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AIRCRAFT DESIGN

Standardisation of Small Engine Parts. (Aviation, Vol. XXVII, No. 21, 23/11/29, pp. 1016-1017.) (5.121/11601 U.S.A.)
An American view of the advantages and disadvantages of standardisation of small engine parts.

Dornier—Do. X. (Ill. Flug., Vol. XI, No. 8/9, 1929, p. 175.) (5.14/11602 Germany.)
A descriptive account with five photographs and some constructional data.

Effect of Axial Restraint on the Stress in a Rotating Disc. (W. G. Green, Phil. Mag., Vol. VIII, No. 54, Dec., 1929, pp. 993-1018.) (5.2/11603 Great Britain.)
The shaft prevents axial strains of the disc. The stresses and strains are worked out and superposed upon the stress strain system due to rotation. The application gives rise to expressions in Bessel functions, a number of which are computed and tabulated.

Stresses in Ties and Struts under End Constraint. (W. H. Brooks, Phil. Mag., Vol. VIII, No. 53, Dec., 1929, p. 943.) (5.2/11604 Great Britain.)
Differential equations are formed and solved in elementary functions, and useful charts are drawn for rapid determination.

Bending and Torsional Oscillations of a Cantilever Wing. (G. Delangue, La Tech. Aero., Vol. XX, No. 95, 15/9/29, pp. 173-185.) (5.213/11605 France.)
The author develops the usual theory of small vibrations, defines the elastic axis, etc., and writes down the linear differential with constant coefficients and the resulting criteria for stability.

Coupled Bending Torsion and Aileron Oscillations of Cantilever and Semi-Cantilever Wings. (129th Report of D.V.L., H. Blenk and F. Liebers, L.F.F., Vol. IV, No. 3, 10th July, 1929, pp. 69-93.) (5.214/11606 Germany.)
A list of about 100 symbols is given.
In the pursuit of lightness, structures have been evolved which may have met all steady forces but which have not supported the dynamic forces due to

forced elastic oscillations. The investigation of the latter becomes necessary. Of numerous possible oscillations those of the wings are the most dangerous.

The principal extension of previous work consists in taking into account the mass of the wings which raises the (still drastically simplified) differential equation from third to fourth degree. The spar of variable section is replaced by a spar of constant section but the same fundamental period.

1. The mass of the aeroplane is taken as large compared with the mass of the wings, but the latter enters with the differential equation raising it from third to fourth degree.

2. The bending of the wing is treated as a simple oscillation about an axis selected so that the natural period and damping are unaltered.

3. The torsion angle is taken as a simple sine function of the length along the " elastic axis."

4. The " elastic axis " is parallel to the leading and trailing edges in a rectangular wing.

5. The " axis of inertia " is also taken as parallel to leading and trailing edges of a rectangular wing.

These conditions are equivalent to replacing the wing by an ideal wing which is equivalent in span, chord, section mass, inertia axis, elastic axis, moments of inertia, about the two latter, and natural periods and damping for both bending and torsion. The air forces and moments and their partial differential coefficients with respect to incidence are determined by experiment and calculation. The differential equations of the oscillations are formed and solved for small oscillations in the usual manner, and the conditions for stability are obtained by Routh's method of which a summary is given in an appendix.

Rigidity and Flexibility of Airplane Structures. (Air Corps Information Circular, No. 642, 1/10/29.) (5.26/11607 U.S.A.)

It is remarked that there appears to be a feeling among engineers that rigidity predictions are difficult and inaccurate. A little study of the problem will show, however, that these predictions are practically as easily carried out as are the strength predictions, and the rigidity predictions are more accurate than are those of the strength. They are more accurate because rigidity involves stresses below the elastic limit, while strength involves the modulus of rupture, a very uncertain quantity. The rigidity predictions may, in most cases, be based directly on the results of the strength calculations.

Useful formulæ are supplied for calculation of strain energy in different types of member.

Aerodynamic Characteristics of Twenty-Four Airfoils at High Speeds. (L. J. Briggs and H. L. Dryden, N.A.C.A. Report, No. 319, Oct., 1929.) (5.31/11608 U.S.A.)

The aerodynamic characteristics of 24 airfoils are given for speeds of 0.5, 0.65, 0.8, 0.95 and 1.08 times the speed of sound, as measured in an open-jet airstream two inches in diameter, using models of 1-inch chord. One section used in the Reed metal propeller was included.

In general the polar curve deteriorates rapidly from half the speed of sound up to and beyond the speed of sound.

Wind Tunnel Tests on a Series of Wing Models through a Large Angle of Attack Range. (M. Knight and C. J. Wentzinger, N.A.C.A. Rep., No. 317, 49 pp.) (5.31/11609 U.S.A.)

Author's Summary: This investigation covers force tests through a large range of angle of attack on a series of monoplane and biplane wing models. The tests were conducted in the atmospheric wind tunnel of the National Advisory

Committee for Aeronautics. The models were arranged in such a manner as to make possible a determination of the effects of variations in tip shape, aspect ratio, flap setting, stagger, gap, decalage, sweep back and airfoil profile. The arrangements represented most of the types of wing systems in use on modern airplanes.

The effect of each variable is illustrated by means of groups of curves. In addition, there are included approximate autorotational characteristics in the form of calculated ranges of " rotary instability."

Wind Tunnel Tests on Aerofoil Boundary Layer Control, Using a Backward Opening Slot. (M. Knight and M. J. Bamber, N.A.C.A. Tech. Note No. 323, Oct., 1929.) (5.313/11609a U.S.A.)

Author's Summary: Various slot locations, widths of opening and pressures were used. The greatest increase in maximum lift was 96 per cent., the greatest decrease in minimum drag was 27 per cent., and the greatest increase in the ratio (maximum lift coefficient)/(minimum drag coefficient) was 151 per cent.

C_{DS}, a hypothetical drag coefficient, when used in the equation $p = \frac{1}{2} o S V^3 C_{DS}$, gives the power required to maintain the air flow through the slot to or from the inside of the airfoil. This power does not include the losses in the blower or connecting air ducts, since these losses will vary with different duct blower installations. For a particular installation the duct blower losses must, of course, be included in C_{DS} or accounted for in some other suitable way in calculating the over-all wing efficiency.

Wind Tunnel Tests on an Airfoil Equipped with a Split Flap and a Slot. (M. J. Bamber, N.A.C.A. Tech. Notes, No. 324, Oct., 1929.) (5.313/11610 U.S.A.)

Author's Summary: The aerodynamic characteristics of an airfoil with a gauze-covered suction slot near the leading edge, connected by an air passage to a split flap at the trailing edge.

As long as the air flow was in through the slot, the lift was increased with practically no change in drag, but when the flow was reversed there was a considerable decrease in lift and increase in drag. As this reversal of flow took place at about two-thirds of the maximum lift coefficient of the airfoil without the slot, the maximum lift coefficient with the slot was considerably decreased.

Wind Tunnel Pressure Distribution Tests on an Airfoil with Trailing Edge Flap. (C. J. Wenzinger and O. Loeser, Jr., N.A.C.A. Tech. Note, No. 326, Oct., 1929.) (5.313/11611 U.S.A.)

Extract: The isometric pressure diagrams appended are of particular interest because they show the manner in which the air loads along the chord of the airfoil change with flap displacement and with angle of attack. The peaks of the loads occur at the leading edge as in the case of a plain airfoil but, in general, greater loads act near the trailing edge as a result of the flap displacement. These latter loads also reverse their direction of application, depending upon whether the flap is displaced upwards or downwards from the neutral position. The curves of normal force, centre of pressure and hinge moment coefficients are included as characteristics of the particular airfoil and flap combination.

Conclusions: 1. Maximum chord loadings are obtained at large angles of attack and with the flap displaced in the downward direction.

2. In general, upward movement of the flap produces greater changes in the C_{NF} and in the C.P. travel than downward movement of the same magnitude. Greater hinge moments, however, are obtained with the flap displaced downward.

Flow of Water in Convergent and Divergent Channels. (I. Nikuradse, Z.V.D.I., Vol. LXXIII, No. 40, 5/10/29, p. 1423-1424, précis No. 289 of D.V.L. Research Papers.) (5.32/11612 Germany.)

Substantially two-dimensional flow between inclined planes was investigated with the object of determining the wedge angle at which branching of the stream at the walls took place, and the mean characteristics when turbulent motion set in. A sectional drawing of the variable angle channel is given. A diagram exhibits the seventh powers of the mean velocity over the field as a fair approximation to straight lines, as required by the well-known empirical formula. Other diagrams give the mean velocity distribution, the interchange of momentum by convection, between strata, and the mean convection path, as defined in Prandtl's treatment of turbulent resistance.

Stability of Flow of a Viscous Liquid. (J. Pérés, C.R., Vol. CLXXXIX, No. 22, 25/11/29, pp. 898-900.) (5.32/11613 France.)

The author considers the integral of the square of the vorticity over a surface in two-dimensional problems and shows that the maximum vorticity in the plane cannot increase. Similar results appear to have been applied to the theory of turbulent motion by W. Ekman (Arkiv för Mat. Astr. och. Fysik. 6, XII, 1910).

Tides in Oceans on a Rotating Globe, Part III. (G. R. Goldsbrough and D. C. Colborne, Proc. Roy. Soc., Vol. CXXVI, No. A.800, December, 1929, p. 1.) (5.32/11614 Great Britain.)

Author's Abstract: In Part I of this series of papers a method was described by which solutions of the general dynamical equations of the tides could be obtained which were appropriate to an ocean on a rotating globe bounded by vertical cliffs along two meridians of longitude. The method was applied in that paper to a specially chosen ocean which had a law of depth that introduced a simplification into the calculations. The present paper gives the results for an ocean bounded by two meridians 60° apart, and having a uniform depth of 12,700 feet. Such an ocean would fairly represent the Atlantic Ocean if it were completely land-locked instead of being quite open to the Southern Ocean at one end and partially open at the other. The solution is worked out in spherical harmonics. The results are computed. A diagram shows lines of equal phase and four nodal points in each half sector.

A New Criterion of Cavitation. (Cmdr. J. M. Irish, J. Am. Soc. Nav. Eng., Vol. XLI, No. 4, pp. 597-607.) (5.32/11615 U.S.A.)

By plotting shaft h.p. and tip speed on a chart the possibility of cavitation is determined from certain rules.

Resistance of Fish (Theorie du Poisson). (A. Magnan and A. Sainte-Laguc, Bull. Tech. des S.T.Ae., No. 58, May, 1929, p. 186—see also issue No. 10—10925.) (5.32/11616 France.)

An elaborate study of the geometrical shape, weight, and motion of various fish. The swimming action and speed are obtained from cinematograph records. Resistance is obtained from towed specimens. The results are given in kilograms weight per metre square of the " maitre couple " defined as the (ruled) surface bounded by the curve of contact of a cylinder with generators parallel to the motion and tangent to the fish body.

Figures from 18 kg. weight to 54 kg. weight per square metre are given.

Owing to the irregular nature of the surface of reference thus defined, and the inconsistent units used, considerable reduction is required for comparison with aeronautical results.

New Experiments on the Resistance of Fishes. (A. Magnan and A. Sainte-
Lague, C.R. Vol. CLXXXIX, No. 20, 12/11/29, pp. 798-799—see also
foregoing abstract.) (5.32/11617 France.)

Experiments were carried out on the rate of descent of 22 types of fish,
recently killed, weighted at the nose and falling freely in water.

The striking result was obtained that in most cases the rate of fall corre-
sponded to uniform acceleration, *i.e.,* to constant resistance. There is no *prima
facie* hydrodynamical reason why this should not be so, and it implies that
turbulence is present throughout the speed range. The configuration of flow
therefore changes continuously from a high resistance type to low resistance
type with increasing speed. The maximum speed attained was 2 mms. The
inconsistent units of the previous contributions are used, reduced as before to
the "*maitre couple.*"

Internal Friction of Electrolytic Solutions and Their Bearing on Debye's Theory.
(H. Falkenhagen and M. Dole, Phys. Zeit., Vol. XXX, No. 19, Oct.,
1929, pp. 611-622.) (5.32/11618 Germany.)

The experimental result of Jones and Dole shows that the increment of the
coefficient of viscosity is proportional to the equal root of the concentration. A
mathematical discussion of the electrical density of the cloud of ions is given,
and the resulting increase of viscosity is calculated for potassium chloride, K.CL.
Unfortunately the experimental value is given for potassium iodide, K.I., the
figures being 0.0046 and 0.0029. The authors appear to be satisfied with the
order of agreement.

Studies on Aerodynamic Effect of Gap between Wings and Fuselages.
(Shatswell Ober, N.A.C.A. Technical Note, No. 327, November, 1929.)
(5.32/11619 U.S.A.)

Author's Summary: The general result indicated by this study is that if
desirable from any viewpoint the gap between wing and fuselage may be closed
without detrimental aerodynamic effects, and with a given monoplane there is
less drag if the wing is directly on top of the fuselage than if it is parasol.

Three types with three arrangements each are examined and eight diagrams
are given.

Types of Flow in Rotating Tubes. (Dr. Ing. F. Levy, Z.V.D.I., Vol. LXXIII,
No. 42, 19/10/29, p. 1512.) (5.325/11620 Germany.)

The rotation of a cylindrical tube reduces the pressure drop of air flowing
through it. Similarly the rotation of a cone diffusor increases the coefficient of
pressure conversion. Experiments were carried out with air for Reynolds' num-
bers varying from 2,000 to 80,000. With rotation, the pressure coefficient of
the diffusor increased from 72 to 92 per cent., whilst the resistance coefficient
of the cylindrical diminished from .024 to .01. Full particulars are given in
V.D.I. Research Publication, No. 322.

*Loss by Shock in the Flow of Gases through Pipes with Sudden Changes of
Section.* (W. Nusselt, Z.V.D.I., Vol. LXXIII, No. 44, 2/11/29, pp.
1588-1589.) (5.325/11621 Germany.)

A photograph exhibits the nature of the energy transformation into waves
of compression and reflected from the walls, and a mathematical analysis is
given. The various hypotheses are illustrated by temperature entropy diagrams.
See also 10938, issue No. 10.

Discharge Coefficients of Square-Edged Orifices for Measuring the Flow of Air.
(H. S. Bean, E. Buckingham and P. S. Murphy, Bureau of Standards Journal of Res., Vol. II, No. 3, March, 1929, pp. 561-658.) (5.325/11622 U.S.A.)

Air at pressures between 1 and 13 atmospheres was passed through square-edged concentric orifices installed in long, straight pipes of 4, 6 and 8 inches nominal diameter, the three pipes being in series. The design, calibration and peculiarities of behaviour of the nozzles are described and the theory of this method of measurement is discussed. The experimental results are represented by equations connecting the values of the discharge coefficients with the ratio of orifice to pipe diameter and with the ratio of downstream to upstream static pressure. Tables of numerical values of discharge coefficients are also given.

Drag and Interference of a Nacelle in the Presence of a Wing. (E. N. Jacobs, N.A.C.A. Tech. Note, No. 320, Oct., 1929.) (5.33/11623 U.S.A.)

Author's Summary: The N.A.C.A. cowling did not yield the expected increase in speed when adapted to the outboard nacelles of tri-motored airplanes. The interference and drag of a combination of a wing and nacelle were measured for several different positions of the nacelle, and also for several different forms of nacelle-to-wing fairing.

The results indicate that the drag and interference of a Wright Whirlwind engine nacelle with the N.A.C.A. cowling, when combined with a thick wing, can be reduced to one-sixth at 100 m.p.h. by changing its position and fairing it into the wing.

A Radio Altimeter. (Sc. Am., Vol. CXLI, No. 6, Dec., 1929, p. 528.) (6.33/11624 U.S.A.)

The G.E.C. of U.S.A. is stated to be developing a wireless echo method of height indication based on the principle that every time the airplane changes altitude by half a wave length a whistling note goes through a complete tone cycle from low pitch to high pitch and back again. By counting the cycles of the tone, using half the wave length of the oscillator as a measuring stick, it is possible to measure the altitude. By means of the meter, graduated from 3,000 to 200 feet, the pilot may read his altitude within close limits at any time. The "echoes" indicating height are periodic, becoming stronger as the plane approaches the ground. The periodic characteristic of the echo, and the chance that the pilot would not see the instrument at the instant an echo was recorded, presented a problem which was met by developing a "memory meter." In this instrument the echo is recorded as altitude when it occurs and the meter continues to hold that reading until a stronger echo, indicating a lower altitude, occurs. In approaching the earth, the memory meter gives a continuous indication of altitude.

Wind Tunnel Pressure Distribution Tests on a Series of Biplane Wing Models: Effects of Changes in Decalage, Dihedral, Sweepback and Overhang. (M. Knight and R. W. Noyes, N.A.C.A. Tech. Note, No. 325, Oct., 1929.) (5.336/11625 U.S.A.)

Author's Summary: This preliminary report furnishes information on the changes in the forces on each wing of a biplane cellule when the decalage, dihedral, sweepback and overhang are separately varied. Since each test was carried up to 90° angle of attack, the results may be used in the study of stalled flight and of spinning and in the structural design of biplane wings.

See also N.A.C.A. Technical Note, No. 310, Effects of Changes in Stagger and Gap.

Travel of the Centre of Pressure of Airfoils Transversely to the Airstream. (R. Katzmayr, N.A.C.A. Tech. Memo., No. 530, Sept., 1929, from Berichte der Aeromechanischen Versuchsanstalt in Wien, Vol. I, No. 1, 1928.) (5.336/11626 U.S.A.)

The resultant forces and moments were obtained by experiment upon each half of a wing separately for varying incidences. The results are applied in eleven tables and exhibited graphically and diagrammatically. Although the actual distribution of lift is not obtained the results are stated to be immediately usable for strength calculations.

Water Pressure Distribution on a Twin-Float Seaplane. (F. L. Thompson, N.A.C.A., Report, No. 328, Dec., 1929.) (5.34/11627 U.S.A.)

Author's Summary: The results of this investigation show that water pressures as great as 10 lbs. per sq. in. may occur at the step in various manœuvres and that pressures of approximately the same magnitude occur at the stern and near the bow in hard pancake landings with the stern well down. At other parts of the float the pressures are less and are usually zero or slightly negative for some distance abaft the step. The maximum negative pressure of 0.87 lb. per sq. in. was measured immediately abaft the step. The maximum positive pressures have a duration of approximately one-twentieth to one-hundredth second at any given location and are distributed over a very limited area at any particular instant. The greatest accelerations measured normal to the thrust line at the c.g. occurred in pancake landings, and a maximum of 4.3 g. was recorded. Approximate load distribution curves for the worst landing conditions are derived from the data obtained to serve as a guide in static tests.

Experiments with Tailless Aeroplanes. (A. Lippisch, Flugsport, Vol. XXI, No. 22, pp. 418-426.) (5.35/11628 Germany.)

The article is chiefly descriptive with a number of photographs and diagrams. An elementary technical account is given with some technical details.

Development of the Tailless Aeroplane. (Maj. Ernst, Aero Revue, Vol. IV, No. 11, Nov., 1929, pp. 232-233.) (5.35/11629 Switzerland.)

In the tailless aeroplane the propeller works fairly efficiently. It was found possible to get a speed of over 70 m.p.h. with a ten h.p. 500 c.c. engine. The glider used had a span of over 12 metres, the propeller diameter being 1.2 metres.

A New Coefficient Characterising Airscrew Efficiency. (Maurice Roy, L'Aeronautique, Vol. XI, No. 126, Nov., 1929, pp. 370-371.) (5.41/11630 France.)

The author follows Betz in an attempt to give greater precision to the definition of the actual efficiency of an airscrew combined with an aeroplane body and wings.

Tests of Metal Model Propellers. (E. P. Lesley and E. G. Reid, N.A.C.A. Report, No. 326, Nov., 1929.) (5.42/11631 U.S.A.)

Author's Abstract: This report describes the tests of five adjustable blade metal model propellers both in a free wind stream and in combination with a model fuselage with stub wings, which were conducted at Stanford University under research authorisation of the National Advisory Committee for Aeronautics. The propellers are of the same form and cross-section but have variations in radial distribution of pitch. By making a survey of the radial distribution of air velocity through the propeller plane of the model fuselage it is found that this velocity varies from zero at the hub centre to approximately free stream velocity at the blade tip. The tests show that the efficiency of a

propeller when operating in the presence of the airplane is, over the working range, generally less than when operating in a free wind stream, but that a propeller with a radial distribution of pitch of the same nature as the radial distribution of air velocity through the propeller plane suffers the smallest loss in efficiency.

Variable Pitch Propellers. (F. W. Caldwell, S.A.E., Vol. XXV, No. 6, Dec., 1929, pp. 656-666.) (5.43/11632 U.S.A.)

Author's Summary: After reviewing briefly the difficulties encountered, due to propeller and engine characteristics, the author discusses the effect of camber ratio and angle of attack on the speed at which breakdown of lift occurs, following this with comments on the efficiency of propellers as static thrust producers, the use of the method of momentum to compute thrust and the application of adjustable-pitch propellers to supercharged engines.

The forces required to operate the control adjustments are (a) friction, (b) twisting moments produced by centrifugal force and (c) twisting moments produced by air pressure. The second of these is taken up in considerable detail and a mathematical expression is derived, by which this quantity can be evaluated at various stations along the blade and plotted, after which the integration can be carried out graphically.

A method of elastic stress analysis is given which involves determining the direct centrifugal stress; plotting thrust, torque and bending moment curves; determining the most highly stressed fibres; and finding the deflection at the various stations by a process of double integration, the mean ratio of the deflection necessary to balance the air pressure by centrifugal force to the deflection that would occur if no centrifugal force were present giving an approximate idea of the relative magnitudes of the elastic and static stresses.

Photographs and diagrams are given of pitch adjusting gear.

Full-Scale Effect of Wings on Efficiency of Single Airscrew. (F. E. Weick and D. H. Wood, N.A.C.A. Tech. Note, No. 322, October, 1929.) (5.45/11633 U.S.A.)

Author's Summary: An open cockpit single engine fuselage was tested with and without biplane wings and a closed cabin fuselage with varying amounts of cowling was tested with and without a monoplane wing. A standard metal propeller and " Whirlwind " engine were used. The wings are shown to cause a reduction of from one to three per cent. in propulsive efficiency, which is about the same for the monoplane as for the biplane wings.

Chromium-Molybdenum Steel Tubing Fuselage Construction. (J. H. Kindelberger, S.A.E , XXV-5, Nov., 1929, pp. 474.) (5.53/11634 U.S.A.)

Editorial Summary : Molybdenum steel was developed to make stronger struts possible. Strength and reliability of welds depend on designing joints that can be welded without overheating any parts. Complicated fittings should be made up into sub-assemblies; an example is given. The weakest point in the structure may be expected to be in the tubing near the weld, where it is not highly stressed in characteristic structural members.

A brief description is given of jigs for welding airplane assemblies, including fixtures for drilling holes in an assembled frame for major attachments. The paper closes with a description of the measures taken to prevent corrosion.

Necessary Factors for Profitable Air Transport Service. (A. Gymnich, Luftfahrt, Vol. XXXIII, No. 21/22, 22/11/29, pp. 318-323.) (5.6/11635 Germany.)

Profitable air transport requires high speeds over long distances. The U.S.A. " Patrician " has a cruising speed of 128 miles an hour and a top speed

of 150 miles an hour with 18 passengers and luggage. By standardisation and series construction the first cost of American transport engines and machine is half that of a similar German machine, and spare parts are cheap and easily obtainable. In the series of air-cooled radial engines built by the Wright Co., of America, 80 per cent. of the spares covering a series of five different engines are interchangeable. This reduces the cost of engine maintenance accordingly. American civil aviation offers faster service than ground transport with first cost and maintenance of aircraft and engines much below continental practice.

Large v. Small Aeroplanes for Transport of Mails. (J. v. Schroder, Luftfahrt, Vol. XXXIII, No. 21/22, 22/11/29, pp. 316-318.) (5.6/11636 Germany.)

Aeroplanes suitable for the transport of mails should be small, fast and as far as possible independent of weather, with postal freight 100-200 kilograms, and range 600 miles.

Economic Speed-Weight Relation in Air Transportation. (E. P. Warner, S.A.E. Journal, Vol. XXV, No. 6, p. 635.) (5.6/11637 U.S.A.)

The calculations of this paper are on the basis that an aeroplane cruises at 85 per cent. of its maximum speed; that two-thirds of the maximum rated horse-power is consumed in level cruising flight; fuel for a 400-mile flight is carried; the total weight of the power plant is 2.5 lb. per h.p.; weight of the airplane structure is 33 per cent. of the total weight carried; and the pay load is assumed to be two-thirds of the figure remaining after subtracting the structure, the power plant and the fuel weight. The various points covered include the relations of pay load to engine horse-power, initial cost of airplane and engine, costs per pound of pay load and per passenger mile, value of the time saved by greater speed, and the possibilities of increased cruising speed. Five means for securing higher cruising speed are listed. A number of charts and tables supplement the paper.

Transmission of Sound through Wall and Floor Structures. (V. L. Chrisler and W. F. Snyder, Bur. of St. Jrnl., No. 3, Vol. II, March, 1929, pp. 541-559.) (5.61/11638 U.S.A.)

Author's Summary: A report on sound transmission through (1) a large number of masonry walls and floors and other materials which are homogeneous in construction; (2) a few compound walls and floors which have masonry core; and (3) a few stud walls.

The results are given for five frequency bands covering a range from 250 to 3,365 cycles per second. Transmission tests were also made for impact noises. Specifications for the construction of the various panels used are appended.

NAVIGATION

Airway Radio Progress. (M. Codel, Aviation, Vol. XXVII, No. 20, 16/11/29, pp. 979-980.) (6.0/11639 U.S.A.)

Maps are given showing a network of twenty-four weather and eight beacon stations distributed along United States airways.

Bumpiness on the Cairo-Basra Air Route. (J. Durward, Met. Office Professional Notes, No. 52, Nov., 1929.) (6.1/11640 Great Britain.)

An account is given of actual experiences and a number of conclusions are drawn for the guidance of pilots.

Waves and Tides in the Atmosphere. (G. I. Taylor, Proc. Roy. Soc., Vol. CXXVI, No. A.800, December, 1929, p. 169.) (6.23/11641 Great Britain.)

The work of Lamb and Chapman is examined critically. Observations of the wave set up by the Krakatau explosion are used as the only available check on geophysical calculations.

Navigation at Sea and in the Air. (P. V. H. Weems, Journ. Am. Soc. of N. Engineers, Vol. XL, No. 3, Aug., 1928, p. 516.) (6.3/11642 U.S.A.)

A descriptive account of requirements for air navigation and of the methods and instruments available.

Earth Inductor Compasses—Installation by U.S. Navy. (U.S. Air Services Mag., Vol. XIV, No. 12, Dec., 1929, p. 51.) (6.342/11643 U.S.A.)

It is stated that " pioneer " earth inductor compasses have been installed on 25 flying boats.

Measurement of Fluctuations of Air Speed by the Hot-Wire Anemometer. (H. L. Dryden and A. M. Kuethe, N.A.C.A. Rep., No. 320, Oct., 1929, 26 pp.) (6.382/11644 U.S.A.)

Author's Summary : The hot wire anemometer suggests itself as a promising method for measuring the fluctuating air velocities found in turbulent air flow. The only obstacle is the presence of a lag due to the limited energy input which makes even a fairly small wire incapable of following rapid fluctuations with accuracy. This paper gives the theory of the lag and describes an experimental arrangement for compensating for the lag for frequencies up to 100 or more per second when the amplitude of the fluctuation is not too great. An experimental test of the accuracy of compensation and some results obtained with the apparatus in a wind tunnel air stream are described.

A New Inertialess Chronograph. (P. A. Cooper, Res. Dept., Woolwich, Phil. Mag., Vol. VIII, No. 54, Dec., 1929, pp. 1100-1114.) (6.48/11645 Great Britain.)

The application of gas-filled lamps to chronographic records marked by a characteristic discharge at the instant of applying the requisite voltage, has been further developed. Illustrations of cathode lamps and diagrams of electrical connections are given. The discharge is recorded on a cinematograph film moving at five metres per second, and short time intervals are recorded with an uncertainty of less than 1/50,000 of a second.

Further developments are anticipated.

Penetration of Fog. (H. Amick, U.S. Air Services Mag., Vol. XIV, No. 12, Dec., 1929, pp. 55-6.) (6.61/11646 U.S.A.)

A description of infra red rays in fog. It is suggested that two beacons emitting bars of infra red rays of sufficiently long wave length and intensity to penetrate some miles of fog, can be observed and orientated. Rotatable photo electric cells are mounted on an aeroplane in such a way as to fix the position rapidly with respect to the beacons.

Neon and Incandescent Lamps for Beacons. (Capt. Mioche, L'Aeronautique, Vol. XI, No. 125, Oct., 1929, pp. 347-349.) (6.62/11647 France.)

The editorial note ascribing special penetrating power in haze and fog to neon lamps finds no support in the experimental work cited, from which there appears to be no sensible difference.

A neon tube of 1,400 watts gives 250 c.p. while a 500-watt metallic filament lamp gives 1,000 c.p. white light and an estimated 250 c.p. (25 per cent.) through

a red filter of the same wave length as the neon lamp, so that the neon lamp has no economic advantage. (This appears to be in some contradiction with a German view; see 10949, issue No. 10.)

Six figures give photographs of beacons and a diagram of connections of a neon flashing beacon.

A Method of Recording Fast Oscillations by Means of Scratch Records. (W. Pabst (D.V.L. Report), V.D.I., Vol. LXXIII, No. 46, 16/11/29, pp. 1629-1633.) (6.72/11648 Germany.)

A diamond pressed against a hard glass surface scratches a line of the order of .002 mms. thick. The scratch record has been used for deflection of test pieces, vibration of machines, and forces acting on seaplane floats. In the design of engine indicators the diagram would be approximately .25 mms. high compared with the 3 mms. diagram height of Collins micro-indicator. A continuous 200-hour record of the r.p.m. of aircraft engines can be taken on a glass cylinder and would show how often and how long the engine has been operated within the range of critical vibration.

On the Theory of Hearing. (G. v. Békésy, Phys. Zeit., Vol. XXX, No. 21, 1/11/29, pp. 721-745.) (6.76/11649 Germany.)

Various experimental arrangements are described for the isolating measurement of the proportional change of sound amplitude which could just not be detected by the ear. The ratio is independent of the frequency and a reason is given in the similarity of nervous excitation over the whole basilar membrane.

The Stormer and other Rotation Viscometers. (Journ. of Franklin Institute, Vol. CCVIII, No. 6, Dec., 1929, p. 799.) (6.78/11650 U.S.A.)

An elementary account of the theory and application of the instrument with directions for practical use.

Two Hot-Wire Viscometers. (E. G. Richardson, Journ. of Sci. Inst., Vol. VI, No. 11, Nov., 1929, pp. 337-343.) (6.78/11651 France.)

Author's Abstract: Instruments based on the convective cooling of an electrically heated wire, for giving the distribution of velocity across a liquid (a) flowing in a cylindrical tube, (b) flowing in the annular space between two concentric cylinders, one rotating and the other at rest, are described. As examples of their use, the velocity gradients in a number of liquids at various stages between streamline and turbulent flow are shown, and compared with the forces producing the flow. The use of a hot wire and a string galvanometer to detect unsteady flow is illustrated. Numerical results are given in five diagrams.

Apparatus Utilising Photo-Electric Cells for Measuring Colour Temperature and Lumens of Incandescent Electric Lamps. (G. T. Winch, Journ. Sci. Inst., Vol. VI, No. 12, p. 374.) (6.79/11652 Great Britain.)

Author's Summary: Describes the development and construction of a photo-electric apparatus for measuring the colour temperature and luminous output of incandescent electric lamps. Both temperature and lumen scales are linear, thus facilitating the calibration of the apparatus.

Application of the Planimeter to the Integration of Multiple Integrals and of Partial Differential Equations. (Dora Wehage, Z. Instrum., Vol. XLIX, No. 9, Sept., 1929, pp. 425-444, and No. 10, Oct., 1929, pp. 477-496.) (6.95/11653 Germany.)

Part I.—Double integrals reducible to the simple form $\iint dx dy$ can be immediately evaluated by planimeter.

Part II.—Examples given are, moment of inertia, probability integrals, mean geometrical distance, radiation from rectangular parallelopipeds, and cylinders all in two dimensions.

Fully worked out numerical values are given in an appendix.

Part III.—A linear partial differential equation of the second order with constant coefficient is expressible as a series of double integrals by successive partial integrations. Planimetry of the double integrals affords a numerical series, and if the latter converges rapidly, the method becomes useful. Examples are given of application to determining the asymptotic lines of the pseudosphere, and the equation of telegraphy.

Guggenheim Safety Competition. (Editorial, Aviation, Vol. XXVII, No. 20, 16/11/29, pp. 974-978.) (7.0/11654 U.S.A.)

A descriptive account is given of some of the entries to the competition.

Starting Formulæ for Landplanes. (G. Mathias, Z.F.M., Vol. XX, No. 20, Oct., 1929, pp. 528-529.) (7.17/11655 Germany.)

Blenk's formulæ are generalised and exhibited analytically and graphically, the formulæ permitting the reduction of all starting performance to a given weight in calm air, and more generally from one type of aeroplane to another.

Stability and Controllability of German Landplanes. (W. Hubner, Z.F.M., Vol. XX, No. 20, Oct., 1929, pp. 521-529.) (7.21/11656 Germany.)

A descriptive account is given of the various types of instability. The question of controllability is also discussed. Photographs and diagrams of tail surfaces are given, and graphical representation of damping coefficients. The article is not mathematical.

Trim and Stability of Aeroplanes. (M. Guibert, L'Aeronautique, Vol. XI, No. 126, Nov., 1929, pp. 375-380.) (7.21/11657 France.)

A continuation of the article in No. 125, of which a notice was given in Abstracts and Notices, No. 11, para. 11330.

Theory of Steady Aeroplane Flight. (M. Roy, L'Aerotech., Vol. XI, Part 118, March, 1929, pp. 89-92.) (7.21/11658 France.)

Steady circling and spiral motions are included. The axes are specified, the variables defined and general functional relations are laid down and simplified by neglecting small quantities. No attempt is made to give determinate numerical form to the relation. The principle of similitude is used and general inferences are drawn. The interaction of airscrew and wings and body is considered; airscrew efficiency is defined and discussed. The effect of height and performance is necessarily a function of all the parameters entering into the problem. Criticism is directed against empirical formulæ in use, but no definite alternative is offered.

Connectors in Acoustical Conduits. (R. B. Lindsay, Phys. Rev., Vol. XXXIV, No. 5, 1/9/29, pp. 808-816.) (7.26/11659 U.S.A.)

Transmission through a connector. Employing the horn theory of Webster the power transmission through an acoustical connector joining two conduits is calculated when the law of the change of area of the connector is applied of the form $S = S_o \phi(x)$. The general result is applied to the following special cases :—

(1) Conial connector. $S = S_o x^2$, for which it is found that the transmission approaches unity with decreasing wave length; curves are given showing the exact dependence of the transmission on frequency for various values of l, the length of the connector, and of the expansion ratio m.

(2) Bessel connectors of higher order, $S = S_0 x^a$, where a can take all values, in which case it is found that with decreasing wave length the transmission approaches a value approximately independent of a.

(3) Exponential connector, $S = S_0 e^{ax}$, the limiting case of the Bessel connectors with a slightly different transmission ratio.

(4) Connectors with generating curves having a point of inflection, $S = S_0 e^{-ax}$, the transmission differing little from previous cases.

These theoretical results are in agreement with certain experimental results of G. W. Stewart.

The phase change introduced by the connector is calculated for these special cases, and is shown to approximate to kl in the limit with increasing kl.

Motorless Flying. (Aeroplane, Vol. XXXVII, No. 19, 6/11/29.) (7.61/11660 Great Britain.)

An editorial article giving a descriptive account of some of the principal performances at the well-known gliding station at Wasserkuppe and elsewhere, with the suggestion that similar experimental and sporting activities should be encouraged in this country.

New Gliding Record at Rossitten. (Luftfahrt, Vol. XXXIII, No. 21/22, 22/11/29, pp. 323-324.) (7.61/11661 Germany.)

The previous gliding record of approximately 14 hours has been beaten by Lieut. Dinort by over half an hour, on October 19th and 20th, 1929. In starting, the glider was towed by a motor car.

AIRCRAFT ENGINES

British Water-Cooled Engines. (Lieut. L. F. R. Fell, Aircraft Engineering, Vol. I, No. 10, Dec., 1929, p. 327.) (8.11/11662 U.S.A.)

A detailed descriptive account of the Rolls-Royce F and H engines is given with sectional arrangements and some details of pistons, connecting rods, supercharger, etc. Tables and five diagrams of performance are given.

Cameron 4-Cyl. Aero Engine. (Editorial, Autom. Zeit., Vol. XXXII, No. 31, 10/11/29, pp. 706-707.) (8.12/11663 Germany.)

This article gives brief details of design and performance of the new 4-cylinder 60 h.p. light aeroplane engine.

Tests of Standard Water-Cooled Liberty 12 Engine with various Piston Rings, etc. (Air Corps Information Circular, Vol. VII, No. 638, 1/10/29.) (8.12/11664 U.S.A.)

Five endurance tests on two Liberty engines are described along with the state of the engines after runs of 32 hours and 52 hours respectively. Various types of pistons and piston rings were employed.

The Double Acting Fast Running "Biga" Engine. (Autom. Tech. Zeit., No. 24, 31/8/29, pp. 529-531.) (8.14/11665 Germany.)

The piston of the engine is carried by an external cross-head. This arrangement ensures efficient air-cooling of the piston. The design is stated to be more compact than the opposed piston engine of Junkers.

Type Testing of Commercial Aircraft Engines. (Vol. CCVIII, No. 5, Journ. Franklin Inst., Nov., 1929, p. 679, Notes from N.S. Bureau of Standards.) (8.18/11666 U.S.A.)

All engines flown in licensed aircraft must be approved by the Department of Commerce as airworthy. Engines which have been tested by the Army or

Navy and accepted for military purposes are approved automatically on request. Otherwise each new type of engine must pass a special test which is conducted at the Bureau of Standards.

Interpretation of the Indicator Card. (R. N. Janeway, S.A.E., XXV-5, Nov., 1929, pp. 478-488.) (8.18/11667 U.S.A.)

The use of the indicator card for the study of combustion heat transfer requires a knowledge of the properties of the working substance as well as accurate diagrams. The importance of the latter as well as the need of accurate phasing does not appear to have been realised by the author.—*Abstractor's Note.*

Engine Torque Analysis. (H. A. Huebotter, S.A.E., Vol. XXV, No. 6, Dec., 1929, pp. 641-654.) (8.18/11668 U.S.A.)

Author's Summary : Analytical methods of investigating engine torque are given in this paper, with a number of sample analyses.

This method is said to be easier to apply to a complete analysis than is the graphical method, and to be adaptable to several types of investigation that cannot be made by the graphical method.

The discussion includes an outline of the mathematics required to follow the analysis.

The paper is illustrated by 20 graphs and approximate equations are given in the discussion.

Allowable Stress in Tubes Subjected to Torsion. (Air Corps Information Circular, No. 641, 1/10/29.) (8.22/11669 U.S.A.)

A study has been made of all available experimental data on tubes subjected to torsion. The results obtained are given.

The experimental data were obtained from Army and Navy tests, as shown on each data sheet accompanying the report.

An empirical formula has been derived which expresses the data in a usable form.

For use in design there has been plotted (Fig. 8) on the basis of this formula, a family of nine curves covering the materials commonly used in aeroplane structures. These curves may be used directly for design, as they are plotted from the shear value allowed by the Air Corps for each material.

Friction in Sliding, Roller and Ball Bearings under Conditions of Intermittent Work. (Prof. L. Klein, Z.V.D.I., Vol. LXXIII, No. 42, 19/10/29, pp. 1499-1502.) (8.23/11670 Germany.)

The coefficients of the ball and roller bearings tested were generally less than one half of the oil lubricated bearing, but the temperature rises under various conditions of working for the two types of bearings differ less, *e.g.*, temperature rise in an eight-hour run of a roller bearing 40°C., of oil lubricated bearing 52°C.

Needle Bearings for Gudgeon Pin. (V.D.I., Vol. LXXIII, No. 46, 16/11/29, p. 1655.) (8.23/11671 Germany.)

Needle bearings in the gudgeon pin of a Diesel piston are illustrated. The bearings are built for a load up to 300 kilograms per sq. cm. (900 lbs. per sq. in.) and require very little lubrication.

Measurement of Flow of Heat. (A. F. Dufton and W. G. Marley, Phil. Mag., Vol. VIII, No. 53, Dec., 1929, p. 841.) (8.3/11672 Great Britain.)

New instruments are described and illustrated by photographs for measuring separately the flow of heat in a room by radiation and convection. Although the results are chiefly applicable to building problems the methods are of general application.

Wind Tunnel Tests on the Automobile-Type Fan. (Prof. Vincent C. George, S.A.E. Journ., Vol. XXV, No. 4, Oct., 1929, pp. 400-403.) (8.32/11673 U.S.A.)

Wind tunnel tests were made on a fan of 18 in. diameter. The size of the blade was uniform, being 3 in. wide and 7 in. long, but the number of blades varied. Two, three, four, six and eight blades were used in the different tests and the best results were obtained with a flat blade. Various curvatures of blade were tried, the ratio of the chord of the curve to the height of the arc varying from 20:1 to 5:1. Curves resulting from the data obtained with the flat blade are shown and their characteristics explained.

Heat Insulators. (E. Griffiths, D.S.I.R., Food Invest., 1929, Spec. Rept., No. 35, 96 pp. (Br. Chem. Abstrs., Vol. XLVIII, No. 46, 15/11/29, p. 913).) (8.36/11674 Great Britain.)

Ordinary granulated materials do not entirely suppress convection current; slabs of cork give greater insulation than granular cork. The soft timber known as balsa is a good heat insulator, but it must be faced with harder material for use in industry.

The Transmission of Heat in a Horizontal Pipe during the Condensation of Saturated and Superheated Steam. (M. Jakob, S. Erk and H. Eck, Z.V.D.I., Vol. LXXIII, No. 42, 19/10/29, pp. 1517-1520.) (8.36/11675 Germany.)

The mechanism of condensation was studied by temperature measurements at the surface of the tube. The effect of orientation and the greater efficacy of horizontal tubes were elucidated. Experiments on the effects of diameter and length have been planned.

Loss of Heat from Exposed Surfaces. (R. M. Colles, Iron and Steel Inst., Carnegie Schol. Mem., 1929, 18, 31-51 (British Chemical Abstracts, B, 15/11/29, p. 913).) (8.36/11676 U.S.A.)

The rate of heat loss from steel cylinders at a temperature of 200°C. in air has been studied for various surface conditions of the steel, such as oxidised, rusty, painted, etc. The heat loss was found to be a maximum when painted dark red. A covering with aluminium foil was found to be the most efficient protector against heat loss. It is stated that wind has a greater cooling action than heavy rain.

Lubrication of Aircraft Engines. (F. A. Foord, A.F.R.Ae.S., Proc. R. Ae. Soc., Vol. XXXIII, No. 228, Dec., 1929, pp. 1089-1132.) (8.4/11677 Great Britain.)

A comprehensive paper on the subject of lubrication of aircraft engines.

Lubrication Oil for Naval Purposes. (Cmdr. M. C. Bowman, J. Am. Soc. Nav. Eng., Vol. XLI, No. 4, pp. 656-675.) (8.41/11678 U.S.A.)

Laboratory tests and service tests are given on which contracts have been based.

Discharge Stability Tests on Insulating Oils. (W. Zimmermann, Petroleum Z. 24, 1213-30 (1928), (Chem. Abstr., Vol. XXIII, No. 20, 20/10/29, p. 5036).) (8.41/11679 U.S.A.)

Tests were carried out by the firm Siemens Suckhert with improved apparatus for determining the breakdown potential. Without proper care in mixing different samples from the same consignment may show great variations. The insulating value of used oils may be restored by suitable chemical treatment.

Recovery of Lubricating Oil. (Der Motorwagen, No. 12, 3034/29.) (8.44/11680 Germany.)

After filtering off carbon and other particles, the old crankcase-oil is regenerated by passing it through a layer of aluminium-magnesium-hydrosilicate. This material has the property of absorbing acid oxidation products, metal soaps and polymerisation products. It also polymerised unstable, unsaturated compounds and absorbed them subsequently. The material is known under the trade name of " Floridin " and regenerators employing it have been built by Messrs. Bensmann for a number of years with complete success.

Investigations on Oscillations in the Expansion Line in High Speed i.c. Engines. (K. Voelckel and H. Kissinger, Autom. Tech. Zeit., Vol. XXXII, No. 30, 31/10/29, pp. 670-672, and No. 31, 10/11/29, pp. 701-703.) (8.5/11681 Germany.)

Optical indicator diagrams were taken at speeds of 3,400 r.p.m., using various fuels and under various conditions of running. Analysis of the oscillations observed in the expansion line of the diagram showed conclusively that these were due to the nature of the fuel alone and not influenced either by the free period of the indicator or gas vibrations occurring in the cylinder. The frequencies observed varied between 32 and 62 thousand per minute.

Performance of Gasoline in Engines. A Spectroscopic Study of Combustion in the Engine Cylinder. (W. C. Thee, Oil and Gas, J.28, No. 12, 46, 158, 160, 161 (1929). (Chemical Abstracts, Vol. XXIII, p. 5310).) (8.51/11682 U.S.A.)

A straight run fuel under non-detonating conditions gave a discontinuous spectrum. When detonation sets in the spectrum becomes continuous and resembles that of benzene (non-detonating).

Results of Recent Investigations on Viscosity of Oils under Pressure. (Dr. Ing. S. Kiesskalt, V.D.I., Vol. LXXIII, No. 42, 19/10/29, p. 1503.) (8.51/11683 Germany.)

The experiments of Shore and Hersey on the effect of pressure on viscosity (*Mechanical Engineering*, Vol. L, 1928, p. 221) are co-related with the experiments produced by the author, V.D.I. Research Publication, No. 291. There is a definite relation between viscosity temperature and pressure is an exponential function.

Analytical Reactions of Tetraethyl Lead. (G. Edgar and G. Calingaert, Ind. and Eng. Chem., Analytical Edition, Vol. I, No. 4, 15/10/29, p. 221.) (8.51/11684 U.S.A.)

Analytical methods for the determination of tetraethyl lead and related compounds in concentrated preparations in dilute solution in gasoline, vary in accuracy, and the errors range from .1 to 2 per cent.

Temperature of Spontaneous Ignition of Gas Mixtures of Air and Hydrocarbons. Influence of Pressure and Preheating. (P. Mondain-Monval and B. Quanquin, H. le Chatelier, C.R., No. 22, 25/11/29, pp. 917-919.) (8.51/11685 France.)

Experiments were carried out with pentane, heptane, hexane and octane; the ignition temperatures do not differ much. If the pre-heating period is increased the ignition temperature falls markedly; a 50 per cent. pentane mixture has an ignition temperature at atmospheric pressure of 325°C. with a delay of three secs. Pre-heating for a period of 35 mins. lowers the ignition temperature to 240°C.

Liquid Fuels for C.I. Engines. (P. Mettgenburg, Autom. Zeit., Vol. XXXII, No. 31, 10/11/29, pp. 703-706.) (8.51/11686 Germany.)

A useful summary is given of the physical and chemical qualities to be specified in selecting a suitable fuel for c.i. engines.

Alcohol Fuels for Use in Internal Combustion Engines. (J. C. King and A. B. Manning, J. Inst. Petroleum Tech. 15, 350-368 (1929). (Chemical Abstracts, Vol. XXIII. No. 19, 10/10/29, p. 4794).) (8.513/11687 U.S.A.)

The stability of alcohol, benzol, petrol mixtures depends on the constitution of the petrol and the amount of water content. Certain mixtures do not show separation at −15°C., and while the alcohol content prevents the formation of local hot spots.

Gaseous Explosions—Effect of Tetraethyl Lead on Rate of Rise of Pressure. (M. S. Carr and G. G. Brown, Ind. and Eng. Chem., Vol. XXI, No. 11, Nov., 1929, p. 1071.) (8.514/11688 U.S.A.)

Author's Summary: Explosive mixtures of different types of hydrocarbons were prepared containing varying amounts of tetraethyl lead. The rate of rise of pressure following ignition was determined from the pressure time curves.

The effect of tetraethyl lead was found to be essentially independent of the chemical structure of the fuel, but governed by the type or rate of combustion of the explosive mixture. As the rate of reaction (or rise in pressure) increases, the retarding action of tetraethyl lead disappears and is replaced by an accelerating action on the combustion.

A similar effect was observed upon adding increasing amounts of tetraethyl lead to the mixture. Small amounts of tetraethyl lead tend to retard slow combustion, but larger concentrations of tetraethyl lead showed no retarding action and in many cases a positive accelerating effect.

These actions may be explained on the assumption that the decomposition products of tetraethyl lead are the active agents, and by considering the relative rates of decomposition of tetraethyl lead and of reaction of the explosive mixture.

Effect of Anti-Knock Materials on the Condenser Discharge Spark Energy Required to Ignite the Mixture of Air with the Vapour of Ethyl Ether. (Yuzaburo Nagai, J. Soc. Chem. Ind., Japan, 31, 503-507 (1928). (Chemical Abstr., Vol. XXIII, No. 20, 20/10/29, p. 5036).) (8.514/11689 Japan.)

For a constant supply voltage the minimum condenser capacity required for ignition increases with the proportion of anti-knock material. Ethyl selenide, lead methyl and tin methyl were investigated.

Tetra-alkyl Lead Compositions. (W. S. Calcott and A. E. Parmelee, U.S. patent 1,724,640, E. I. Du Pont de Nemours and Co. (Chemical Abstracts, Vol. XXIII, No. 19, 10/10/29, p. 4816).) (8.514/11690 U.S.A.)

Tetraethyl lead and ethylene bibromide are stabilised by adding an aliphatic base such as dimethylamine.

Flame Characteristics of "Pinking" and "Non-Pinking" Fuels—II. (G. B. Maxwell and R. V. Wheeler, J. Inst. Pet. Tech., 1929, 15, 408-415 (Br. Chem. Abstr., Vol. XLVIII, No. 45, 8/11/29, p. 878).) (8.514/11691 Great Britain.)

Benzene gives continuous combustion throughout. When added to pentane it reduces the tendency to knock by decreasing the chemical energy available to maintain a shock wave. Amyl nitrite, added to pentane mixtures, reduces the after-glow in the wake of the flame and gives a correspondingly more intense glow when knocking occurs. With carbon bisulphide-air mixtures the combus-

tion is continuous and well maintained behind the flame front. The authors summarise the conditions for knock in a closed vessel as follows :—

1. The dimensions of the vessel and the nature of the fuel must be such that a stationary wave is set up in the gas before the initial flame has reached every part of the vessel.

2. The nature of the fuel must be such that there is sufficient residual chemical energy available to maintain a shock wave when the flame, after having been accelerated by a stationary wave, is arrested at the wall of the vessel.

Turbulence opposes the formation of stationary waves and accelerates combustion behind the flame, and thus acts as an anti-knock. Lead ethyl renders the combustion continuous behind the flame front.

Variations of the Temperature of Spontaneous Combustion. (C.R., Vol. CLXXXIX, No. 21, 18/11/29, pp. 856-858.) (8.514/11692 France.)

The addition of 1 per cent. of acetone +1 per cent. of analine to an alcohol-benzol-petrol mixture containing 50 per cent. petrol, 30 per cent. benzol and 20 per cent. absolute alcohol, gave an increase of 25°C. of the spontaneous ignition temperature, or an increase of 92°C. over petrol alone.

The Variation of the Temperature of Spontaneous Ignition of Fuels in the Presence of Different Compounds. (A. Grebel, C.R., 189, 90-2 Genie civil 95, 110-3, 1929 (Chemical Abstracts, Vol. XXIII, No. 21, p. 5311).) (8.514/11693 France.)

Using a modified Moore apparatus it was found that anti-knock substances added in small quantities raised the spontaneous ignition point. In large quantities they lower it.

Oxidation Mechanisms of the Paraffin Hydrocarbons. (G. Egloff, R. E. Schaad and C. D. Lowry, Jun., Ind. Eng. Chem., 1929, 21, 785-791 (British Chemical Abstracts, Vol. XLVIII, No. 47, 22/11/29, p. 930).) (8.514/11694 U.S.A.)

The peroxide theory of combustion accounts for the prominence of aldehydes in the oxidation products, but peroxides have not been isolated and the tendency of hydrocarbons to knock does not correspond with their ability to form peroxides. The authors consider that the modern theory of chain reactions fits in best with the experimental facts.

Symposium on Fuel Mixture Distribution. (S.A.E., XXV-5, Nov., 1929, pp. 525-541.) (8.52/11695 U.S.A.)

(1) Balancing power output in multi-cylinder engines—H. M. Jacklin.

Editorial Summary : The author presents and comments upon indicator diagrams from tests made on the road and in the laboratory. The effects of pulsations in the manifold of an engine having a rather complicated manifold system are studied by means of lower loop light spring diagrams, and diagrams obtained from six cylinders of an engine operating at about 0.7 load at 1,400 r.p.m. are analysed. The effects of changing the mixture delivered to one cylinder of an automobile engine are also illustrated and analysed. Some sixty-five indicator diagrams are given.

(2) Report on air fuel ratio tests—H. W. Best.

Editorial Summary : Tests conducted to determine how air fuel ratios obtained by analysing the exhaust gases checked with ratios obtained by measuring the air and fuel are analysed by the author, the tests having been made on a six-cylinder $3\frac{1}{2} \times 5$ in. engine and the air measured by using a Durley air box having a 2 in. flat plate orifice. As a check, a $1\frac{1}{2}$ in. well-rounded

orifice was also used with the same results. The exhaust gases were analysed in conventional Orsat apparatus having four absorption bottles. The tests were made at a constant air fuel ratio at an engine speed of about 1,300 r.p.m. with a wide-open throttle and maximum power carburettor setting. Thus far, 31 samples have been taken by different men and the air and fuel were measured each time a sample was taken. Three methods of obtaining air fuel ratios from the exhaust gas analyses were used and compared, and the author comments upon the results obtained.

(3) Editorial Summary of Prof. C. Fayette Taylor's paper on the effects of a centrifugal supercharger :—

The conclusions drawn from the tests are that the mechanical mixing effect of the high-speed centrifugal blower at approximately full load causes increased brake mean effective pressure, decreased specific fuel consumption and a slightly increased mixture ratio range. With increasing blower speed, other conditions being held constant, a tendency toward increased maximum brake mean effective pressure, reduced fuel consumption and an increased firing range was observed. These improvements are more pronounced with a less volatile fuel. At three-quarter and lower loads, when commercial gasoline was used as fuel, no improvement in engine performance was obtained.

A general discussion follows.

Carburation of Combustible Gas with Butane and Propane-Butane Mixtures; Carburation of Water Gas. (W. W. Odell, U.S. Bur. Mines Bull., 294, 1929, 96 pp.) (British Chemical Abstracts, B, 15/11/29, p. 915.) (8.53/11696 U.S.A.)

Large quantities of liquid butane and propane recovered from natural gas are available in America. These liquid hydrocarbons can be mixed with water gas in order to increase its catalytic value. Formerly water gas was enriched by adding cracked gas oil. The new method, however, is considerably cheaper and yields a more stable product.

The Fundamental Aspects of Combustion. (W. A. Bone, G. I. Finch and D. T. A. Townend, Trans. Fuel Conference, World Power Conference, London, 1928, 2, 143-85 (1929); cf. C.A. 21, 2058. Chemical Abstracts, Vol. XXIII, No. 19, 10/10/29, p. 4795.) (8.57/11697 U.S.A.)

The slow oxidation of hydrocarbons is accompanied by hydroxylation. Unstable hydroxylated molecules break down into simpler products with the evolution of heat. These in their turn undergo oxidation in a similar manner. The reactions in flames are similar.

Explosion of Hydrogen Air Mixtures in a Closed Vessel. (B. H. Thorpe, Phil. Mag., Vol. VIII, No. 53, 1929, p. 813.) (8.57/11698 Great Britain.)

The author describes a new diagram indicator and compares experimental methods used in the Leeds University Engineering Laboratory with those of other workers. Comparative diagrams show remarkable differences according to the method employed. Numerous results of the present investigation are compiled in tables and plotted in diagrams, and a number of conclusions are drawn.

Exhaust Temperatures as Load Index for Oil Engines. (E. C. Magdeburger, Journ. Am. Soc. of N. Engineers, Vol. XL, No. 3, Aug., 1928, p. 496.) (8.59/11699 U.S.A.)

A chart is given calibrating the relation between exhaust temperature and brake M.E.P.

An Exhaust Gas Turbo-Charger. (Automobile Engineer, Vol. XIX, No. 262, Dec., 1929, p. 509.) (8.62/11700 U.S.A.)

Recent German developments—Lorenzen patent. The difficulties are discussed briefly along with methods of meeting them. Photographs and diagrams exhibit some details of the general arrangement of the supercharger. The results claimed are satisfactory air-cooling up to high working temperatures, 800-900°C., the possibility of peripheral speeds up to 300 ms. and turbine speeds of 30,000 r.p.m.

World Engineering Congress at Tokio. (Burton Crane, Automotive Industries, Vol. LXI, No. 22, 30/11/29, pp. 785-787.) (8.62/11701 U.S.A.)

In a general report special attention is given to a paper by C. Diserens, representative in Japan of the Swiss Locomotive and Machine Works and the Brown-Boveri Co., on an exhaust gas turbine drive for a supercharger. Increases from 50-100 per cent. output are indicated by experiments. In particular the 4-cylinder 330 h.p. 275 r.p.m. engine is capable of developing 600 b.h.p.

Modern Methods of Ascertaining Specific Gravity. (W. A. Benton, Chemistry and Industry, No. 48, 29/11/29, pp. 1145-1147.) (8.66/11702 Great Britain.)

A novel densitometer for flue gases is described. Air of known density and flue gas are supplied to two similar cylindrical chambers by fans driven at the same speed in opposite directions. At the other end two similar fans, having torques proportional to their density, impressed by the movement of the gases, are held in equilibrium by a simple geometrical linkage, calibrated for relative densities.

Experiments Carried Out in Connection with the German Competition for Silencing Internal Combustion Engines. (Prof. Wawrziniok, Autom. Tech. Zeit., Vol. XXXII, No. 33, 30/11/29, p. 780.) (8.72/11703 Germany.)

The noise emitted by the silencer is compared with standard noise of similar quality, maintained at constant intensity by an electric oscillating circuit.

ARMAMENT

Velocity and Acceleration of Arrows. (C. N. Hickman, Jrnl. Franklin Inst., Vol. CCVIII, No. 4, Oct., 1929, pp. 521-537.) (9.16/11704 U.S.A.)

Six diagrams are given of space time, velocity time and acceleration time curves.

Photographic Control of Bombing Instructions. (Commandant Tetu, Rev. F. Aero., No. 3, Oct., 1929, pp. 309-318.) (9.5/11705 France.)

The bomber takes a photograph at the instant of hitting. The photograph determines the height and course with greater accuracy than can be obtained by any other method.

The wind velocity at various heights is determined beforehand by sounding balloons. Examples are given of comparisons between course and height determined by this method and by alternative methods, which indicate the useful nature of the check.

Machine-Gun Cinematograph Camera. (Sc. Am., Vol. CXLI, No. 6, Dec., 1929, p. 482.) (9.72/11706 U.S.A.)

Two figures are given of the cinematograph camera mounted on a standard machine gun mounting. The developed film records the sighting. The apparatus is used for instructional purposes and for awarding points in manœuvres.

MATERIALS

Metals Used in Aircraft Construction. (Prof. B. Stoughton, Chemistry and Industry, Vol. XLVIII, No. 50, 13/12/29, p. 1189 (Abstract of address before American Section).) (10.0/11707 Great Britain.)
The author assembles and tabulates a large array of data of the properties of modern alloys and materials suitable for aircraft construction. The list includes alloy steels, aluminium alloy, magnesium alloys and various timbers.

Surface Hardening of Steel by Nitrogen. (H. W. McQuaid, J. Am. Soc. Nav. Eng., Vol. XLI, No. 4, pp. 705-712.) (10.11/11708 U.S.A.)
A full description of the process as applied in America is given. The author states that the results have been less successful than in Europe, and gives a caution against a possibility of comparing results from unsuitable methods.

Saving Weight at Low Cost. (H. E. Knerr, Aviation, Vol. XXVII, No. 22, 30/11/29, p. 1073.) (10.12/11709 U.S.A.)
Details are given of the cost of manufacture and properties of normalised chrome molybdenum steel tubing of average size and gauge used in aircraft construction. The ultimate heat treated tensile strength is given as 12,500 bars (190,000 lbs. weight per square inch).

Inhibitors in the Action of Acid on Steel. (F. H. Rhodes and W. E. Kuhn, Ind. and Eng. Chem., Vol. XXI, No. 11, Nov., 1929, p. 1066.) (10.15/11710 U.S.A.)
Measurements were made with several organic compounds of nitrogen as inhibitors in the action of sulphuric acid on iron. The most effective were cyclic compounds which contained an atom of nitrogen in the ring, the inhibiting effect increasing with the molecular weight.
The addition of inhibitors of this type to dilute sulphuric acid in contact with iron increases the interfacial resistance between the acid and the iron.

Corrosion of Metals: General Theory. (W. Palmaer with others, Handl. Ing. Vetenskaps-Akad., Stockholm, 1929, No. 93, 347 pp. (Abstracted in British Chemical Abstracts, B, 15/11/29, p. 921).) (10.15/11711 Sweden.)
The law of mass action is inapplicable to the process of solution of metals in acids. A series of experiments has been carried out in order to decide between the other two principal theories, viz.:—(a) The production of local differences of potential, and (b) the diffusion of the acid into, and of the reaction products away from, the interface between metal and acid. It appears that the establishment of local E.M.F., and not diffusion phenomena, must be regarded as the determining factor.

Accelerated Corrosion Tests for Coatings of the Iron Phosphate Type. (E. M. Baker, A. J. Herzig and R. M. Parke, Amer. Electrochem. Soc., Sept., 1929 (British Chemical Abstracts, Vol. XLVIII, No. 45, 8/11/29, p. 898).) (10.15/11712 U.S.A.)
Steel is protected against corrosion by immersion in solutions containing phosphoric acid and ferrous hydrogen phosphate at 100°C. The method known as coslettising gives reasonable protection as estimated by the accelerated salt spray test.

Welding Rustproof Steels. (W. Hoffmann, N.A.C.A. Tech. Memo., No. 531, Sept., 1929.) (10.18/11713 U.S.A.)
Author's Summary, p. 9: (1) Rustproof steels can be easily welded by the acetylene-oxygen process.

(2) The welding rods must be protected in arc welding.

(3) The hardness resulting from the welding process must be removed by thermal treatment.

(4) The physical characteristics of rustproof steel welds are better than those of soft steel welds.

(5) Owing to its loss in carbon, silicon and manganese, the steel melted in the gas flame or electric arc is more rustproof after than before welding.

Welding of Stainless Materials. (H. Bull and L. Johnson, N.A.C.A. Tech. Memo., No. 532, Sept., 1929.) (10.18/11714 U.S.A.)

An account is given of the properties of chromium and chromium nickel steels. Instructions are drawn up for electric resistance welding, arc welding and gas welding.

With air-hardening steels reheating and tempéring is recommended, with high chromium and nickel steels the whole welded structure must be reheated.

Liability to corrosion after welding depends on the subsequent treatment.

Mechanical properties of alloy steels, curves of Brinell hardness plotted against reheating temperatures and corrosion curves are given.

Photographs and micro-photographs of corrosion are reproduced.

Modern Light Alloys and Their Application to Aircraft Engine Design. (G. D. Welty, S.A.E., XXV-5, Nov., 1929, pp. 469-473.) (10.2/11715 U.S.A.)

Editorial Summary: Tables are given showing chemical compositions and physical properties, including a table of physical properties of various casting alloys at elevated temperatures. Special purpose alloys are commented upon, and also a new aluminium alloy for pistons which is beginning to find commercial application and possesses properties particularly desirable in aircraft engines.

Recent developments in magnesium alloys and their application to aircraft engine design are specified, tables of physical properties are given, and comments are made on the characteristics of the material as compared with aluminium alloys. It is believed that for certain applications in which strength and weight saving are the main considerations, magnesium alloys will find wide application, although the author recommends thorough tests before adopting magnesium for major engine parts.

Service Characteristics of Light Alloys. (E. H. Dix, Jr., S.A.E., XXV-5, Nov., 1929, pp. 463-467.) (10.2101/11716 U.S.A.)

Editorial Summary: Aluminium and magnesium, being the lightest commercial metals and therefore the most suitable for aircraft construction, are discussed in their pure and alloyed states. Physical properties of the pure metals and their alloys are given and the effects of adding small quantities of alloying elements are shown. Heat treating as a means of increasing the strength per unit weight of the alloys is discussed at length, together with the effects of natural ageing and artificial ageing at elevated temperatures and of quenching in hot and in cold water after heat treating.

The several types of corrosion are considered and resistance to corrosion of the metals and their various alloys are discussed. Protection afforded to aluminium alloy by a surface coating of pure aluminium is described, and other methods are mentioned.

Tests on Alclad Sheet. (Schmidt, Z.V.D.I., Vol. LXXIII, No. 45, 9/11/29, p. 1612.) (10.2101/11717 Germany.)

Alclad sheets supplied by the Aluminium Co., of America, were tested at the German Adlershof Laboratory for mechanical properties and resistance to corrosion in comparison with duralumin supplied by the German Duren works.

Mechanically the results were identical. The pure aluminium sheets of the alclad did not peel off under extreme conditions. Under corrosion tests the alclad was superior. In German opinion the production of alclad is the most important advance in combating the corrosion of duralumin.

Mathematical Theory of Light Alloy Pistons containing Invar Strips. (E. Mahle, Autom. Tech. Zeit., Vol. XXXII, No. 34, 10/12/29, p. 785, concluded from Part 33.) (10.23/11718 Germany.)

The linear coefficient of expansion for light alloys employed in piston construction lies between .000017 for aluminium silicon alloys and .000026 for aluminium copper alloys and magnesium alloys. By supporting the piston skirt on invar steel strips the expansion of this part can be modified. The coefficient of expansion of the invar steel is of the order of .000001. The invar is a steel containing approximately 33 per cent. of nickel. Small variation of nickel content produces considerable variation to the coefficient of expansion. A nickel content less than 26 per cent. produces no effect. A maximum effect is produced for nickel content of 36 per cent. which has an expansion of only 1/1000th that of the alloy. Beyond 36 per cent. the coefficient rises with increase in nickel. The article describes how by placing the invar strips the clearance between the skirt and the cylinder wall can be made practically independent of the working temperature of the engine. Piston slap and over-oiling when starting up can thus be avoided.

Corrosion Tests with Aluminium and Duralumin in Sea Water. (Summary of Report, Z.F.M., Vol. XXI, No. 11, Nov., 1929, pp. 378-386.) (10.27/11719 Germany.)

Immersion tests in sea water showed that pure aluminium is less attacked than duralumin. The possible mitigation of corrosion by suitable heat treatment is receiving attention. Chromate plating gave the best results. Welding decreases the chemical stability of duralumin, but not that of pure aluminium. Riveting does not increase the corrosion of duralumin, but the rivet itself is attacked. It is important that the material of the rivets should have a contact potential only slightly below that of the duralumin.

Electrolytic Chromium Plating of Metals. (W. Birett, Z.F.M., Vol. XXI, No. 11, Nov., 1929, pp. 372-377.) (10.27/11720 Germany.)

Chromium plating in general is only successful if it can be preceded by nickel plating. Under these conditions a final hard surface is obtained which does not peel and is very resistant to corrosion. The article describes the modern technique of the method.

New Researches on the Treatment of Duralumin as Affected by Fe, Si and Mn. (K. L. Meissner, Z. Metallk., Vol. XXI, Part 10, Oct., 1929, pp. 328-332.) (10.27/11721 Germany.)

The theory that magnesium silicide is formed does not hold good; the magnesium alone determines the effects of treatment.

Iron has a detrimental effect on copper-aluminium alloys, which is no longer found with Cu-Mg-Al alloys.

The results of tests before and after treatment are tabulated and a set of conclusions is drawn as to the effects of adding the various components.

Corrosion of "Alclad" Sheet. (E. Rackwitz, L.F.F., Vol. V, No. 4, Oct., 1929, p. 142.) (10.27/11722 Germany.)

The results of tests carried out in Germany on this American invention show conclusively that alclad has notably better corrosion resisting qualities than

duralumin, obtained with slight increase of weight.   Alclad is recommended
particularly for seaplane floats and for boat hulls.

Methods of Research in Metallography.   (Dr. G. Masing, Engineering, Vol.
CXXVIII, No. 3334, 6/12/29, p. 756.)   (10.28/11723 Great Britain.)
An abridged report of a paper read before the Institute of Metals, Dusseldorf, 10/9/29.

Physical-Chemical and Chemical Properties of Timber.   (Prof. Dr. C. G.
Schwalbe, Z.V.D.I., Vol. LXXIII, No. 42, 19/10/29, pp. 1521-1524.)
(10.32/11724 Germany.)
Wood consists principally of cellulose, wood gum and lignine.   These substances are present in a colloidal condition and their relative proportions determine the nature of the wood as well as its behaviour towards chemical agents.
The various methods of protecting wood against outside influences are described.
If satisfactory methods of preventing warping, cleavage and shrinking could be
devised timber would hold its own against iron and concrete as a building material.

Artificial Drying and Seasoning of Timbers.   (H. Will, Z.V.D.I., Vol. LXXIII,
No. 40, 5/10/29, pp. 1421-1423.)   (10.32/11725 Germany.)
A design of drying oven in side and end elevations shows the packing of
the timber and the circulation of steam or air.   By controlling the moisture,
temperature and rate of circulation of the medium (air, steam, etc.) rapid drying
and seasoning can be obtained without deterioration of the quality.

Ice Formation on Planes Studied in Wind Tunnel.   (U.S.N. Inst. Proceedings,
No. 319, Vol. LV, September, 1929, p. 815.)   (10.46/11726 U.S.A.)
A brief note states that the condition under which ice forms upon aeroplanes
have been successfully reproduced in a small wind tunnel.

A Symposium on Ageing of Rubber.   (Ind. and Engineering Chem., Vol. XXI,
No. 11, Nov., 1929, p. 1008.)   (10.52/11727 U.S.A.)
Editorial Summary: The Geer oven and the Bierer-Davis oxygen bomb have
produced a striking improvement in the durability of rubber goods.
Some doubt has existed as to the extent to which artificial ageing represents
the course of natural ageing.   The subject, in spite of its importance, cannot yet
be regarded as rationalised.
The authors of the seven papers published (noted below) attempt to present
their data in a quantitative manner, where such treatment seemed at all warranted,
and a close study of the papers will enable the reader to reach a clear idea as
to the possibilities and the limitations of artificial or accelerated ageing as now
practised.

(1) Relation between artificial ageing tests and natural ageing.   (J. M.
Bierer and C. C. Davis.)
(2) Natural *v.* artificial ageing.   (Stanley Krall.)
(3) Accelerated ageing *v.* shelf ageing.   (E. M. Follansbee.)
(4) Ageing of mechanical rubber goods stocks by various methods.   (K. J.
Soule.)
(5) Some notes on artificial ageing tests for rubber.   (W. W. Vogt.)
(6) Correlation of various ageing tests with natural shelf ageing.   (S. M.
Cadwell.)
(7) Correlation between Geer oven and natural ageing of selected Tire compounds.   (A. H. Nellen and H. M. Sellers.)

Measure of Shock Absorber Performance. (E. W. Weaver, Autom. Ind., Vol.
 LXI, No. 24, 14/12/29, p. 870.) (10.57/11728 U.S.A.)
 An indicator has been devised for recording the action of automobile springs
damped by shock absorbers. A number of indicator cards are reproduced.

The Operational Solution of Linear Differential Equations. (Balth. van der
 Pol, Phil. Mag., Vol. VIII, No. 53, 1929, p. 861. See also previous
 paper, Vol. VII, p. 1153.) (10.61/11729 Great Britain.)
 The author develops the method of Heaviside in a manner of interest
principally to mathematicians, though no doubt the methods will find application
in physics and engineering.

TESTING APPARATUS, ETC.

Wind Tunnel at California Institute. (S.A.E., XXV-5, Nov., 1929, p. 520.)
 (11.11/11730 U.S.A.)
 Editorial Summary : The institute wind tunnel is round in section and con-
stitutes a closed circuit. Deflecting vanes at the corners serve to change the
direction of the air with little loss of energy and keep the rate of flow almost
uniform throughout the area of the working section. The material used is
concrete, with wood for the working section and removable sections. An idea of
the size of the tunnel is given by the photographs and the sectional drawing,
which shows that it extends from the sub-basement level to the third floor level.
The main dimensions of the tunnel are given.

Experimental Determination of Stresses in Aeroplane Frames. (W. Margoulis,
 L'Aerotechnique, Vol. XI, No. 118, March, 1929, pp. 81-84.) (11.21/11731
 France.)
 An instrument is described which is clamped into members of a frame before
load. The deformation of the member by elongation, curvature, torsion, etc.,
produces a corresponding deformation of xylonite strips forming part of the
instrument, and the numerical value is taken from a calibration table of strain
against colour changes.

Faults in the Manufacture of Gas Bottles. (Aeuer and Sorge, Z.V.D.I., Vol.
 LXXIII, No. 45, 9/11/29, pp. 1613-1615.) (11.24 11732 Germany.)
 The usual methods of testing gas bottles do not reveal sintering and porosity.
Photographs illustrate a method of X-ray examination which reveals such defects.
The cost, about 3/- per bottle, justifies examination in relation to first cost and
added security.

Inspection of Metals and Their Alloys. (L. W. Johnson, Automobile Engineer,
 Vol. XIX, No. 262, Dec., 1929, pp. 111-158.) (11.24/11733 Great Britain.)
 A systematic set of tests is described with explanatory diagram. Photo-
graphs are given of defects revealed by these methods.

AIRSHIPS

Airship R.100. (R. B. Brigham, Flight, Vol. XXI, No. 1096, 27/12/29, p. 1352.)
 (12.11/11734 Great Britain.)
 A descriptive account giving many details of the construction and equipment
of R.100.

Speed and Deceleration Trials of U.S.S. Los Angeles. (S. J. De France and
C. P. Burgess, N.A.C.A. Report, No. 318, Oct., 1929.) (12.12/11735
U.S.A.)

Authors' Summary: The trials proved very conclusively that the water
recovery apparatus increases the resistance about 20 per cent., which is serious
and shows the importance of developing a type of recovery having less resistance.

Between the American and German speed trials without water recovery there
remains an unexplained discrepancy of nearly 6 per cent. in speed at a given rate
of engine revolutions. Warping of the propeller blades and small cumulative
errors of observation seem the most probable causes of the discrepancy.

American All-Metal Airship ZMC.2. (Luftwacht, No. 11, November, 1929,
p. 512.) (12.12/11736 Germany.)

The airship consists of an outer cover of alclad, with ring girders giving
stiffness, and a few internal wires. The seams are riveted by special machine
and rendered gastight with an asphalt composition. The gas leakage is of the
order of 1/10th litre per m² in 24 hours. The volume is 5720 m³, length 45 m.
and max. diam. 16 m. With helium filling the useful load is 1,565 kilograms.

Numerical Analysis of R.101's Performance. (Korvettenkapitan A. D. Belitz,
Luftfahrt, Vol. XXXIII, No. 19/20, 22/10/29, pp. 294-295.) (12.12/11737
Germany.)

The published figures are analysed from several points of view. Apprecia-
tion is offered as to the various technical novelties, but the reduction of useful load
by the use of heavy oil engines is noted.

New American Airship Z.R.S.4. (Editorial, " Aviation," Vol. XXVII, No. 20,
16/11/29, p. 991.) (12.12/11738 U.S.A.)

A photograph is given of the laying of the first ring in the structure of the
new American airship Z.R.S.4, at Akron, Ohio. In addition to the two naval
airships reference is made on the following page to the building of two new
commercial ones, each of 6,500,000 c.f. helium capacity, a second airship shed
at Akron and one in Southern California, and mooring masts at Hawaii and in
the Philippines.

Flight Tests on U.S.S. Los Angeles—Stress and Strength Determination. (C. P.
Burgess, N.A.C.A., Rep., No. 325, Nov., 1929.) (12.2/11739 U.S.A.)

Author's Summary: The tests described in this report furnished data on
the actual aerodynamic forces, and the resulting stresses and bending moments
in the hull of the U.S.S. Los Angeles during as severe still-air manœuvres as
the airship would normally be subjected to, and in straight flight during as rough
air as is likely to occur in service, short of squall or storm conditions. The
maximum stresses were found to be within the limits provided for in accepted
practice in airship design. Normal flight in rough air was shown to produce
forces and stresses about twice as great as the most severe still-air manœuvres.
No light was thrown upon the forces which might occur in extreme or exceptional
conditions, such as the storm which destroyed the Shenandoah.

The transverse aerodynamic forces on the hull proper were found to be small
and irregular. Owing to the necessity of conserving helium, it was impossible
to fly the airship in a condition of large excess of buoyancy or weight in order
to determine the air pressure distribution at a fixed angle of pitch. However,
there is every reason to believe that in that condition the forces on the actual
airship are as close to the wind tunnel results as can be determined by present type
of pressure measuring apparatus.

It is considered that the most important data obtained are the coefficients of
tail surface forces and hull bending moments. These are tabulated in this report.

Flight Tests on U.S.S. Los Angeles—Full-Scale Pressure Distribution Investigation. (S. J. De France, N.A.C.A. Rep., No. 324, Nov., 1929.) (12.3/11740 U.S.A.)

Author's Summary: The investigation reported herein was conducted by the National Advisory Committee for Aeronautics at the request of and in conjunction with the Bureau of Aeronautics, Navy Department. The purpose was primarily to obtain simultaneous data on the loads and stresses experienced in flight by the U.S.S. Los Angeles, which could be used in rigid airship structure design. A secondary object of the investigation was to determine the turning and drag characteristics of the airship. The stress investigation was conducted by the Navy Department. The aerodynamic loading was obtained by measuring the pressure at 95 locations on the tail surfaces, 54 on the hull and five on the passenger car. These measurements were made during a series of manœuvres consisting of turns and reversals in smooth air and during a cruise in rough air which was just short of squall proportions. The results of the pressure measurements on the hull indicate that the forces on the fore-body of an airship are relatively small. The tail surface measurements show conclusively that the forces caused by gusts are much greater than those caused by horizontal manœuvres. In this investigation the tail surface loadings caused by gusts closely approached the designed loads of the tail structure. The turning and drag characteristics will be reported in separate papers.

Investigations of the Power Plant of the Airship Graf Zeppelin. (Dr. Ing. H. Thoma, Z.V.D.I., Vol. LXXIII, No. 39, 28/9/29, p. 1383.) (12.8/11741 Germany.)

During the flight to America in May, 1929, four out of the five engines failed by fracture of the crankshaft through resonant vibrations brought into the working range by an alteration in the tension of the spring coupling between engine and airscrew. By altering the dimensions of the clutch it was possible to avoid the resonant period and no further trouble has been experienced. The vibration dampers fitted to the free end of the crankshaft were designed for the fundamental frequency. Their failure was due to the high frequency impulses of the transmission gear. To measure crankshaft vibrations electrically gear wheels are attached to different parts of the shaft, the meshing of the teeth depending on the relative twist. Change in meshing is measured by the changes in electrical capacity of a circuit including a gear wheel and recorded by an oscillograph.

Reliable Power Plant for Airships. (Lt.-Cmdr. J. M. Shoemaker, Aviation, Vol. XXVII, No. 24, 14/12/29, p. 1158.) (12.8/11742 U.S.A.)

A descriptive account and discussions of various engine failures in airships and suggestions for their avoidance.

Diesel Engines for Motor Boats. (Lt. J. O. Huse, J. Am. Soc. Nav. Eng., Vol. XLI, No. 4, pp. 535-562.) (12.81/11743 U.S.A.)

A useful summary of the relative positions of small marine c.i. engines, in the United States and in Europe.

The Application of the Diesel Engine to Locomotive Traction. (Von F. Meineke, Z.V.D.I., Vol. LXXIII, No. 42, 19/10/29, p. 1509.) (12.81/11744 Germany.)

For train propulsion torque must increase with decrease of r.p.m. This can most conveniently be obtained by boosting the Diesel engine, the amount of boost being a maximum at low speed. To keep down the maximum pressures

the compression ratio should diminish with increase in boost.   For this object it is proposed to fit a special piston in which the crown transmits the pressure to the connecting rod by a coil spring, so that high boost pressure automatically increases the clearance volume and reduces the maximum pressure.

Two-Cycle Solid Injection Diesel Engine designed by F. B. Stearns. (Autom. Ind., Vol. LXI, No. 21, 23/11/29, p. 748.) (12.81/11745 U.S.A.)
   The engine is a six-cylinder V, bore 6 ins., stroke 8 ins.   A Roots' blower supplies scavenging air.   The fuel is injected by a piston pump with needle valve nozzles.   The engine is stated to develop 200 h.p. at 1,000 r.p.m. at a total weight of 3,900 lbs.

Motoring Diagrams of Diesel Engines. (Z.V.D.I., Vol. LXXIII, No. 47, 23/11/29, p. 1687.) (12.81/11746 Germany.)
   Evidence of dribbling at the fuel valve can be detected in motoring diagrams, but much more rarely with solid injection than with air injection.

Use of Gas Fuel on the Airship Graf Zeppelin.   Report of the Zeppelin Con-struction Co., Friederichhafen. (F. Sturn, V.D.I., Vol. LXXIII, No. 37, 14/9/29, pp. 1303-4.) (12.84/11747 Germany.)
   Any mixture of gaseous hydrocarbons can be used on bringing the density up to that of the atmosphere by admixture of hydrogen.   Ten gases were tested, and the mixture finally adopted contained 13 per cent. ethylene, 26 per cent. propylene, 13 per cent. butylene, 25 per cent. methane, 16 per cent. ethane and 5 per cent. hydrogen (+ 2 per cent. unspecified), constituting the so-called " Blangas."
   Since gas fuel is free from knocking, the compression ratio in the cylinders was increased to 7 : 1 (in the previous airship 6 : 1).   The improvement in output is shown graphically.   The economy of fuel is also shown graphically in com-parison with benzol, the same power being obtained at lower r.p.m. and the consumption being less at given r.p.m.
   Blangas has a density of 1.08 and a calorific value of 14,000 K. cal./m³.

WIRELESS

Experiments with Water Waves, Representing Analogous Phenomena in Electro-Magnetic Waves. (L. Heck, Z.H.F.T., Vol. XXXIV, No. 4, Oct., 1929, pp. 121-131.) (13.0/11748 Germany.)
   Twenty photographs of water waves produced on the surface of a tank illustrate corresponding phenomena in radio-telegraphy.   Phenomena of reflec-tion, refraction and interference are clearly brought out.

Directional Characteristics of Combined Aerials with Harmonics. (G. Gresky, Z.H.F.T., Vol. XXXIV, No. 4, Oct., 1929, pp. 132-140.) (13.0/11749 Germany.)
   Simple equations are formed and fourteen cases are illustrated graphically on charts, showing intensity as a function of direction, in polar co-ordinates.

Atmospheric Disturbances in Sending and Receiving at High Mountain Altitudes. (J. Fuchs, Z.H. Freq. Tech., Vol. XXXIV, No. 3, Sept., 1929, pp. 96-101.) (13.0/11750 Germany.)
   Observations were carried out at the observatory situated on the Sonnblick, near Salzburg, at a height of 3,106 m.   Receiving and sending strengths were substantially the same as for Vienna, 2,900 m. lower, but atmospheric disturb-ances were greater.   Electrical phenomena associated with precipitation were observed and are tabulated.

New Wave Length Standard for X-Rays. (A. H. Compton, Jnl. Franklin Inst., Vol. CCVIII, No. 5, Nov., 1929, p. 605.) (13.1/11751 U.S.A.)

It is possible to secure X-ray spectra from ruled reflection gratings if the X-rays are allowed to strike the reflecting surface at a sufficiently sharp glancing angle.

Dr. J. A. Bearden has made measurements by the ruled grating method that seem to be of much higher precision than those of the previous investigators. Results are given in tables and three photographic representations exhibit the order of accuracy to be expected.

Wireless in Aeronautics. (Dr. H. Orlovius, Luftfahrt, Vol. XXXIII, No. 19/20, 22/10/29, pp. 291-292.) (13.1/11752 Germany.)

Applications to direction finding and course laying are discussed. Two examples are given of charts transmitted by wireless to an aeroplane, one a weather chart showing the advance of a line squall, the second an aerodrome map showing a flooded portion of the landing ground. It is stated that the only apparatus used beyond normal aeroplane wireless equipment was the comparatively small and light " Fultograph."

The reproductions sent by wireless are excellent as shown.

Simple Methods of Determining Wireless Valve Constants. (M. von Ardenne, Z.H.F.T., Vol. XXXIV, No. 4, Oct., 1929, pp. 143-145.) (13.2/11753 Germany.)

A variable resistance is inserted in the anode circuit by means of which the anode potential can be brought almost to zero. Plotting voltage against current approximately straight line curves are obtained, and although these turn off abruptly near the limiting current they can be produced to cut the horizontal asymptotic, thus giving the reading required. Various sources of error are discussed.

The apparatus is extremely simple and the results appear to be satisfactory.

Directional Wireless Applied to Navigation of Ships and Aircraft. (W. Loth, C.R., Vol. CLXXXIX, No. 18, 28/10/29, pp. 682-684.) (13.4/11754 France.)

The interesting proposal is made to regulate the rotation of two wireless beams from different stations so that their point of intersection follows the course set. A simple rule determines the deviation from the course in terms of the time difference of reception of the two signals.

Mutual Impedance between Adjacent Antennæ. (C. R. Englund and A. B. Crawford, Bell Tele. Lab., Reprint, No. B-423, Sept., 1929.) (13.5/11755 U.S.A.)

Author's Summary : The simple theory for the computation of reflecting or multi-branch antennæ systems is sketched. If the points at which observations of electrical quantities are to be made are indefinitely specified, a knowledge of the self and mutual impedances (properly defined) between antennæ is sufficient to make the computations determinate.

High Grid Resister Amplifier. (W. B. Nottingham, Jrnl. Franklin Inst., Vol. CCVIII, No. 4, pp. 469-474.) (13.5/11756 U.S.A.)

An account is given of Mulder and Razek's result that the effective mutual conductance of a three-element " vacuum " tube can be greatly increased by operating the tube in a grid circuit containing a high resistance. The equations are simple and are exhibited in two diagrams.

Calculation of Characteristics and the Design of Triodes. (Yuziro Kusunose, Inst. Rad. Eng., Vol. XVII, No. 10, Oct., 1929, pp. 1706-1749.) (13.5/11757 U.S.A.)

Author's Summary: The first part deals with the calculation of characteristics and constants of the triode from the electrode structures, special considerations being taken for applying the formulæ already established for tubes of complicated structures. In the second part the derivation of various working conditions of a triode from its static characteristic is treated, in which the writer worked out a graphical representation of d.c. and a.c. components of the anode working current at various working voltages. The resulting dynamic characteristic diagram is applicable to any type of triodes in evaluating the working voltages, currents and powers, whether the tube be used as an amplifier, oscillator or modulator. The third part presents the designing procedure for a typical case in which the use of a triode is indicated and its power output is given. First the working points are determined on the dynamic characteristic diagram so as to give the required working condition; then all the quantities arising in the operation are known in their relative amounts. The present paper, being an abridgment of a paper published in Japan, is primarily intended for presenting a simple method of designing triodes.

Ions and Electrical Currents in the Upper Atmosphere of the Earth. (E. O. Hulburt, Physical Review, Vol. XXXIV, No. 8, 15/10/29, pp. 1167-1183.) (13.5/11758 U.S.A.)

Author's Summary: It is assumed that the ionisation in the upper atmosphere is caused by the ultra-violet light of the sun and that the ion and electron densities at noon at the equator are in keeping with the facts of wireless waves. From the laws of recombination of the ions and of diffusion and drift of the ions in the earth's magnetic, gravitational and electrical fields the distribution of the ions over the earth is worked out. The distribution is found to agree with wireless data over the earth, and with Gunn's diamagnetic theory of the solar diurnal variation of the earth's magnetism (Phys. Rev. 32, 133 (1928)). The gravitational drift currents are found to flow mainly along the parallels of latitude in the following way: (1) A current sheet in the daylight hemisphere flowing eastward in the levels above 150 km. which at the sunrise and sunset longitudes divides into two sheets; (2) one of these flows westward on the day side of the earth underneath (1) in the levels below 150 km.; and (3) the other sheet continues eastward around on the night side of the earth. The current is mainly (4/5) between the 40th parallels of latitude north and south, and falls to lower values at the higher latitudes. The total currents in the three sheets are about 1.16×10^7, 8.7×10^6 and 2.9×10^6 amperes respectively. The east and west daytime current sheets subtract from each other leaving in effect an eastward current of about 2.9×10^6 amperes flowing around the earth all the time. This causes a magnetic field agreeing in magnitude and type with that obtained by Bauer in his 1922 analysis of the magnetic field of the earth of external origin (Terr. Mag. 28, 1 (1923)). The current sheets are not of the type required by Chapman's drift current theory of the diurnal magnetic variation (Proc. Roy. Soc. A122, 369 (1929)). As a result of the drift currents, the sunset longitude of the earth is at a potential around 2,000 volts above that of the sunrise longitude. This electric field combined with the earth's magnetic field causes the ions and electrons on the night side of the earth to drift upward with velocities between 100 and 200 cm. sec.$^{-1}$. The ions and electrons move into regions of lower pressure and therefore do not recombine as fast as they otherwise would. This removes a difficulty from an earlier calculation which yielded a slightly too great rate of disappearance of the free charges at night. The upward drift of the ionisation causes a rise of the Kennelly Heaviside layer which is, partially at

least, compensated for by the fall due to the cooling and contraction of the atmosphere at night, and is complicated by the diffusion of the ions. It is difficult to say how much of the night-time rise of the layer observed in experiments with wireless rays may be a genuine rise and how much may be an apparent rise due to delayed group velocities, or to other causes.

Relation between the Range of Very Short Waves and Height of Transmitter. (H. Gassbender and G. Kurlbaum, 125th Report of D.V.L., L.F.F., Vol. III, 1929, Part 4, pp. 96-98.) (13.7/11759 Germany.)

For long waves there is no demonstrable relation between height and range. For short waves there is a close dependence.

Waves of 3.7 m. transmitted by a one-watt sender were employed. The range varies from one-third to two-thirds of distance of the visible horizon, in round figures. With these low powers apparently only the direct ray is sensible at the receiver end.

The Propagation of Short Waves of Small Energy over a Range of 1,000 km. (K. Konger, H. Plendl, L.F.F., Vol. III, No. 4, 22, April, 1929, pp. 89-95.) (13.7/11760 Germany.)

A two-watt short wave transmitter, 200 volts, with a quartz crystal and frequency doubler, giving waves of 30-70 metres length is illustrated by photographs and diagrams. A table gives six types of two-watt apparatus weighing from 2-6 kilograms, and three larger types weighing from 12-15 kg., exclusive of batteries.

Diagrams show the zones of good reception, of poor reception, and of silence. A photograph is given of a Junker F.13 with the equipment fitted and of the control board. The tests were made in flights totalling 20,000 km. over land. The meteorological effects are discussed. The strength of the signals is independent of aeroplane height and messages can be sent and received from the ground. The small weights involved are remarkable.

The Selection of Standards for Commercial Radio Television. (J. Weinberger, A. Smith and G. Rodwin, Proc. Inst. Rad. Eng., Vol. XVII, No. 9, Sept., 1929, pp. 1584-1620.) (13.8/11761 U.S.A.)

Author's Summary: The elements considered are picture proportions, number of scanning elements, number of picture repetitions per second, scanning method and direction, phase of transmitted current.

Synchronising is considered, with possible methods, and also various arrangements for utilising the television channel.

Mechanical Developments of Facsimile Equipment. (R. H. Ranger, Proc. Inst. Rad. Eng., Vol. XVII, No. 9, Sept., 1929, pp. 1564-1575.) (13.8/11762 U.S.A.)

Descriptive account of some of the apparatus used, with sketches.

The Drum Scanner in Radiomovies' Receivers. (C. F. Jenkins, Proc. Inst. Rad. Eng., Vol. XVII, No. 9, Sept., 1929, pp. 1576-1583.) (13.8/11763 U.S.A.)

Descriptive account with sketches of some of the apparatus used.

Fight for British Television. (W. Barrie Abbott, Television, No. 21, Vol. II, Nov., 1929, pp. 468-469.) (13.8/11764 Great Britain.)

The pros and cons of television broadcasting are discussed by the protagonists of the Baird system and the B.B.C. officials.

Television in U.S.A. (Television, No. 21, Vol. II, Nov., 1929, pp. 460-463.) (13.8/11765 Great Britain.)

In an account of the New York Radio Show of September, 1929, brief descriptions are given of wireless and television activities.

Photographing a Television Image. (A. F. Birch and D. R. Campbell, Television, No. 21, Vol. II, Nov., 1929, p. 448.) (13.8/11766 Great Britain.)

Four photographic reproductions of television images are given.

Television in Germany. (Dr. S. Loewe and Dr. P. Goerz, Television, Vol. II, No. 21, Nov., 1929, pp. 428-430.) (13.8/11767 Great Britain.)

A brief account is given of the activities of the Fernseh Company in providing television for private individuals. A special receiver and apparatus connected with the mains required to be installed. The transmission is confined to a low-powered Witzleben station, $1\frac{1}{2}$ k.w., but it is intended to transfer it to the more powerful station at Konigswusterhausen.

Television, Some Suggested Schemes. (E. G. Lewin, Television, Vol. II, No. 23, Jan., 1930, p. 554.) (13.8/11768 Great Britain.)

A descriptive account is given with some diagrams of five proposed systems.

MISCELLANEOUS

The Distribution of Light in Optical Systems. (A. C. Hardy, Journ. of Franklin Institute, Vol. CCVIII, No. 6, Dec., 1929, p. 773.) (14.0/11769 U.S.A.)

A discussion of the problem of computing the distribution of light flux at every point of an optical system from the data as to intensity of source and constants of lenses employed. A nomenclature is carefully defined particularly with respect to setting out photometric units, and various problems in the flux of light are solved by the use of elementary mathematics.

The Action of Chromic Acid on the Sensitivity of Solarised Silver Bromide Plates. (A. P. H. Trivelli and R. P. Loveland, Journ. of Franklin Inst., Vol. CCVIII, No. 6, Dec., 1929, p. 731.) (14.0/11770 U.S.A.)

Authors' Summary : The reaction of chromic acid on the sensitivity of photographic emulsions is discussed and it was found to be of a complex nature. This can be analysed into :—

(a) A very slow action on the silver halide itself.
(b) An action on the silver and on the silver sulphide of the sensitivity speck, with different reaction velocities.
(c) An action on the gelatine of partial hydrolysis and oxidation, forming and destroying at the same time a new sensitiser.

Air Survey of Alaska. (Clayton Knight, U.S. Air Services Mag., Vol. XIV, No. 12, Dec., 1929, p. 38.) (14.0/11771 U.S.A.)

A descriptive account of the U.S. Government survey giving details of the crew, equipment and methods.

Problems of Aerial Photography. (Lt. Guillaume, Rev. F. Aer., Oct., 1929, No. 3, pp. 332-342.) (14.1/11772 France.)

A clear account of the general problems with useful abacs (nomograms) for the reduction of oblique photographs.

Air Survey in Northern Rhodesia. (Flight, Vol. XXI, No. 1096, 27/12/29, p. 1342.) (14.1/11773 Great Britain.)

An anonymous article giving a descriptive account of the equipment and work of the aircraft engaged in carrying out extensive aerial survey work.

Mechanisation. (Army Ordnance, Vol. X, No. 57, p. 180.) (15.21/11774 U.S.A.)

An account of development of the armoured car with numerous photographs of the different types.

Anti-Aircraft Artillery. (G. M. Barnes, Army Ordnance, Vol. X, No. 56, Sept., 1929, pp. 103-111.) (15.21/11775 U.S.A.)

A descriptive account of a 3-inch quick-firing A.A. gun with electrically driven training devices. Lists of data are given and photographs of some details of the training gear. A photograph is also given of a 4-inch A.A. gun of about 60 calibres length with electrical training gear.

Guggenheim Safety Competition. (L. E. Neville, Aviation, Vol. XXVII, No. 24, 14/12/29, p. 1146.) (16.1/11776 U.S.A.)

A series of descriptive articles with sketch illustrations of safety devices.

The Bergemann Cock. (L'Air, No. 238, 1/10/29, p. 29.) (16.12/11777 France.)

A spring-loaded fuel cock between carburettor float chamber and fuel supply pumps is held open by a treated cotton string stretched across the carburettor intake. If a backfire sets the fuel in the carburettor on fire the cotton is burnt through, the fuel supply cut off and the float chamber drained into a container charged with carbon-tetrachloride. The device received a prize at the Paris Exhibition of touring aircraft.

Aircraft Carriers: Description of Acceptance Trials of U.S.S. Lexington. (Cmdr. C. S. Gillette, Journ. Am. Soc. of N. Engineers, Vol. XL, No. 3, Aug., 1928, p. 438.) (18.12/11778 U.S.A.)

A paper giving extensive details of construction, mostly of interest to naval architects.

Japan's New Navy. (Dr. Oscar Parkes, Sc. Am., Vol. CXLI, No. 5, Nov., 1929, pp. 396-399.) (18.12/11779 U.S.A.)

A descriptive article, with photographs of the Japanese aircraft carriers "Akagi" and "Kaga."

Catapult Postal Aeroplane. (Ill. Flug., Vol. XI, No. 8/9, 1929, p. 151.) (18.4/11780 Germany.)

A descriptive article, with twelve photographs, a map and a weather chart on launching a postal seaplane from a catapult on the "Bremen."

Competition for Design of Airport. (Aviation, Vol. XXVII, No. 24, 14/12/29, p. 1181.) (20.0/11781 U.S.A.)

A brief account is given of the winning design.

Insuring Safety on Air Routes. (L. D. Seymour, Sc. Am., Vol. CXLI, No. 6, Dec., 1929, p. 504.) (20.3/11782 U.S.A.)

A descriptive account of the inspection and security organisation as practised on American air lines.

The New Munich Oberwiesenfeld Aerodrome. (K. J. Mossner, Z.F.M., Vol.
XX, No. 19, Oct., 1929, p. 493.) (20.4/11783 Germany.)
A descriptive account is given of the equipment of the new flying port at
Munich with photographs, maps and drawings of the landing ground and
buildings.

Device for Picking Up Air Mail. (L'Aeiophile, Vol. XXXVII, No. 21/22,
15/11/29, pp. 342-343.) (20.41/11784 France.)
Photographs and diagrams are given of a device for picking up mail sacks
in flight.

Aerodrome Lighting. (Aviation, Vol. XXVII, No. 19, 9/11/29, p. 960.)
(20.5/11785 U.S.A.)
Requirements for the lighting of airports under varying conditions and for
various purposes are considered in detail in the following pamphlets:—
" Looking Ahead in Airport Lighting," by C. E. Weitz; Bulletin 55, issued
by National Lamp Works of General Electric Company, Cleveland, Ohio, Sept.,
1929.
" The Design and Lighting of Airports," by L. A. S. Wood (Manager,
Exterior Lighting Section, Westinghouse Electric and Mfg. Co.); Paper pre-
sented at American Society for Municipal Improvements Convention, Phila-
delphia, Pa., Oct., 1929.

Vector Representation of Photometric Quantities. (M. M. Gurevic, Phys. Zeit.,
Vol. XXX, No. 19, Oct., 1929, pp. 640-644.) (20.5/11786 Germany.)
The illuminating power of an element of a surface emitting light is repre-
sented by a vector normal to the surface and proportional to the area of the
element and intensity of emission per unit area.
An element of an illuminated surface is represented in a similar manner.
The total illumination falling on the second surface from the first is then readily
represented in vector notation by a double integral involving all elements of both
surfaces and their mutual vector distances.

Handling of Seaplanes in Airports. (Ill. Flugwoche, Vol. XI, No. 8/9, 1929,
p. 179.) (20.61/11787 Germany.)
A description with 14 photographs and sketches of the handling of seaplanes
and flying boats by means of trolleys, slipways, cranes and floating docks.

Hoisting and Lowering Seaplanes from a Ship. (Ill. Flugwoche, Vol. XI, No.
8/9, 1929, p. 159.) (20.7/11788 Germany.)
A descriptive article with four photographs, showing a flexible slipway
lowered from the deck of a ship and trailing in the sea.