No. 334, Feb., 1930.) (8.38/12815 U.S.A.)

A description of the various cowlings, clearly illustrated by numerous photographs; the performances are given in numerical tables and graphically.

The Lubrication of Engines. (O. Thornycroft and C. H. Barton, Airc. Eng., Vol. 2, No. 15, May, 1930, p. 109). (8.4/12816 Great Britain.)

Carbonisation is largely due to the incomplete evaporation and combustion of the lubricating oil in the engine cylinder. Probably the carbonaceous matter in crankcase sludge has been carried down from the combustion chamber. There are no satisfactory laboratory tests available at the moment for comparing the carbonising tendencies of various oils, and no tests for sludging. Any tests devised should be carried out in close conjunction with engine experiments.

Questions on Lubrication Discussed at D.V.M. Conference, 10/12/29. (Z.V.D.I., Vol. 74, No. 12, 22/3/30, pp. 371-372.) (8.4/12817 Germany.)

The questions discussed cover primarily the special lubricating requirements of instruments, the measurements of oiliness and the stability of lubricating oil. In the case of instruments it is important that the oil should not creep and should be chemically stable. Certain parts of the instrument such as ebonite or wood may act deleteriously on the oil. It appears that the presence of anti-catalysers does not afford complete protection against oxidation.

The Spreading of Lubricants on Solid Surfaces, Molecular Influence. (P. Woog, C.R., Vol. 189, No. 23, 2/12/29, pp. 977-979.) (8.41/12818 France.)

The spreading of certain lubricating oils on metal surfaces depended on the time of exposure to sunlight previous to the experiment. Similar results were obtained by exposure to a quartz lamp. Under certain conditions the difference in spreading was accompanied by changes in viscosity.

Measurement of Lubricating Quality of Oils. (V. Vieweg, Tech. Mech. und Therm, Supplement to Z.V.D.I.), Vol. 1, No. 3, March 1930, pp. 101-105.) (8.41/ 12819 Germany.)

If so-called boundary lubrication exists the molecules in the oil film must be definite y orientated to an extent which can be measured by the degree of rectification of an alternating current passing through the film.

Estimation of Lubricant Quality of Oils. (R. Voitlander, Z.V.D.I., Vol. 73, No. 48, 30/11/29, p. 1702.) (8.41/12820 Germany.)

A cylinder rotating about a vertical axis is pressed against a second cylinder rotating about a horizontal axis. Both cylinders are immersed completely in the lubricant to be tested and rotated at the same angular velocity. The torque transmitted through the horizontal cylinder is recorded as a measure of the lubricating quality of the oil. Experiments so far carried out show clearly differences in this

quality with constant viscosity. The friction depends markedly on the contact pressure between the cylinder and falls off with diminution of pressure. Of all the substances tested sugar solution showed the smallest coefficient of friction.

Oil Scraper Ring. (Autom. Tech. Zeit., Vol. 32, No. 35, 20/12/29, p. 808.) (8.42/12821 Germany.)

A new form of scraper ring is described which is considerably deeper than the normal type and which has a number of oil holes in the surface of the ring instead of a groove. It is claimed that this makes the passage of the oil into the interior of the ring easier. The absence of the groove and the deeper section make the spring tension practically identical with that of the normal piston ring.

Motor Fuels. (De Bataafsche Petroleum Maatschappij, French patent No. 667, 160). (Chem. Abstr., Vol. 24, No. 5, 10/3/30, p. 1203.) (8.5/12822 France.)

A motor fuel is prepared by dissolving an " anti-knocking " agent in a solvent itself insoluble in the fuel and dispersing the solution in the fuel, if necessary with a dispersing or emulsifying agent and a stabiliser. In an example $(COOK)_2$ is dissolved in water and the solution dispersed in benzine. In other examples solutions of potassium cromate, citrate, gallate are used.

Liquid Fuel. (I. G. Farbenind, A.-G. German Patent No. 485,945.) (Chem. Abstr., Vol. 24, No. 5, 10/3/30, p. 1203.) (8.51/12823 Germany.)

In a prior patent 448,620, liquid fuel is improved by addition of carbonyl compounds of the Fe group. The present patent describes the improvement of liquid fuels by addition of other organic compounds of the Fe group, such as a Fe derivative of acetylacetone, Fe oleate, Fe naphthanate, Fe acetoacetate and Fe benzoylacete.

Study of the Absorption Spectra of certain Mineral Oils, in the Visible Range. (T. D. Gheorghiu.) *Ultra-Violet Absorption Spectra of certain Carbohydrates.* (A. Andant.) Bull. Tech. No. 64, December, 1929.) (8.5/12824 France.)

Fuels and lubricating oils were subjected to the radiation from a carbon filament lamp of wave lengths from about 3,000 to 6,000 A.U. The absorption was measured electrically by photo-electric cells. Characteristic absorption spectra were obtained from various lubricating oils in dilute benzene solution and formed a useful means of identification. Characteristic ultra-violet spectra of the carbo hydrates were also obtained over a range of wave lengths from 2,000 to 3,000 A.U. with a hydrogen lamp as the source radiation. The degree of absorption was measured by a photo-electric photometer. The fuels included hexane, octane, nonane, decane, undicane, duodicane and cyclo-hexane.

Two Physical Properties of Fuels which determine Mixture Formation in Carburettor Engines. (Wawrziniok, Auton. Tech. Zeit., Vol. 33, No. 11, 20/4/30, pp. 292-294; and No. 12, 30/4/30, pp. 316-318). (8.51/12625/6 Germany.)

It is the function of the carburettor to atomise the fuel sufficiently finely to prevent separation. The stability of the fuel fog depends on the latent heat and the surface tension. Those fuels which have the lowest latent heat and the smallest surface tension provide the finest subdivision and the greatest stability.

The surface tension of a series of fuels has been measured by the author over a range of temperature. In the case of fuel mixtures it is shown that the resultant surface tension is not an additive property.

An apparatus is described in the second article for registering automatically the rate of evaporation of a fuel at various temperatures and various air pressures.

British Patent No. 308614, March 24th, 1928.   (8.514/12827 Great Britain.)
Mercury cyanide is suggested as an anti-knock compound.

Knock-Rating of Fuels. (D. G. G. Brown, Autom. Ind., Vol. 62, No. 4,
25/1/30, p. 112.) (8.514/12828 U.S.A.)

The Department of Engineering Research, University of Michigan, is now
prepared to issue certificates in Knock-Rating. A photograph is given of the
N.A.C.A. 1-cylinder test engine. A diagram of the fuel system and a chart show-
ing the knock characteristics as determined for certain standard fuels are given.

*Variation of Ignition Temperature with Mixture Composition for Various Fuel
Mixtures.* (Grebel, C.R., Vol. 189, No. 21, 18/11/29, p. 856.) (8.514/
12829 France.)

The nature of the parent fuel has a determining effect on the resultant type
of combustion. Using petrol, ethyl aldehyde produces violent detonation. With
gas oil on the other hand, the aldehyde only acts as an accelerator. Similarly
acetic acid and ethyl alcohol have much less anti-detonation effect when added
to gas oil than when added to petrol.

Comparison of Anti-Knock Ratings Determined in Different Laboratories. (C.
H. Barton, C. H. Sprake & R. Stansfield, S.A.E. Jrnl., Vol. 26,
No. 4, April, 1930, pp. 479-484.) (8.514/12830 U.S.A.)

The tests show that, within narrow limits, very concordant knock ratings
for different fuels can be obtained with engines of widely different design and
working conditions if temperature and speed are carefully controlled and settings
are adjusted for maximum-knock mixture strength.

*Detonation Characteristics of some of the Fuels Suggested as Standards of Anti-
Knock Quality.* (J. M. Campbell, G. Lovell & T. A. Boyd, S.A.E. Jrnl.,
Vol. 26, No. 4, April, 1930, pp. 485-486.) (8.514/12831 U.S.A.)

Data are given from work done on the universal testing-engine developed
by the N.A.C.A. The fuel system is described and a chart shows the results
of relative compression ratio based on pure normal heptane. Hydrocarbon
mixtures are considered as a possible basis for a standard fuel. Undesirable
characteristics seem to be eliminated when the blended materials give a straight-
line distillation curve. The detonation characteristics of blends are discussed.

*The Physical Chemistry of the Phenomenon of " Knock " and of " Anti-De-
tonants."* (P. Lafitte, J. Chim. Phys. 26, 391-423 (1929) (Chem. Abstr.,
Vol. 24, No. 5, 10/3/30, p. 1207.)) (8.514/12832 France.)

Knocking is not due to pre-ignition and is not a true detonation. It is a type
of vibrating burning. Anti-detonants have more effect on the propagation of com-
bustion waves. These substances increase rate of oxidation of liquid hydro-
carbons but decrease the rate for the vapour.

Knock Testing. (Nat. Pet. News, 15/1/30, p. 61 (Autom. Absts., VIII/2,
20/2/30, p. 43)) (8.514/12833 U.S.A.)

The knock rating of a fuel is obtained by comparing the compression ratio at
which it knocks distinctly with that at which normal heptane knocks, and the
result is given as the relative compression ratios of the standard fuel and the
fuel tested. An injection pump supplies the fuel, which is mixed with a metered
quantity of air before entering the engine, and this control of the mixture strength
improves the accuracy of the knock determination.

Synthetic Benzol Process. (Chem. & Met. Eng., Vol. 37, No. 3, March, 1930 p. 189. (8.516/12834 Germany.)

A process for the production of synthetic benzol from blast furnace gas using the water gas reaction according to the Fischer method has been put into operation near Brom.

Synthetic Motor Fuel from Methane. (Z.V.D.I., Vol. 74, No. 9, 1/3/30, p. 279.) (8.516/12835 Germany.)

At the coal research institution of Mulheim the processes for obtaining motor fuels from methane are at present being investigated by Dr. F. Fischer.

Methane of 93 per cent. purity, obtained from coke oven gas by extensive cooling, is heated to 1,000°C. at ordinary pressure. An aromatic fuel was obtained.

A silent electric discharge is passed through coke oven gas at a low pressure. Hydrogen and acetylene are formed and on heating to 700°C. in the presence of catalysts again yield aromatic fuels. On subsequent heating to 250°C. in the presence of iron/nickel catalysts aliphatic fuels of the petroleum type are produced.

Mixture Distribution. (Alex. Taub, S.A.E. Jrnl., Vol. XXVI., No. 4, April, 1930, pp. 454-470.) (8.54/12836 U.S.A.)

The distribution in an engine is estimated by the curves of consumption per b.h.p. per hour and m.e.p. plotted against total consumption. Various types of induction pipes are described. The air stream should be balanced by equalising the compression pressure of the various cylinders before any other correction is attempted. Precipitation of the fuel is the most difficult problem and is best dealt with by the proper placing of hot spots.

The Use of Electrofilters for Cleaning Gases. (R. Heinrich, Z.V.D.I., No. 7, 15/2/30, pp. 193-199.) (8.542/12837 Germany.)

Industrial gases may contain dust varying in amounts between 1 and 100 grammes per cu. metre. By passing the air through a tube with a wire stretched along the axis at a potential difference of 70,000 volts between the wire and the earthed tube the dust in the air is almost completely deposited on the tube. The electrical energy required is from .05 to .5 kilowatt hours per thousand cu. ft. of gas treated. The electro filter is adaptable to the removal of tars and oils from high temperature gases in generator gas plants.

Injection Lags in a Common-Rail Fuel Injection System. (A. M. Rothrock, N.A.C.A. Tech. Notes, No. 332, Feb., 1930.) (8.59/12838 U.S.A.)

The fuel, contained in a high pressure reservoir, enters the pipe line to the injection valve by a mechanically operated timing valve. The injection valve is spring loaded and opens under the fuel pressure. A very short time after the timing valve needle has lifted a by-pass valve of considerable area is mechanically opened. The pressure in the fuel-pipe line to the injection valve drops rapidly and the injection valve shuts. The lag between the opening of the timing valve and the start of the spray increased linearly with tube length, but was not affected by bore. The lag increased slightly with valve opening pressure and decreased materially with increase in injection pressure. The initial pressure in the injection valve tube before the opening of the timing valve did not affect the lag, providing the injection pressure was considerably in excess of the valve opening pressure.

Compression Ignition Oil Engines. (R. Schulz, Airc. Eng., Vol. 2, No. 13, March, 1930, p. 63.) (8.59/12839 Germany.)

A brief specification is given of the Junkers SL1. Photographs are given of the crankcase of the partly assembled engine and of the complete engine mounted on an aeroplane. Drawings exhibit the cycle of operations of an opposed piston pair in a common cylinder, and two types of drive, in one with both pistons acting on a common shaft (Marine practice), in the other the pistons working on separate shafts, the latter connected by gearing (aeronautical practice).

The blower pressure appears to be 0.20 atmospheres; the compression ratio 1 : 14; the maximum pressure 38 atmospheres; the power 600 to 700 h.p. at 1500 to 1700 revs.; dry weight 1.2 to 1.4 kg./h.p.; length 1.7 metres, height 1.6 metres, width .51 metres.

Junkers Heavy Oil Aero Engine. (Engineering, Vol. 129, No. 3352, 11/4/30, p. 471.) (8.59/12840 Germany.)

Technical details are given with six photographs, diagrams, an indicator diagram and a graphical calibration of the scavenging effect. The consumption is given at 170 gm. per h.p. at 1500 r.p.m., the output as 700 h.p. at 1600 r.p.m., and the weight per h.p. 1.2 kg.

Combustion Chambers, Injection Pumps, and Spray Valves. (J. E. Wild, S.A.E., Vol. 26, No. 5, May, 1930, p. 587.) (8.591/12841 U.S.A.)

A descriptive review is given with diagrams of numerous types of combustion-chamber, injection nozzles and injection pumps in use in various solid injection oil engines.

The High-Speed Oil Engine. (Am. Soc. Nav. E., 41, 394-430 (Eng. Absts. No. 42, Jan., 1930, p. 130.)) (8.591/12842 U.S.A.)

In a paper presented to the American Society of Automotive Engineers, 25 high-speed solid injection engines in operation at the moment are described. The weight ranges from slightly under 5lbs./h.p. in the case of the Attendu engine to nearly 60lbs./h.p. in the case of Diesel locomotives. With even moderate supercharge, 3 to 4lbs. per sq. in. thorough scavenging is ensured with improved performance for weight.

On the Possibility of Applying the Cathode-Ray Oscillograph to the Indicator for High-Speed Engines. (Juichi Obata and Yukio Munetomo, Report of the Aeron. Res. Inst., Tokyo, No. 57, Feb., 1930, Vol. 5, 4.) (8.632/12843 Japan.)

Author's Abstract. Investigations were made to employ the cathode-ray oscillograph in place of the usual Duddell oscillograph in the electrical indicator described in a previous paper. It is found that the Johnson type cathode-ray oscillograph may be employed with some modifications of the electrical arrangement; a special device being introduced to indicate the piston position. Photographic record of the indicator diagram can be obtained for those engines for which the point-to-point indicator such as the R.A.E. indicator gives satisfactory results.

Diesel Locomotive with Compressed Air Power Transmission. (J. Greiger, Z.V.D.I., Vol. 74, No. 12, 22/3/30, p. 366.) (8.84/12844 Germany.)

The highest efficiency was obtained with an air pressure of three atmospheres. In order to obtain this efficiency it was necessary to inject water during the compression stroke and to heat the delivered air by means of the exhaust of the Diesel engine. The article deals with an experimental plant from which data for the final design were obtained.

A Compact Aero Engine. (H. W. Earl, S.A.E., Vol. 26, No. 3, March, 1930, p. 341.) (8.89/12845 U.S.A.)

A descriptive account is given of the advantage of an inclined cam drive (Swash plate drive). Some progress appears to have been made in the development of four-stroke-cycle engine of this type with 18 cylinders (9 at each end) parallel to the shaft, mounted in a circular case $17\frac{1}{2}$ in. in diameter, $5\frac{1}{2}$ in. overall length. What appear to be photographs of parts are reproduced. The profile of the cam intersected by a co-axial cylinder and developed on a plane consists of two complete harmonic waves, so that the four-stroke-cycle is completed during a single revolution of the shaft.

Materials, Etc.

Tensile Properties of Steels at High Temperatures. (J. R. Freeman, Jr., and G. W. Quick, Bur. St. Jrnl., Vol. 4, No. 4, April, 1930, p. 549.) (10.11/12846 U.S.A.)

A number of steels, particularly medium manganese rail steel, manganese molybdenum rail steel, chrome molybdenum tyre steel, one per cent. carbon steel and cast steel, were tested systematically after various treatments, and the ultimate tensile strength is plotted against temperatures up to 800°C. The diagrams show the mechanical properties. A number of micro-photographs exhibit structure.

Chrome Molybdenum Steel. (S. L. Gabel and H. C. Knerr, Aviation, Vol. 28, No. 13, p. 632.) (10.12/12847 U.S.A.)

It is stated that the chrome molybdenum steel denoted by number 1430X has become practically the standard material for aircraft construction in U.S.A. Apparently contact of this steel with another mark, No. 1025, has led to corrosion troubles in construction and even in storage.

The materials can be cold-drawn in tubes with the thinnest walls used in aircraft practice, and can be bent cold, machined readily and welded with comparatively small loss of strength.

A number of workshop photographs are given.

The article is continued in Nos. 15 and 17. In the last instalment (page 847) inspection and storing and accessories are discussed, and photographs are given of several applications to construction.

Protective Properties of Electro-Plating. (Aut. Ind., Vol. 62, No. 16, 19/4/30, p. 624, Abstract of Paper by L. Davis and L. Wright, Research Dept. of Metropolitan Vickers Electric Co. Ltd., to the British Institute of Metals.) (10.15/12848 Great Britain.)

The presence in the atmosphere of both $S.O_4''$ and Cl' ions is considered. A description is given of the apparatus for bringing a finely divided corroding mist into contact with specimen strips of 3 in. × 1 in. × 16 in. sheet. Deposits of cadmium, zinc, nickel and chromium were formed on strips of steel, brass, phosphor-bronze and copper exposed for $9\frac{1}{2}$ hours each day for 14 days, excluding week-ends. Progressive photo-stages were photographed, corrosion products were examined and appropriate conclusions were drawn. The somewhat intricate results are tabulated both for the degree of protection and for the nature of the corrosion products.

Four Essentials to Success in Chromium Plating. (Chem. & Met. Eng., Vol. 37, No. 3, March, 1930, p. 147.) (10.15/12849 U.S.A.)

The four essentials for successful plating are (i) temperature of solution, (ii) current density, (iii) nature and condition of surface, (iv) composition of solution,

Of these (i), (ii) and (iv) can be taken care of by proper design of the plant. The nature and condition of the surface to be plated is most important and determines the exact procedure to be adopted.

Protection against Corrosion. (J. E. Sullivan, Aviation, Vol. 28, No. 5, 1/2/30, p. 201.) (10.15/12850 U.S.A.)

Working rules are given from U.S.A. naval aeronautical practice in protection against various types of corrosion, particularly as regards inaccessible details.

Some technical details are given.

Anti-Corrosion Invention for Metal Aircraft, German Patent No. 493065. (A. Rohrbach, Flugsport, Vol. 22, No. 9, 30/4/30, Patents Supplement, p. 82.) (10.15/12851 Germany.)

The inventor proposes to cover the inside of the metal structure with a thin film of paraffin or similar liquid which prevents corrosion, the liquid being sealed in a series of compartments. External corrosion is dealt with by protective paint.

Theory of Metallic Corrosion—Part III. (G. D. Bengough, J. M. Stuart, A. R. Lee, Proc. Roy. Soc., A.127/804, 1/4/30, pp.42-70.) (10.15/12852 Great Britain.)

The reproducibility of corrosion experiments is of vital importance; sources of error may be due to variation in test pieces, or variable environment; in particular, vibration was found to cause more rapid corrosion in the experiment of Part II by setting up convection of oxygen.

The somewhat pessimistic conclusions of Part I are now amended and with adequate control of environment, annealed zinc specimens gave reproducible results within ± 1 per cent.

The numerous reservations made by the authors suggest that the numerical results are mainly on an empirical basis, but the elucidation of the detailed processes of corrosion in special cases is an indispensable preliminary to attempting a physical-chemical theory.

The Atmospheric Corrosion of Iron. (W. S. Patterson, J. Soc. Chem. Indust., Vol. 49, No. 17, 25/4/30, p. 203T.) (10.15/12853 Great Britain.)

A certain amount of atmospheric pollution is necessary to initiate rusting of either iron or steel. The deposition of water on the metal surface, either through a high relative humidity or through the hygroscopic character of solid impurities deposited from the atmosphere, will suffice to establish local electrolytic corrosion, provided the metal surface is in some respect non-homogeneous.

The Effect of Sea-Water on Painted Surfaces. (Dr. Barenfanger, Z.V.D.I., Vol. 74, No. 12, 22/3/30, pp. 373-375.) (10.15/12854 Germany.)

Whilst many paints are known which afford protection of iron against sea-water corrosion, these coverings are all attacked by certain organisms which destroy the covering and enable the sea water to start rust. Attempts made to destroy these organisms by adding certain poisons to the paint have so far failed and it appears that lasting protection can only be obtained if cheap stainless steel should become available for the covering of hulls.

Welding in Aeroplane Structures. (R. Granjon, L'Aérotechnique, No. 132, May, 1930, pp. 169-173.) (10.18/12855 France.)

The author, as director of a trade research association laboratory, working in conjunction with the S.T.Ae., gives a precis of the methods tried and adopted, and a descriptive account of rules of procedure, precautions, materials, methods, training of operators, and tests.

A chrome molybdenum steel has been adopted, following U.S.A. practice.

The greater rapidity of building welded aeroplane frames, one week for two operators as compared with several weeks for other types, favours mass production in war; operators can be trained in a fortnight. Educational courses have been instituted and it is hoped that French constructors will speedily make up the start gained by their competitors. The firms producing acetylene and oxygen no doubt hope to extend their markets in this legitimate way.

Lithium. (Autom. Tech. Zeit., Vol. 33, No. 11, 20/4/30, p. 280.) (10.21/12856 Germany.)

In the Edison Accumulator, the electrical capacity is increased by the presence of Lithium. Since 1913 the price of Lithium has fallen with increasing demand from 2/6 per gramme to 1/- per gramme, roughly from the price of gold to that of silver.

Small additions of Lithium give the aluminium alloy Skleron its exceptional hardness, and also give hardness to lead alloy bearing metals.

Rolls-Royce Aluminium Alloy " Hiduminium." (Autom. Ind., Vol. 62, No. 18, 3/5/30, p. 697.) (10.2101/12857 U.S.A.)

The composition, casting and machining and working properties of the new alloy are given. It is used for light alloy castings in Rolls-Royce cars and aero engines. Aluminium forms over 80 per cent. by weight, the other constituents being Cu, Ni, Mg, Fe, Ti, and Si.

Aluminium Specification. (S.A.E., Vol. 26, No. 3, March, 1930, p. 379.) (10.2101/12858 U.S.A.)

Proposed revisions of specifications for aluminium alloys and for protective coatings are discussed, and a number of examples of specifications are given.

The remarkable results of Alclad protection are referred to.

Physical Properties and Methods of Test for some Sheet Non-Ferrous Metals. (J. R. Townsend, W. A. Straw and C. H. Davis, Bell Tele. Lab., Reprint B.447, Jan., 1930.) (10.211/12859 U.S.A.)

Author's Abstract: This paper continues an investigation undertaken to secure a simple and reliable method of test for sheet non-ferrous metals and the development of commercial test limits.

The Rockwell hardness and tensile strength limits are given for four alloys of brass, and two alloys each of nickel silver and phosphor bronze.

The Corrosion of Aluminium Alloys in Sea-Water. (H. Bauermeister, Z. Metallk., Vol. 22, No. 4, April, 1930, p. 119.) (10.27/12860 Germany.)

Cast aluminium alloys underwent considerable corrosion when in contact or in close proximity with brass or bronze. The alloy known as KS Seewasser under these conditions behaves fairly well. The best protection so far is a covering of pure aluminium sheet first produced in the U.S.A. as " alclad." German varieties are Duraplat and Allautal.

Effect of Artificial Ageing on Mechanical Properties of Timber. (Lyon, Fron, and Fournier, C.R., Vol. 189, No. 23, 2/12/29, pp. 992-995.) (10.32/12861 France.)

On exposing timber to the action of air containing small quantities of ozone it acquires within a month the chemical and micro-structural properties of seasoned timber. With certain precautions it is found that artificially aged wood · may be accepted for aeronautical construction.

Excess of ozonisation renders the fibre brittle, in resemblance to over-seasoned timber, *i.e.*, timber kept for twenty or thirty years in store.

Ageing of Rubber and its Retardation by the Surface Application of Anti-oxygens. (C. Moureu, C. Duffraisse, and P. Lotte, Ind. & Eng. Chem., Vol. 22, No. 5, 1/5/30, p. 549.) (10.52/12862 U.S.A.)

Three phenols were applied as anti-oxygens, in a 10 per cent. solution in ether and other solvents, to samples of rubber sheeting, which were subjected to heating for about 100 hours at 90°C. The degree of protection was measured by the tensile strength of treated and untreated samples before and after the heating process. In many cases the deterioration which normally accompanies the heating process can be almost completely prevented by suitable anti-oxygen application.

A bibliography and a list of patents are attached.

Durability Tests of Spar Varnishes. (C. L. Came, Bur. Stan. Jrnl. Res., Vol. 4, No. 2, Feb., 1930, p. 247.) (12863 U.S.A.)

Author's Summary: Fifty commercial spar varnishes, which had been tested for conformity to Federal specification No. 18b, were exposed to several accelerated weathering cycles and outdoors. Kauri reduction values were also determined. The varnish was applied both by whirling and brushing. Sand-blasted and non-sand-blasted panels were used.

The paper correlates the tests mentioned above and also gives the results of similar tests made on experiment varnishes, prepared in the laboratory from various oils and resins.

A short bibliography is given.

Electrolytic Deposits on Aluminium and its Alloys. (M. Ballay, C.R., Vol. 190, No. 5, 3/2/30, pp. 305-308.) (10.541/12864 France.)

The surface is either sand-blasted or strongly corroded by acid before the plating is attempted. Satisfactory results were obtained by using a hot solution of ferric chloride containing only a small quantity of hydrochloric acid, and the best of these with solutions containing between 6 and 22 grammes of iron per litre, the acid content varying from .1 to .7 moles. of hydrochloric acid per litre.

Effect of Turbulence in Wind Tunnel Measurements. (H. L. Dryden & A. M. Küethe, N.A.C.A. Report, No. 342, April, 1930.) (11.16/12866 U.S.A.)

The results obtained by Blasius for laminar flow and by Karman for turbulent flow are quoted.

A definition of turbulence in terms of the mean size and number of eddies is given.

The relations between resistance and Reynolds numbers are plotted under varying conditions for spheres and streamline bodies, and the variety of possible results is brought out.

The general conclusion is that standardisation of wind tunnels so as to give dynamical similitude is not practically possible, and that the degree of turbulence must always be taken into account and should, if possible, be stated numerically.

Testing Aeroplane Wing Ribs. (The Engineer, Vol. 149, No. 3871, 23/3/30, p. 321.) (11.22/12867 Great Britain.)

A description is given of a static wing-testing apparatus, constructed by Sir W. G. Armstrong Whitworth Aircraft Ltd., for testing wing ribs with any prescribed distribution of load. A photograph shows the method of operation.

Airships

The Metal-Clad Airship. (R. H. Upson, S.A.E., Vol. 26, No. 5, May, 1930, p. 567.) (12.12/12868 U.S.A.)

A somewhat discursive statement of the performance of the U.S. Navy Z.M.C.—2 is given, with figures of weights, etc., along with an optimistic forecast of the possibility of a 100-ton metal-clad airship.

Airship Progress and Problems. (G. Fulton, J. Am. Soc. Nav. E. 41-30-63 (Eng. Absts. No. 40, July, 1929, p. 169.)) (12.12/12869 U.S.A.)

The new airships of the American Navy will have a displacement of 6½ million cubic feet. The hull of each ship will contain a hangar capable of housing five aeroplanes. In order to conserve helium an exhaust water recovery plant is fitted. Oil engines are contemplated, working in conjunction with fuel gas. From previous experience the loss of helium by diffusion through the gas bags will be about 1½ refills per year.

Is German Airship Construction Developing on Right Lines? (Prof. O. Krell, Luftwacht, No. 1, Jan., 1930, p. 33.) (12.13/12870 Germany.)

The author states that commercial airship navigation would require speeds of the order of 100 m.p.h.; while methods of handling the ship on the ground would have to be much improved to render flying to schedule possible. The new airship L.Z.128, under construction in Germany, will have insufficient power to give a notably better performance than its predecessor. It would be more profitable to spend the money on systematic research into airship drag and construction. Unless increased performance is obtained without making the size unwieldy, the airship could have no commercial future.

L.Z.128 Helium Filling. (Luftwacht, No. 1, January, 1930, p. 41.) (12.62/12871 Germany.)

It is intended to supply the new Zeppelin airship, L.Z.128, now under construction, with helium. In order to save expense the upper parts of the lifting bag will contain hydrogen which can be blown off if necessary. In this way it is intended to conserve the expensive helium as much as possible, while retaining a considerable protection against fire risk, since the hydrogen is situated at a considerable distance from the engine. The engines are to be run with power gas as in L.Z.127.

Wireless, Etc.

Radio Facilities in Aircraft. (E. L. Nelson & F. M. Ryan, S.A.E., Vol. 26, No. 3, March, 1930, p. 326.) (13.1/12872 U.S.A.)

Specifications are given of two weather and beacon receiving radio sets, with photographs and diagrams of connections. Careful shielding and bonding are recommended. A graphical record of the strength of the signals received from a weather report station is given.

Accurate Testing of Audio Amplifier in Production. (A. E. Thiessen, Proc. Inst.
    Rad. Eng., Vol. 18, No. 2, February, 1930, pp. 231-242.) (13.2/12873
    U.S.A.)

The equipment is described, with photographs and diagrams of connections,
and instructions are given for rapid comparison of amplification within the band
of audio frequencies and of the undistorted power delivered, with calibrated
standards.

An elementary mathematical theory of the measurements is given.

Standardisation in the Radio Vacuum-Tube Field. (W. C. White, Proc. Inst.
    Rad. Eng., Vol. 18, No. 3, March, 1930, pp. 373-390.) (13.2/12874
    U.S.A.)

Author's Summary.—In vacuum-tube engineering the base dimensions, the
filament voltage, plate voltage, and grid-bias voltage are the features that require
standardisation to the greatest degree. The history and present status of
standardisation of these features are given. Only tube types commonly used
for broadcast reception and transmission are included.

Radio in Air Transport Operation. (H. Hoover, Jnr., S.A.E., Vol. 26, No.
    3, March, 1930, p. 321.) (13.2/12875 U.S.A.)

About forty stations are being provided at 200-mile intervals from New
York to San Francisco, and from Seattle to Key West, having a capacity of
2 kw. and a range of 125 to 250 miles, using International band 800 to 1200
metres. The system is used for broadcasting weather reports and for emitting
directional signals. Additional wave lengths between 25 and 400 metres are
assigned for aeronautics, and short wave apparatus is generally used.

The serious disadvantage of silent zones in short wave signalling is
mentioned. Much attention is given to the fact of shielding being continuous
in a grounded metallic shield.

Power Output Characteristics of the Pentode. (Stuart Ballantine & H. L. Cobb,
    Proc. Inst. Rad. Eng., Vol. 18, No. 3, March, 1930, p. 450.) (13.2/
    12876 U.S.A.)

From Author's Summary.—The type of pentode considered in this paper
comprises a cathode, a control grid, a screen grid, a grid connected to the
cathode to prevent the flow of secondary-electron current from the plate, and
a plate. Experimental measurements on a specimen low-power pentode are given
and an improved and simplified technique is described. The power sensitivity
of the pentode is measured and compared to that of a triode under conditions
of equal optimum undistorted output. The pentode was found to be the more
sensitive and equivalent to the triode preceded by a stage of amplification giving
a gain of 3.3.

The Output of Power Obtained from Vacuum Tubes of Different Types. (H .A.
    Pidgeon & J. O. McNally, Bell Tele. Lab., Reprint No. B.462, March,
    1930.) (13.2/12877 U.S.A.)

Author's Abstract.—In the case of three-electrode tubes it is possible from
theoretical considerations to compute, approximately, the electrical parameters
a tube must have in order to give the maximum output power of a given quality
obtainable under fixed operating conditions.

The electrical characteristics and output of fundamental, second and third
harmonics of two of the more common telephone repeater tubes are given.

Since no sufficiently exact theoretical analysis of multi-grid tubes is yet
available to permit the determination of the parameters of optimum tubes, a
comparative experimental investigation of a number of such structures has been
undertaken.

The power output of multi-grid tubes and of three element tubes is compared. The reasons for the comparatively large power output of certain types of multi-grid tubes are discussed.

Trans-Continental Air Transport Radio Set. (G. E. Everett, Aviation, Vol. 28, No. 15, 12/4/30, p. 753.) (13.2/12878 U.S.A.)

A descriptive account is given with photographs and technical details of the drastic simplification and lightening applied to radio sets in use in order to meet certain requirements. Weight was reduced from 165lbs. to 85lbs. The detachable connections were concentrated in a five point block, and it is stated that an inexpert rigger can remove one set and instal a new one in a few minutes.

Six cases of burning-out having occurred with the old sets all the circuits are now protected by fuses.

New Piezo Oscillations with Quartz Cylinders cut along the Optical Axis. (A. Hund & R. B. Wright, Bur. Stds. J. Res., Vol. 4, No. 3, March, 1930, p. 383.) (13.21/12879 U.S.A.)

Three possible modes of elastic vibrations exist, depending on the linear modulus of elasticity, the torsional modulus, and for transverse vibrations on both moduli.

In experimenting with a quartz cylinder cut along the optical axis various combinations of electrodes were used in conjunction with regenerative circuits brought nearly to self-oscillation. The resulting oscillations of the quartz crystal were studied by means of glow patterns, and the observed frequencies were compared with calculated values. From the general agreement the authors conclude that all oscillations are true piezo-electric effects and that torsional oscillations predominate.

In a footnote it is claimed that this is the first successful attempt to produce torsional vibrations along the optical axis.

Free Periods of Resonators. (E. J. Irons, Phil. Mag., Vol. 9, No. 57, March, 1930, pp. 346-360.) (13.21/12880 Great Britain.)

The electrical acoustic analogy is applied to the statement and solution of problems in resonators. The method will find applications to the measurement of sound intensity.

Quartz Control for Frequency Stabilisation. (Handel, Kruger & Plendl, D.V.L. Proc. Inst. Rad. Eng., Vol. 18, No. 2, February, 1930, pp. 307-320.) (13.21/12881 Germany.)

In sending from aircraft, quartz controlled transmitters were designed requiring only 2 watts for continuous communication up to 800 km. In receiving, noise vibration and magneto interference occurred. The most serious cause of trouble was mechanical vibration, to eliminate which it was necessary to stabilise the frequency of the receiver.

Several quartz control arrangements were investigated without success on account of change of quartz frequency with temperature and sensitivity to vibration. A successful arrangement was devised by which a strongly damped short wave (50m.) reception audion was controlled by coupling a separate quartz controlled Heterodyne with light loading and small temperature effect, while a long wave audion was coupled and tuned to the intermediate wave lengths thus produced (2,000m.). Several low frequency amplifying stages were connected in series with the tube. Perfect purity and constant frequency were maintained under intense mechanical and acoustic vibration.

The Radio-Beacon at Bobigny. (M. Cleriot, L'Aéronautique, No. 132, May, 1930, p. 174-181, No. 133, June, 1930, pp. 221-226.) (13.4/12882 U.S.A.) (See Abstracts Nos. 12883 and 12884).

The French authorities are following U.S.A. practice in introducing short wave signals of equal intensity from two frame antennæ crossed in a vertical plane giving bisector planes of equal intensity for the sounds received. A refinement is obtained by synchronising the beacons to give different alternate morse signals but overlapping so as to form a continuous uniform sound, *e.g.*, with the letters L and F overlapping so that the signal is continuous. To one side of the course the letter L emerges, to the other side the letter F. The effects of distance, azimuth angle, and angle between frame-settings on the intensity of reception is discussed in elementary mathematical form. The stability of the directional plane is affected by variable wave lengths in the two sending circuits, but may be mitigated by suitable adjustment of the receiver.

Visual Double-Modulation Type Radio Range, Application to Airways. (H. Diamond, Bur. Stan. Jrnl. Res. Vol. 4, No. 2, February, 1930, p. 265.) (See abstracts Nos. 12882 and 12884.) (13.4/12883 U.S.A.)

Author's Summary.—This paper deals with methods for aligning the courses of the visual radio range with fixed airways. It has previously been shown that the courses of the aural radio range may be shifted by the use of a vertical wire antenna in conjunction with the transmitting loop antennæ or by varying the relative power in the two antennæ. These methods are, in part, applicable to the visual system. In the aural system the goniometer primaries are excited alternately. This permits independent consideration of the field patterns due to the primaries. In the visual system this is not the case, as both goniometer primaries are excited all the time. Two cases present themselves, the condition when the currents in the primaries are in time phase and the condition when they are in quadrature time phase. The former condition results in two beacon courses which are 180° apart and cannot be shifted from this relationship. The latter condition yields four beacon courses. A mathematical analysis is made of this case, and the amounts of angular variation possible using several methods of attack are tabulated.

A method of obtaining small amounts of shift by an adjustment of the receiving equipment aboard the airplanes is also described; one of the reeds is shunted by a suitable resistance in order that the reeds will vibrate equally when on one side of the equisignal zone. This method permits of great flexibility in securing a desired course and is suitable only for employment with the visual system. Sample calculations are made for actual airway routes to demonstrate the several methods of attack.

Development of the Visual Type Airway Radio-Beacon System. (J. H. Dellinger, H. Diamond & F. W. Dunmore, Bur. Stan. J. Res. Vol. 4, No. 3, March, 1930, p. 425.) (See abstracts Nos. 12882 & 12883.) (13.4/12884 U.S.A.)

Author's Summary.—A directive transmitter is employed on the ground, making possible the use of simple apparatus on board the aeroplane. A simple receiving set suffices to make use of all the radio aids provided. Visual indication is provided on the aeroplane instrument board by means of a tuned-reed instrument. The pilot observes the vibration of two reeds. On the course the vibration amplitudes are equal. Off the course they are unequal, the reed vibrating with the greater amplitude being on the side to which the aeroplane has deviated.

Two types of beacon transmitters are described, the double modulation and the triple modulation. The former is capable of serving either two courses at 180° with each other or four courses at arbitrary angles. The latter serves 12

courses at any desired angles and is adapted for use at any airport located at the junction of a large number of airways.

Descriptions are given of the receiving set and receiving antenna system developed. Aeroplane engine ignition shielding is also discussed.

Special adaptations of the beacon system are being developed to facilitate landing in fog.

A Tuned-Reed Course Indicator. (F. W. Dunmore, Bur. St. Jrnl., Vol. 4, No. 4, April, 1930, p. 461.) (13.4/12885 U.S.A.)

A purely mechanical combination of three single reed indicators gives an instrument in which the combinations of maximum and minimum vibrations of the three reeds indicates 12 courses at 30° intervals. Details of the instruments and of the method of application are given.

Loth Navigation System. (R. J. de Marolles, Airc. Eng., Vol. 2, No. 15, May, 1930, p. 107.) (13.4/12886 Great Britain.)

A descriptive account is given of a method of holding course by the synchronisation of wireless beam messages from two rotating beacons. When the course is held reception is simultaneous. Departure right or left is marked by lag or lead of one signal on the other.

Graphs to Prof. Sommerfeld's Attenuation Formula for Radio Waves. (Bruno Rolf, Proc. Inst. Rad. Eng., Vol. 18, No. 3, March, 1930, p. 391.) (13.5/12887 U.S.A.)

Author's Summary.—A short summary is given of Prof. Sommerfeld's conclusions, with approximate expressions for the " numerical distance " and the angle determining various shapes of theoretical attenuation curves. At very great distances, the signals over flat ground are shown always to decrease as the inverse square of distance, while at short distances short waves die away approximately as the inverse square root of distance.

A New Transformation of A.C. Circuits with Application to Theory of Audition. (B. v. Jer. Pol., Proc. Inst. Rad. Eng., Vol. 18, No. 2, February, 1930, pp. 221-230.) (13.5/6.261/12888 U.S.A.)

On multiplying each term of a complex impedance by j j^2 and j^3 ($j^2 = -1$ in Steinmetz' notation) new circuits are obtained possibly involving negative resistances. Applying these to an impedance in series with a resistance and capacity in parallel, the new circuit exhibits a negative resistance in series with a resistance and inductance in parallel. The modified impedance is independent of the frequency, but the phase is not. A circuit obtained by this method was applied to throw out of phase the high and low pitch components of ordinary speech. An oscillogram showed phase differences, but the ear failed to note any deformation, in accordance with Ohm's acoustical law that only amplitude and not phase is sensible to the ear.

Wave Propagation over Continuously Loaded Fine Wires. (M. K. Zinn, Bell Tele. Lab., B.459, February, 1930.) (13.5/12889 U.S.A.)

Author's Summary.—This paper contains the results of a theoretical investigation of wave propagation along a pair of wires that are " loaded " by enclosing each wire in a continuous sheath of magnetic material. The results of greatest practical interest are certain approximate formulæ that are sufficiently simple to be adapted to engineering design studies, while having a high degree of precision for all practical dimensions and frequencies.

A Method of Measuring the Overall Performance of Radio Receivers. (H. A. Thomas, J.I.E.E., Vol. 68, No. 400, April, 1930, p. 475.) (13.5/12890 Great Britain.)

Author's Abstract.—This paper describes researches which have been carried out at the National Physical Laboratory for the Radio Research Board. An improved method of measuring the amplification of a radio receiver is described, together with the manner in which this method can be applied to practical cases, particularly at short wave-lengths. The apparatus covers a wave-length range of from 15 to 30,000 metres, and is capable of dealing with inputs of from 0.25 to 1,000 mV. over this range. After describing in detail the construction and operation of the apparatus the results of tests on four receivers of widely different types are given, and some general deductions are obtained from the properties of these receivers. In conclusion suggestions are made for a possible means of classifying receivers for different purposes.

Study of Noise in Vacuum Tubes and Attached Circuits. (F. B. Llewellyn, Bell Tele. Lab. Reprint B.461, March, 1930.) (13.5/12891 U.S.A.)

Author's Abstract.—The noises originating in vacuum tubes and the attached circuits are investigated theoretically and experimentally under three headings : (1) shot effect with space charge, (2) thermal agitation of electricity in conductors, (3) noise from ions and secondary electrons produced within the tube.

Multiple Signals in Short Wave Transmission. (T. L. Eckersley, Proc. Inst. Rad. Eng., Vol. 18, No. 1, January, 1930, pp. 106-122.) (13.7/12892 U.S.A.)

Transmissions from England to America are analysed on the basis of repeated reflection from the Heaviside layer and the production of multiple paths.

The minimum possible wave-length increases from 8.6 m. to 20 m. as ionic density decreases from sunset to sunrise ; the attenuation decreases.

Transmission Characteristics of a Short Wave Telephone Circuit. (R. K. Potter, Proc. Inst. Rad. Eng., Vol. 18, No. 4, April, 1930, p. 581.) (13.7/12893 U.S.A.)

Author's Summary.—A method of observing and recording the audio-frequency transmission characteristics of a short wave radio-telephone channel is described. They appear to be the result of wave interference between signals arriving at the receiver over paths of different group or electrical length, possibly combined with the distortion produced by a progressive change in the angle of rotation of the polarisation plane with frequency over the signal band. The persistence of certain pattern shapes during the observation periods and the changes in these shapes from hour to hour suggest that they are the results of progressive rather than erratic disturbances in the transmission medium. Synthetic patterns used in the analysis of the characteristics are explained and illustrated. Types of audio-frequency distortion resulting from selective fading are discussed. The effect of frequency or phase modulation in producing distortion on such a circuit is considered.

Photoactivity of Selenium and Various other Substances. (G. P. Barnard, Television, Vol. 3, No. 25, March, 1930, p. 30.) (13.8/12894 Great Britain).

A summary of the present position is given, and diagrams are exhibited showing the relation between illumination and conductance. Eleven types of cell are considered. A list of 17 references is added.

Television in Germany. (Brig.-Gen. The Hon. A. V. F. V. Russell, Television, Vol. 3, No. 25, March, 1930, p. 10.) (13.8/12895 Great Britain.)

A brief statement is given of the position in Germany. There is an experimental station with a range of 100 km. on 418 metre wave-length; a German Television Society, with several well known technical authorities on the committee and a monthly journal (*Fernsehen*); a combine Company (*Fernseh A.G.*) including the Baird International Television Company, Loewe Radio Company, the Robert Bosch A. G., and the Zeiss-Ikon A.G. The laboratories and offices are housed in the Goerz Works near Berlin.

Television in Colours by a New Scanning Method. (H. E. Ives & A. L. Johnsrud, Bell Tele. ab. B.448, February, 1930.) (13.8/12896 U.S.A.)

Coloured television requires a coloured light source capable of following the variations of the signal current at high speed. A description is given of the apparatus available, of the general arrangements required for sending and receiving coloured television records, and of experiments carried out.

The apparatus required is much more complicated and costly than for monochromatic transmission.

Progress in Television in Germany. (Prof. F. Noack, Z.V.D.I., Vol. 73, No. 48, 30/11/29, pp. 1703-1705.) (13.8/12897 Germany.)

Television apparatus is manufactured in Germany at the moment by three firms, viz., Telefunken, Telehör and the German Television Society. Telefunken uses the process of Carollas, Telehör that of Minaly, and the German Television Society is working in conjunction with Baird. The three processes are described. Telefunken only attempted to transmit pictures of objects which can be placed in a dark room in close proximity to the sending apparatus. The other two methods attempt transmission of objects in daylight. All three processes are handicapped by the few impulses which can be transmitted per second without interfering with existing broadcasting stations. In this connection Telefunken are working at the moment on the utilisation of short waves, since they enable a higher frequency modulation to be employed.

Photography

Aerial Photography. (R. F. Whitehead, Aviation, Vol. 28, No. 21, 24/5/30, p. 1024.) (14.1/12898 U.S.A.)

A second descriptive article on the Alaska mapping expedition. 13,000 square miles were mapped in 1929. The mapping altitude selected is 10,900 feet. Some account is given of the photographic equipment and technique, and of the methods of reduction.

Survey Stereoscopes. (C. F. Smith, B. J. Photy., Vol. 77, No. 3651, 25/4/30, p. 240.) (14.1/12899 Great Britain.)

The advantages of stereoscopic observation of two prints of the same region, taken from different points during an aeroplane flight are made clear from the point of view of rapid estimation of contours of equal level.

All the usual precautions as to uniformity of height, direction, vertical orientation, etc., must be taken.

Photographic Self Timers. (K. N. Mathur & T. K. Lahiri, University of the Punjab, J. of Sc. Inst., Vol. 7, No. 4, April, 1930, p. 122.) (14.2/12900 India.) -

Author's Abstract.—The performance of photographic self-timers has been investigated by means of a vibration galvanometer worked by an electric tuning-

fork. It has been found that the self-timers are quite reliable instruments in that exposures can be repeated with good accuracy, but no reliance whatsoever can be put on the readings indicated on the dial, which may be very much in error.

Miscellaneous

Searchlights and Sound Locators, Part I.   (R. E. Gillmor & P. R. Bassett, Army Ordnance, Vol. 10, No. 59, March-April, 1930, p. 311.)   (15.11/12901 U.S.A.)

Do. Part II., No. 60, May-June, p. 418.

Part I.—A description is given of the co-operation of sound ranging apparatus and A-A/c guns. The first article discusses principally the range of searchlights. A 150-ampere high-intensity arc will give 800 million c.p. on a mirror diameter of 60 inches, which is considered feasible for a mobile unit.

Part II.—Further details are given of the technical equipment, including anti-aircraft wireless. A distant electrical control is described.

Structure and Properties of Parachute Cloths.   (H. J. McNicholas & A. F. Hedrick, N.A.C.A. Tech. Note No. 335, March, 1930.)   (16.11/12902 U.S.A.)

Author's Summary.—The requisite properties of a parachute cloth are discussed and the methods for measuring these properties described. In addition to the structural analysis of the cloths, the properties measured are weight, breaking strength, tear resistance, elasticity, and air permeability. Based on a comparative study of all the cloths, specifications are drawn for the manufacture of silk parachute cloths, using either the plain or the mock leno weave.

Prevention of Fires on Motor Boats.   (H. E. Nevell, S.A.E., Vol. 26, No. 5, May, 1930, p. 618.)   (16.12/12903 U.S.A.)

The author presumably presents the views of United States underwriters, and his recommendations and the discussion are of corresponding interest.

The Effect of Lightning on an Aeroplane.   (E. Burton, Aviation, Vol. 28, No. 4, 25/1/30, p. 149.)   (16.22/12904 U.S.A.)

A descriptive account is given of tests carried out with a 3,000,000 volt discharge passing through a model monoplane of metal frame. The momentary current amounted to several hundred thousand amperes. The points under consideration are shock to passengers, damages to the ignition system, and the effect of hot ionised exhaust gases in forming the conducting path, fire hazards and fusing of metal joints. No conclusions are given. Reference is made to cases on record of Zeppelins having been struck by lightning, in only two of which has the hydrogen ignited. The bonded metal frame is considered to act as a Faraday Cage absorbing and dissipating the charge. Photographs of the terminals and of a spark passing through the model are given.

The Autogyro: Its Characteristics and Accomplishments.   (Harold F. Pitcairn, J. Franklin Inst., Vol. 209, No. 5, May, 1930, p. 571.)   (17.3/12905 U.S.A.)

A descriptive account is given with eight photographs, some of which are new, of the autogyro. The maximum speed is given as 105 m.p.h., with definite expectations of 120 m.p.h. when fitted with a 225 h.p. engine.

Flying from the " Lexington " and " Saratoga." (Lt. L. D. Webb, U.S.N.,
 U.S. Air Services, Vol. 15, No. 5, May, 1930, p. 35.) (18.12/12906
 U.S.A.)

A descriptive account is given of the routine on these ships during combined
operations. There are three photographs showing the " Lexington " at full
speed, with part of the deck covered with seaplanes with folded-back wings, and
a biplane leaving the deck.

Breathing at High Altitudes. (R. Kaisar, L.F.F., Vol. 6, No. 2, 25/1/30.)
 (19.11/12907 Germany.)

Experiments were carried out on selected persons, under reduced total pressure
and under reduced partial pressure of oxygen only, the total pressure remaining
atmospheric. The quantity of air per breath and the number of breaths per
second were noted, the exhaust air was analysed, blood tests were taken, the
general physical condition was recorded and the experiments were co-related
with flight tests. Reduction of the partial pressure of oxygen has in general a
less deleterious action in its immediate effects than reduction of the total
pressure. The after-effects of reduced partial oxygen pressure at ground level
were much more severe than those observed in the altitude chamber, but in most
cases they could be almost entirely eliminated by a short period under high
pressure. Additions of small quantities of carbon dioxide materially reduced the
oxygen requirement at altitude.

Various types of apparatus for the supply of oxygen were tested.

Studies in the Physiology of Flying. (H. Strughold, Z.F.M., Vol. 21, Part 9,
 14/5/30, pp. 226-228.) (19.2/12908 Germany.)

Investigations were made on the accuracy of movements of the limbs with
reduced pressure and diminution of oxygen.

There was little effect with partial oxygen pressure 70 normal; thereafter
control and accuracy of movement fell off rapidly.

The quantitative methods are described and the results are exhibited graphi-
cally.

Physical Standards for Pilots. (L. H. Bauer, M.D., & H. J. Cooper, M.D.,
 Aviation, Vol. 28, No. 11, 15/3/30, p. 520.) (19.2/12909 U.S.A.)

A brief descriptive account of the methods applied in assessing physical fit-
ness for pilots. Examples are quoted of accidents arising from pilots having
flown in defiance of medical advice. A mean between laxity and undue severity
is essayed.

The Air Port Problem in New York City. (J. C. Holme, Aviation, Vol. 28,
 No. 4, 25/1/30/, p. 157.) (20.0/12910 U.S.A.)

An account is given of some of the thirty air ports constructed in and near
New York. Two air photographs are given, with the location of landing
grounds marked. The problems of co-ordination, equipment and control are
discussed.

The " Kangaroo " Device for Picking Up and Dropping Loads in Flight. (III.
 Flug., Vol. 2, No. 12, December, 1929, pp. 241-242.) (20.41/12911
 Germany.)

Weights of the order of 10 lbs. were successfully dropped and picked up.
Places without an aerodrome can thus be linked up postally at little expense.

(Abstractor's Note.—The above apparatus is sometimes known as the
the Angumunde apparatus.)

High Voltage Research.   (Electrician, Vol. 104, No. 2701, March, 1930, p. 295.)
(21.0/12912 Great Britain.)

A description is given of the Metropolitan-Vickers Laboratory at Trafford Park, with remarks by Sir Ernest Rutherford on the direction of research on the subject of the Dessauer circuit.   Two 500 kVA 50-cycle transformers give 500,000 volts. to earth, 1,000,000 across terminals.

Photographs of laboratory apparatus and of flash-over sparks at high voltages are given.

Far East Airways.   (Lt. T. D. White, U.S. Air Services Mag., Vol. 15, No. 3, March, 1930, p. 32.)   (O.R./12913 U.S.A.)

Brief notes compiled at the American Legation at Peking are given of developments by eight nationalities in the Far East.

Aeronautics in Latin America.   (B. V. York, U.S. Air Services Mag., Vol. 15, No. 3, March, 1930, p. 30.)   (O.R./12914 U.S.A.)

A summary of information compiled by the Department of Commerce is given, with some statistics and a chart of air services in operation.

Aviation Credit Corporation.   (L. Mitchell, Aviation, Vol. 28, No. 4, 25/1/30, p. 162.)   (O.R./12915 U.S.A.)

This article describes the Company's policies and methods of financing construction.

N.A.C.A. Budget.   (Aviation, Vol. 28, No. 27, 15/2/30, p. 349.)   (O.R./ 12916 U.S.A.)

A summary is given of the estimates for 1931, showing an increase of $29,000, bringing the total to $1,320,000.

A summary of new buildings and equipment is given, and includes a new seaplane channel (tank) 2,000 feet long, for research on hulls and floats.   The full size wind tunnel is approaching completion.

A list of members of the Committees is included.