ABSTRACTS FROM THE SCIENTIFIC AND TECHNICAL PRESS.

Issued by the

Directorates of Scientific Research and Technical Development, Air Ministry.

(Prepared by R.T.P.3.)

No. 105. AUGUST, 1942.

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Relative Ballistics During Dive Bombing. (N. Cavicchioli and R. Giuliano, l'Aerotecnica, Vol. 21, No. 12, December, 1941, pp. 798-806.) (105/1 Italy.)

In the well known Siacci method of trajectory calculation, the mean value of the characteristic parameter β over a small arc depends on the constant value n of the resistance law λv^n assumed to hold over the arc in question. The index n depends on the velocity and thus cannot be fixed arbitrarily. This increases the labour involved in the calculation to an appreciable extent, since several trials may be required before the requisite agreement is obtained.

The authors obviate such iteration difficulties by expressing the parameter β as a function of θ_1, the inclination of the trajectory of the initial velocity. The mean value β_m over the range $\theta_0 - \theta$ is given to a first approximation by

$$\beta_m = \beta_0 - \tfrac{1}{2} N(v_0) \{ \sin \theta_0 (\tan \theta_0 - \tan \theta) \}$$

where $\beta_0 = 1/(\cos \theta_0)$.

$N(v_0)$ = tabulated velocity function.

Provided the arc is sufficiently short, this value can be used over the whole length. The method is illustrated by determining the x, y, t co-ordinates of a bomb released at 6,000 m., $\theta_0 = 40°$, $\theta_1 = 43° \; 26' \; 12''$, $v_0 = 120$ m./sec. (along trajectory).

It is shown that the values obtained for a single arc calculation by the new method are in excellent agreement with those obtained by the original Siacci method utilising 5 arcs to cover the same interval.

A great advantage of the new method apart from the saving in time consists in the fact that the errors involved by neglecting terms in the β expansion can be readily evaluated.

Lanchester's N^2 Law on Effective Strength. (Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 123-124.) (105/2 Great Britain.)

In hand to hand fighting, opponents of equal value will theoretically destroy each other and if the fighting is limited to individual combats, the greater force will be left with a number of combatants equal to the original difference in numbers. With long range weapons, however, the fire power of the whole army can be concentrated on the opponent and the rate of loss of each side will thus be proportioned to the respective number of opponents engaged, other factors being equal.

Thus if b and r denote the respective numbers engaged, $(b > r)$

$$\frac{db}{dt} = -Ar \text{ and } \frac{dr}{dt} = -Ab$$

$$i.e., \quad \frac{b\,db}{dt} = \frac{r\,dr}{dt}$$

and integrating over the interval $0 - T$, where T corresponds to the time when $r=0$, we have $b^2 = B^2 - R^2$, *i.e.*, after destruction of r, $b = \sqrt{(B^2 - R^2)}$ when B and R are the respective numbers originally engaged.

Thus if $B = 70{,}000$ and $R = 50{,}000$, annihilation of R will leave B still with nearly 50,000 men, ($\sqrt{\{70{,}000^2 - 50{,}000^2\}}$), whilst destruction of R in single combat (hand-to-hand fighting) would have left B with only 20,000 men. Thus under concentrated fire and otherwise equal conditions, the effective fighting strength is proportional to the square of the number of combatants and this is known as the Lanchester or N^2 law. If the fighting values of the combatants differ on the two sides, the proportionality factor will be different for the two opponents, *i.e.*, the fighting strength of numerical forces b and r considered above will vary as Kb^2 and Ct^2 respectively when K and C represent the fire power per unit of b and r respectively.

Thus if b can fire at 16 times the rate of r, equality in fighting strength necessitates that r should have fourfold superiority in numbers.

Similarly, three fighters with 12 machine guns each attacking a single bomber with four machine guns have an effective superiority of 27/1 against only 3/1 if attacking singly.

Provided co-operation between the fire of all the units is ensured (individual targets), the N^2 law indicates that numbers are more important than armament.

A departure of present day aerial tactics from single combat (dog fight) to concentrated fire would thus appear to lead to interesting possibilities.

https://doi.org/10.1017/S0368393100140672 Published online by Cambridge University Press

The Effect of Increased Resistance Due to Compressibility on the Tactical Employment of Fighter Aircraft. (E. Muhlemann, Flugwehr und Technik, Vol. 4, No. 8, August, 1942, pp. 208-210.) (105/3 Switzerland.)

The author considers the case of two aircraft of identical performance, of which the one flies at maximum speed in a horizontal direction whilst the second, originally above and behind the first, dives on to it at maximum speed (so-called curve of pursuit). During the dive, the thrust of the propeller is increased by the gravity component and the equation of motion becomes:—

$$m\frac{dv}{dt} = \frac{L\eta}{v} + G \sin \theta - c_w\left(\frac{\rho}{2}\right)v^2F$$

where m = mass of aircraft.
v = velocity along trajectory.
L = h.p. of engine.
η = propeller efficiency.
G = weight of aircraft.
θ = inclination of trajectory.
c_w = resistance coefficient.
F = effective area.

By applying this equation in steps and assuming that the diving aircraft is constantly pointed at the enemy, the curve of pursuit can be constructed graphically on the assumption that η and c_w are constant. The author shows that for a given case:—

Initial speed of both aircraft	= 200 m./sec.
Altitude of horizontal flight	= 5,000 m.
Original excess height of pursuer	= 1,000 m.
Original rear distance of pursuer (measured horizontally)	= 1,000 m.
G	= 4,500 kg.
Wing loading	= 175 kg./m.^{2}.

The enemy will be caught up in 60 seconds, the pursuer still having a speed of over 210 m./sec.

Matters are however completely changed if the effect of Mach number on c_w and η be taken into consideration. Above M=0.6, c_w undergoes a rapid increase whilst η also falls markedly. As a result, the initial gain in speed due to the dive is not maintained and the normal speed (200 m./sec.) is regained after only 43 secs., the two aircraft being then separated by 520 m. In other words, the pursuer has now been only able to make up half the original distance and will not be able to approach any closer.

It thus appears that in the case of aircraft of high normal flying speed (*i.e.*, above 400 m.p.h.) tail attacks depending on advantage in height have but little chance of success, unless carried out from a very close distance.

The increase in drag with rising Mach number has also an important effect on h.p. and range for a given fuel supply. Thus an incraese in speed from 690 to 800 km./h. (430 to 500 m.p.h.) for a constant wing surface of 18 m.^{2} (194 sq. ft.) require a doubling of the engine power and a reduction in range by about 40 per cent. for the same weight of fuel (400 kg.).

The Numerical Evaluation of an Equation of the Fourth Degree. (H. Heinrich, Z.A.M.M., Vol. 21, No. 5, October, 1941, pp. 304-307.) (105/4 Germany.)

The equation considered is of the form

$$x^4 + Ax^3 + Bx^2 + Cx + D = 0 \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where the coefficients are real.

Putting

$$S = x + \tfrac{1}{4}A \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

this reduces to

$$f(s) = S^4 + as^2 + bs + c = 0 \quad . \quad . \quad . \quad . \quad (3)$$

Putting further

$$2a = \alpha$$
$$a^2 - 4c = \beta$$
$$-b^2 = \gamma$$

we obtain

$$R(z) = z^3 + \alpha z^2 + \beta z + \gamma = 0$$

Since γ is negative, this equation has at least one real positive root, which is obtained by the Horner method. With this solution we calculate

$$\delta = \pm \tfrac{1}{2} \sqrt{z}$$

and $f'(\delta) = 4\delta^3 + 2a\delta + b$

$$= \delta(z + 2a) + b.$$

The four solutions of (3) then follow from

$$S = \delta \pm \sqrt{\{-f'(\delta)/4\delta\}}$$

and the corresponding values of x are obtained from (2). A numerical example demonstrates the simplicity of the new method compared with the procedure adopted by Graeffe.

Statistical Problems of Correlation Considered as a Variation and Characteristic Problem and its Connection with Mean Value Calculations. (H. Gebelein, Z.A.M.M., Vol. 21, No. 6, Dec., 1941, pp. 364-379.) (105/5 Germany.)

When considering the two-dimensional probability distributions $w(x, y)$, the question arises to what extent the distribution of y is affected by giving fixed values to x. Obviously such an influence does not exist if $w(x, y)$ is the product of two functions $w(x)$ and $w_2(y)$, each of which depends respectively on x and y only. If, on the other hand, to each value of x there corresponds only one value of y, y is a function of x and there is complete correlation. In general, the relationship will lie between these two extremes, the effectiveness of the coupling being expressed by the so-called correlation factor. This factor can be expressed in several numerical forms, of which those proposed by Pearson (including his mean square contingency) have received wide application. These different methods for numerical evaluation of the coupling between x and y all have certain advantages and disadvantages. Moreover, the connection between the different factors cannot in general be expressed in a simple manner. The author shows that the general problem of correlation reduces to a problem of the calculus of variation and can be reduced to the characteristic value of a Fredholme integral equation. The various correlation factors in use are nothing but approximations to this lowest characteristic value obtained by different methods.

If the frequency distribution is arithmetical instead of geometrical, the integral equation simplifies to a homogeneous linear system of equations.

The problem of optimum association of x and y also arises in mean value calculations, *e.g.*, the representation of experimental points by a smooth curve. The author shows that the general method of correlation developed by him can also be applied usefully to this problem.

On the Differential Equations of an Adiabatic Gas Flow and the Shock Curve. (F. Ringleb, Deutsche Mathematik, Vol. 5, No. 5, Jan., 1941, pp. 377-384.) (105/6 Germany.)

The author considers steady adiabatic potential flow (no friction) and obtains general expressions for the stream lines in the form

$$x = x(w, k)$$
$$y = y(w, k)$$

where

w = absolute value of velocity

k = constant = ψ (stream function)

The acceleration of the flow along the stream line is given by

$$b = \frac{w\,dw}{ds}$$

which the author shows to be equivalent to

$$b = \frac{\rho}{\rho_0} w \frac{\psi_\theta}{\{(1/c^2 - 1/w^2)\psi_\theta^2 - \psi_w^2\}}$$

where ρ_0 = density of gas at $w = 0$.

c = velocity of sound in gas moving at w.

ψ_θ and ψ_w = derivation of stream function with regard to θ and w respectively (θ = inclination of velocity vector).

From this it follows that the flow only becomes critical (acceleration infinite) at those points for which

$$(1/c^2 - 1/w^2)\,\psi_\theta^2 - \psi_w^2 = 0 \quad . \quad . \quad . \quad . \quad (1)$$

The following possibilities arise:—

(1) $w > c$; (1) can be satisfied along a real curve and b becomes ∞, provided $\psi_\theta \neq 0$. This curve thus becomes a shock line. If, however, ψ_θ = identically zero, the flow can reach maximum speed without shock.

(2) $w < c$; (1) can only exist if $\psi_\theta = 0$, $\psi_w = 0$, *i.e.*, at isolated stagnation points.

(3) $w = c$ ($= c_0/1.095$ for $\gamma = 1.4$); (1) can only exist if $\psi_w = 0$.

Two cases arise

(*a*) ψ_w is not identically zero, and the velocity of sound, *i.e.*, critical state can only be reached at isolated points.

(*b*) ψ_w is identically zero. The flow corresponds to a source or sink, the stream lines being radial.

The shock curve is now a circle, intersecting the streamline at right angles.

It appears that the velocity component of the flow at any point on a shock line along the normal is equal to the local velocity of sound. The shock line thus presents a singular solution of the differential equation for the Mach lines, being in fact the envelope of the Mach lines and stream lines.

The analytical extension of an adiabatic flow generally leads to the formation of shock lines. Since, however, the streamlines possess cusps on the shock lines, the complete theoretical solution cannot have physical reality. In practice the flow will generally depart either continually or discontinuously from adiabatic conditions even before the shock line is reached and pass either into a possible subsonic flow by means of a compression shock or the flow will destroy itself.

Provided, however, that b is finite, every part of the theoretical adiabatic flow should be realisable in practice.

Exact Solution of the Differential Equation of an Adiabatic Gas Flow. (F. Ringleb, Z.A.M.M., Vol. 20, No. 4, Aug., 1940, pp. 185-198.) (105/7 Germany.)

The author obtains the general differential equation of the stream's function ψ involving

w = stream velocity.

c = local velocity of sound.

θ = inclination of velocity vector.

The equation is linear and solution can therefore be superposed.

The author applies the method to obtain the stream line for a number of simple cases, such as source (sink), vortex and vortex source, and finally to the flow round an edge (semi-infinite line). In each case differences between compressible and incompressible flow are pointed out.

It is shown that point sources or sinks are not possible in compressible flow, but that the source or sink is limited by a finite circle at which the flow experiences a shock (the stream velocity w=local velocity of sound, acceleration ∞). In the case of a vortex, such a shock curve does not arise, the velocity distribution being similar to the incompressible case, with the difference however that the vortex is again bounded by a finite circle corresponding to maximum velocity and zero density. The antimeter of the two solutions leads to the so-called vortex source which exhibits shock lines. Similar shock lines are found in the compressible flow round an edge. The stream lines moving at some distance from the edge closely resemble the parabolas of the corresponding incompressible flow. As the edge is however approached, the compressible stream lines undergo appreciable flattening round the vortex whilst, finally, for positions still nearer to the edge, the stream lines fail to complete the turn but terminate a shock line where the acceleration becomes infinite. At the shock line the streamline is reflected with a cusp, but this part of the general solution ceases to have significance since it is in contradiction with the steady static conditions assumed. It is interesting to note that in this case the occurrence of a shock is limited to certain streamlines provided the stream velocity exceeds the velocity of sound for the stationary medium by about 20 per cent. In other words, sonic velocity is not a critical state for the flow over a boundary of this type.

The author finally demonstrates how to generalise a known incompressible flow so as to allow for compressibility and illustrates the method for the case of the doublet.

It is obvious that the method can be extended to cover types of profile flow and will enable the determination of profile characteristics which prevent the development of shock curves in spite of high translational speeds. This extension of the work is reserved for subsequent publication.

Stresses in Sail Plane Tow Ropes. (Measurements by the Swiss Institute for Equipment Research, Schweizer Aero Revue, Vol. 17, No. 1, Jan., 1942, pp. 1-8—Supplement.) (105/8 Switzerland.)

Experiments were carried out both for ground starts, using a rubber cable and electric winch, and when the take-off was carried out by means of a towing aircraft (Bucker Jungmann). The sail planes employed were the S. 18 and S. 21 with flying weight of 225 and 299 kg. respectively. In addition some winch starts were carried out with the sail plane "Kranich" (no weight given). The tow rope pulls and inclination of the rope were registered by means of a spring dynamometer attached to the nose of the sail plane, the flight path being obtained photographically by methods which are described in detail. The experimental results are given in tables and graphs, some of the original records also being reproduced. For the winch starts, the rope pull before take-off varied between 75 and 250 kg., depending mainly on skill of crew. When airborne, the pull fluctuated between 20 and 150 kg. (speed throughout 50 km./h.). Using the aircraft tug, the pull on the ground showed less variation, averaging about 100 kg. at 100 km./h. In towed flight at the same speed, the average pull registered is about 40 kg., corresponding to a towing h.p. of 13.

Some interesting remarks are made on the effect of weak links or knotted joints in the tow rope. It appears that such knots may stand considerable short-time loads, but will fail under very much smaller loads (50 per cent.) provided the period of application is sufficiently long.

In other words, such knotted ropes may survive the take-off and yet fail in the subsequent towed flight.

Tricycle Landing Gear Design (Part I). (E. S. Jenkins and A. F. Donovan, J. Aeron. Sci., Vol. 9, No. 10, Aug., 1942, pp. 385-396.) (105/9 U.S.A.)

The problems of the tricycle landing gear are discussed in the light of available information with the object of providing criteria to assist the designer. The general geometric arrangement involving the determination of wheel base, tread, and centre of gravity location is first considered. It is shown that the nose wheel should be located as far forward of the centre of gravity as possible, and that the fore-and-aft location of the rear wheels is limited to a narrow range by conditions of balance and longitudinal stability. The relationship between tread, wheel base, and the resistance to turning over is found, and the effects of tread and fore-and-aft location of the rear wheels on the directional stability and ground manœuvrability are discussed.

The problems related specifically to the design of the nose wheel are next examined, and a basis for the selection of nose wheel tyre size is given. The fundamental causes of shimmy are reviewed, including the effects of trail, caster angle, wheel offset, tyre type, and moment of inertia of castering parts. Shimmy elimination is discussed with special reference to elimination by damping and including methods of calculating the amount of damping necessary to prevent shimmy. The construction of fluid dampeners is described, and their damping characteristics are compared to the simpler mathematically defined types of damping. An empirical relationship between the volume of a vane-type hydraulic dampener necessary to prevent shimmy and the static nose wheel load is given.

Ground handling and manœuvrability, construction and installation difficulties, castering locks and stops, and steering devices are briefly discussed. Conclusions as to the best arrangements must be based on the characteristics of the particular design. As a partial check on the validity of the criteria developed, the results of applying them to some successful tricycle gear aeroplanes are summarised.

Propeller Blade Stresses Caused by Periodic Displacement of the Propeller Axis. (J. Meyer, L.F.F., Vol. 18, No. 11, 20/11/41, pp. 385-386.) (R.T.P. Translation T.M. 1,016.) (105/10 Germany.)

The author considers first the case of the propeller shaft vibrating about a single axis placed at right angles to the shaft and obtains expressions for the bending movements at right angles and in the plane of the propeller disc respectively.

The former are due to gyroscopic action whilst the latter correspond to inertia force, connected with the C.G. motion of the propeller.

If the propeller shaft vibrates about two perpendicular axes simultaneously, the propeller centre will generally describe an ellipse instead of the straight line of the first case. In the special case of circular vibration, it is shown that the maximum values of the two alternating bending moments (phase difference 90°) are exactly twice that of the straight line vibration.

The author next investigates the possibility of eliminating the gyroscopic moments by adopting a flexible hub of constant elasticity C about all axes. This is combined with a flexible engine mounting of elasticity C_1 and C_2 about the normal and lateral axis respectively and the four natural frequencies of the system obtained.

These natural frequencies must be high enough to prevent resonance in the working range. The shaft must also be flexible enough to prevent the propeller participating in the pitching motion of the engine. Under these conditions the coupled and natural frequencies are practically identical and assuming further that the pitching motions of the engine about the normal and lateral axes are identical, the two natural frequencies of the system reduce to

$$\gamma_{1,2} = \sqrt{\{(c_1+c_2)/\theta\}} \quad \text{(engine)}$$

$$\gamma_{3,4} = \sqrt{(c/J)}\sqrt{\{v\,(v\pm 2)\}} \quad \text{(propeller)}$$

where J = equational moment of inertia of propeller.

$\theta = \theta_1 = \theta_2$ = moment of inertia of engine plus propeller about normal or lateral axis.

$v = \gamma/w$.

w = angular velocity of propeller.

If $\bar{w}_{max}$ = maximum angular velocity of aeroplane in banking.

and M_{Kmax} = corresponding gyroscopic moment.

$C = M_{Kmax}/0.175$, if propeller deflection is limited to 10°.

Under these conditions the two natural frequencies of the propeller become

$$\gamma\ 3,\ 4 = 3.4\sqrt{(w_{max}\,\bar{w}_{max})}\sqrt{\{v/(v\pm 2)\}}$$

The application of the method to the concrete case of a 1,500 h.p. radial engine concludes the article.

$J\rho = 400$ kg. cm.^{2} (polar moment of inertia of propeller).

$w_{max} = 150$/sec.

$\bar{w}_{max} = 2$/sec.

It is shown that there is no danger of resonance due to excitation either from propeller or engine side for the value

$c_2 = 685{,}000$ kg. cm.

$c_1 = 14{,}300{,}000$ kg. cm.

At the same time the uncoupling of engine and propeller vibrations is satisfactorily provided for.

Experimental Researches on Aircraft Icing. (B. Brun, Publ. Scient. Techn. du Secrétariat d'Etat à l'Aviation, B.S.T., No. 98, 1941.) (105/11 France.)

It is admitted that only flight tests can furnish reliable data on aircraft icing. Suitable meteorological conditions are, however, relatively rare in France and in addition such tests are not easy in view of the relatively large surface on the aircraft requiring watching, possibly under conditions of fog. Laboratory tests are thus called for and most governments dispose of so-called " refrigerating " wind tunnels where icing conditions can be studied at leisure. In these tunnels, a fog containing super-cold water particles is produced by injecting water (originally at about 10°C.) into an air chamber kept at a temperature between 0° and −12°C. The injection is carried out by means of a spray pistol, the size of the water drops being controlled by the pressure of the air admitted to the pistol. Experience has shown that rate of flow of about 1 gm./sec. for water and compressed air respectively give good results, the size of the drops being of the order of 15 microns for an injection pressure of 3 atmospheres.

Icing experiments can be carried out either on rotating bodies (fog at rest) or the fog can be circulated over the stationary model in a wind tunnel. In order to keep down the output of the refrigerating plant, such wind tunnels are usually of the closed type. Continuous circulation of the fog has, however, its draw-back due to the gradual accumulation of ice crystals, the composition of the fog thus being ill-defined.

For this reason, the French experimenters installed a small wind tunnel directly in the refrigerating chamber, water being injected into the air stream after its passage through the fan. The fog, after passing over the model, is discharged into the atmosphere. High air speeds (up to 50 m./sec.) are possible by this method combined with well-defined fog conditions. On the other hand, the working section is, of necessity, very restricted (60 × 30 cm. as a maximum). Nevertheless, interesting results were obtained on the icing of wing profiles and on the efficiency of electric devices for wind screens.

The nature of the ice deposit (appearance, structure) can be extremely variable. There are, however, two distinct limiting forms, known as either clear or opaque

https://doi.org/10.1017/S0368393100140672 Published online by Cambridge University Press

ice. The latter is the least dangerous since the deposit closely conforms to the shape of the profile. Opaque ice is most likely to form at low temperatures in a thin fog.

After some general remarks on super-cooling and rate of crystallisation, the author deals with the mechanical property of ice deposits. It is interesting to note that the spontaneous crystallations which super-cooled water drops undergo when cooled below a certain critical temperature ($\sim -10°$C.) is not appreciably affected by the presence of dissolved salts nor by vigorous shaking of its super-cooled liquid. The average tensile strength of ice is of the order of 8.5 kg./cm.^{2} the impact strength 0.02 kg./cm.^{2}. The samples were prepared at temperatures θ between -5 and $-30°$C. and tested at temperatures t between -4 and $-15°$C. There was no evidence of either θ or t having an influence on the mechanical properties. The remainder of the report deals with model experiments on the de-icing of propeller and windscreens. According to the experiments, the painting of military propellers with a dull black varnish to reduce visibility favours ice adherence. It also appears that a mixture of glycol and glycerine is preferable to pure glycerine as a de-icing fluid, since it spreads more evenly along the blade. Here again the black war paint reduces the effectiveness of the de-icing fluid, a better spread being obtained with a hard smooth varnish. In conclusion, the authors describe some tests on windscreens provided with electric heaters inserted in the glass.

It appears that such windscreens will be kept clear of ice over the greater part of the surface for an energy expenditure of 100 watts per cm.^{2} of surface (wind speed 250 m.p.h. at $-10°$C.). The electric heaters will stand a maximum safe load of 200-300 watts per 100 cm.^{2} of surface. This is ample to free a screen previously iced up in 2-3 minutes.

Progress in Structural Design Through Strain-Gauge Technique. (C. R. Strang, S.A.E.J., Vol. 50, No. 8, August, 1942, pp. 346-357.) (105/12 U.S.A.)

The technique of the application of modern electrical strain-gauge equipment to basic problems in modern aircraft structural design is discussed in this paper. The general nature of the equipment is very briefly described. Special arrangements of strain-gauge units for each type of stress are discussed together with problems of economy and efficiency in the use of the available equipment.

The application of these methods to a number of typical problems is outlined to point out means by which more precise design can be accomplished. The knowledge, so gained, permits the simplification of the aircraft structure with a corresponding simplification of production problems. These methods are explained from the point of view of their application to the structural behaviour of complete structural assemblies.

Most of the discussion is concerned with static proof tests or flight tests, but some comment on laboratory applications in connection with the development of structural theory is made. Finally, a summary of the difficulties involved and the problems that may be anticipated terminates the paper.

Calculation of Torsional Vibration System Incorporating Elastic Epicyclic Gearing. (J. Meyer, L.F.F., Vol. 19, No. 6, 20/6/42, pp. 199-200.) (105/13 Germany.)

The author considers the torsional vibration characteristic of a radial engine propeller system fitted with epicyclic reduction gearing characterised by the fact that the central sun-wheel is elastically mounted instead of being fixed to the casing as is usual in practice. The propeller shaft is assumed to be infinitely rigid and the moments of inertia of the planet wheels about their axis of rotation are neglected. This reduces the assembly to a four-mass system (propeller, propeller shaft and planet wheel carrier, central sun-wheel, outer wheel of gear (engine driven) and crank system) and the resultant frequency ejection is of the fourth order, involving in addition to the moments of inertia of the above components the stiffness of the crankshaft, and the stiffness of the sun-wheel support, as well as the radii of sun and outer wheel.

The author is of the opinion that the results obtained also apply to the first harmonics of in-line engine, provided the propeller shaft is very stiff in comparison with the engine crankshaft. As the rigid solution of the in-line problem would involve such excessive labour that it is only feasible for two cranks systems, the simplifications introduced by the author are of considerable value.

The Correction of Engine Output to Standard Conditions. (D. S. Hersey, J. Aeron. Sci., Vol. 9, No. 10, Aug., 1942, pp. 355-371.) (105/14 U.S.A.)

In the development of the proposed correction formulas, the theoretic effects of atmosphere changes on the performance of an engine's induction system units are discussed and applied in a general basic correction formula, based on air consumption. These effects pertaining to each induction system unit are checked by comparing the unit formula with test data obtained on a specific engine.

Two engine output correction formulas, covering both full throttle and part throttle operation of single-stage supercharged engines, are then evolved. The accuracy of these formulas is determined by comparison of calculated engine performance with flight test data taken under various atmospheric conditions. A similar check of the correction formulas generally used is also made.

The full throttle single-stage correction formula takes the following simple form, provided that:—

(i) There is no engine speed correction.
(ii) No correction for exhaust back pressure.
(iii) No correction for friction h.p.
(iv) No pressure loss in carburettor.
(v) Constant mixture strength.
(vi) Air is dry (altitude $>$ 75,000 ft.).

$B.h.p._s = (b.h.p._i + f.h.p._i) \times (pc_s/pc_i)\,(Tc_i/Tc_s)^{\frac{1}{2}}\,(C_s/C_i) - f.h.p._i$ where b.h.p. and f.h.p. = brake h.p. and friction h.p. respectively.

pc = absolute pressure at carburettor entry (in Hg.).
Tc = temp. at carb. entry (°F. absolute).
C = supercharger density parameter $= [V^2/(6088\ Tb) + 1]^{2\cdot 53}$.
V = impeller tip speed (ft./sec.).
Tb = temp. at supercharger entry (°Fahr.).

Suffixes s and i refer to standard and observed condition respectively.

A comparison of the old and new full-throttle formulas indicates that former correction errors of as much as 10 per cent. may now be reduced to approximately $1\frac{1}{2}$ per cent. Comparison of the part throttle correction formulas shows that the accuracy of the rational formula is slightly inferior to that of the generally used formula.

Correction formulas for two-stage supercharged engines of the gear-driven and turbo-driven variety are finally proposed for consideration, but no flight test proof of these latter formulas is presented.

The conclusions reached as a result of the correction formula investigations are:—

1. The formula derived for use in correcting the full throttle output of single-stage supercharged engines is basically more sound and considerably more accurate than the generally used full throttle power correction formula.

2. The rational formula derived for use in correcting the part throttle output of single-stage supercharged engines shows no superiority over the empirical part throttle correction formula now in general use.

3. The correction formulas proposed for use in connection engines equipped with two-stage gear-driven and turbo-driven superchargers should give reasonable accuracy, although some experience must be gained in the use of these formulas before they are finally adopted.

Optimum Performance of Pendulum Type Vibration Absorber. (A. H. Shieh, J. Aeron. Sci., Vol. 9, No. 9, July, 1942, pp. 337-340.) (105/15 U.S.A.)

The crankshaft propeller system of a single row radial aircraft engine may be considered as a single degree of freedom system with one natural frequency. After an absorber device is incorporated, it becomes a system of two degrees of freedom with two natural frequencies. It appears that the introduction of the absorber would give worse results than if the device were not incorporated, since it splits one natural frequency to two natural frequencies instead of removing the resonance. The purpose of this article is to investigate the two natural frequencies of the resulting system and the factors that control them. It was found that one of the natural frequencies is insignificant and, by properly adjusting the moment of inertia of the pendulum, the other natural frequency can be kept well away from resonance with the forced frequencies of the harmful orders of torque harmonics.

Researches on Preliminary Chemical Reactions in Spark Ignition Engines. (E. Mählner, L.F.F., Vol. 19, No. 8, 20/8/42, pp. 249-266.) (105/16 Germany.)

The author investigated the magnitude of the preliminary chemical by motoring an engine and measuring the temperature Δt rise in the exhaust when mixture is compressed above the value obtained with air.

The engine experimented with had a bore and stroke of 101 and 103 mm. respectively and could be operated at compression ratios varying from 5 to 12. The cylinder well temperature as well as the mixture or air temperatures were all kept at 140°C. Under these conditions the temperature rise Δt as defined above is largely a question of mixture strength, compression ratio and nature of fuel and may reach values of the order of 80°C. before actual ignition takes place (at first in exhaust pipe and at higher compression ratios in the cylinder itself). In no case did the charge ignite during the compression stroke. Indicator diagrams showed that consecutive engine cycles did not repeat, the raised expansion line due to preliminary combustion generally occurring every other stroke. It thus appears that under the conditions of these experiments the actual temperature rise Δt of the charge is of the order of 160°C. In spite of this considerable heat generation due to preliminary reactions (also reflected in the reduced motoring torque) auto-ignition of the fuel is difficult to obtain at 1,800 r.p.m.

Lower mounting speeds (increased time of application of compression temperature) facilitate auto-ignition.

Knowing the mixture strength B and compression ratio, the maximum temperature of adiabatic compression can be calculated.

At a given compression ratio, Δt increases with β up to a maximum after which it decreases to practically zero. The position of the maximum shifts to richer mixtures with increase in c.r. and at the same time the decrease after the maximum becomes very sudden. It is interesting to note that the compression temperatures corresponding to the maxima Δt values are practically constant (provided the maximum strength is richer than that corresponding to complete combustion) and average about 400°C. for all the fuels tested. These fuels covered an octane number range from 46 to 108, and in addition to commercial and aircraft fuels (some doped with lead) also included iso-octane, alcohol and benzol.

Speaking generally, Δt decreases as the octane rating of the fuel increases. There are, however, notable exceptions showing that the nature of the fuel plays an important part. Thus, whilst for most aircraft fuels containing aromatics, a further increase in octane number by the addition of lead causes a marked decrease in Δt, the addition of lead to a paraffin base fuel of originally low octane number had only a very slight effect on Δt although the octane number was raised from 45 to 73.

Both benzol and alcohol show no evidence of preliminary reactions ($dt \sim 0$).

Possible application of the method for fuel rating are discussed.

Friction Heat in Turbo Machinery. (O. Pabst, L.F.F., Vol. 19, No. 8, 20/8/42, pp. 267-270.) (105/17 Germany.)

The author gives reason for assuming that the heat added by friction over each element of the turbine or compressor cycle is a constant fraction θ of the corresponding useful work done. This, of course, assumes that no heat is lost to the outside and that the change of state does not depart markedly from the adiabatic.

Under these conditions the gas obeys a polytropic law,

$$PV^n = C, \text{ where } n = \gamma / \{ \gamma - (1 \mp \theta)(\gamma - 1) \}.$$

If η = efficiency of turbine or compressor without friction.

$$\theta = 1 - \eta \text{ (turbine).}$$

$$= 1/\eta - 1 \text{ (compressor).}$$

Over the range $\eta = 0.8$ to 1.0 and $\gamma = 1.40$, n decrease practically linearly from 1.55 to 1.40 (compressor) or increases linearly from 1.30 to 1.40 (turbine).

The overall efficiency of the compressor now becomes equal to the rates of polytropic work to the adiabatic work

$$i.e., \ \eta_0 = \frac{(P_2/P_1)^{(\gamma-1)/\gamma} - 1}{(P_2/P_1)^{(\gamma-1)/\eta\gamma} - 1}$$

$$= \eta \text{ if } (P_2 - P_1)/(P_1) \text{ is small.}$$

Some Results of Valve Gear Research as Applied to Diesel Engines. (C. Voorhies, S.A.E.J., Vol. 50, No. 8, August, 1942, pp. 558-571.) (105/18 U.S.A.)

The mechanical design of each component of the valve gear is discussed, considerable space being devoted to the design, operation and advantage of hydraulic valve lifter.

A summary of the various points set forth in this paper includes the following recommendations:—

Camshaft deflection should be held to not more than 0.002 to 0.003 in. Accelerations should be as high as possible on both the opening and closing sides; the opening side acceleration may range up to three times that of the closing side. Cam followers should not be overstressed by the use of too small a nose radius. Mushroom-type followers may have a cast iron face when operating on cams of any material. Steel followers can be used successfully only on cast iron cams provided that the cam is properly designed; the section of the cast iron cam should be about 30 per cent. greater than that of a steel cam for equal rigidity.

The push-rod should be of tubular welded-end construction. The rocker arm should be of the lightest construction that will not deflect excessively under maximum load; a rocker ratio of 1.3 to 1.6 is best, considering all factors. The use of a roller is very good practice in large engines where loads are high. Rocker-arm geometry should be such that the movement of the valve is about one-third above and two-thirds below the centre line.

The valve should have a hard tip, high hot strength, and stainless properties. For relatively high speed a hollow-drilled valve is desirable for lightness. If this design causes excessive heating, sodium cooling should be used.

Valve stem guides should be extended as high as possible on the valve to permit ample clearance without excessive valve cocking.

The spring should have a safety margin of at least 30 per cent. at the point of reversal, and should have the highest possible frequency without overstressing the material.

The valve seat insert should be of ample section, maximum rigidity, and of a material which provides maximum resistance of distortion.

Fuel Feed at High Altitudes. (W. H. Curtis and R. R. Curtis, S.A.E.J., Vol. 50, No. 8, August, 1942, pp. 321-337.) (105/19 U.S.A.)

Adequate fuel feeding at altitude is a matter of vapour elimination, either by preventing its formation or by removing it from the system in the event that its formation cannot be prevented. The effect of vapour is invariably to cause failure of the fuel flow if it forms sufficient quantity in any part of the fuel system that lies between the fuel tank and the carburettor.

This paper gives the results of a study of the conditions that bring about this type of fuel failure, and describes means of exploring the phenomena experimentally so that it can be ascertained in advance of manufacture if remedial steps are necessary.

The greatly accelerated rate of which designs of military aircraft with increased performance have been developed, they explain, has added materially to the difficulty of feeding vapour-free fuel to the carburettors at the higher altitudes.

The influence of the following variables that affect aviation fuel during flight to high altitude is discussed: Dissolved air, vapour pressure, fuel temperature, turbulence, velocity of fuel flow, rate of climb, altitude, vent-line effect, and heat transfer.

In the first part of the paper the simulation equipment is described and illustrated; simulation test procedure is specified; and experimental observations are discussed. The second section, on the centrifugal booster pump, gives the results of three series of tests: One on an isolated tank of fuel, and two on the booster fuel system.

The booster system consists essentially of two pumps placed in series, the first (usually of the displacement type) driven directly from the engine, whilst the second, of the centrifugal type, is installed either on or below the fuel tank and thus operates with a gravity intake.

This latter pump is specially designed to eject vapour bubbles and only admit uncontaminated fuel to the rotor. This is effected by providing the impeller with vanes near the axis and then produce a radial outward flow along the pump entry. Bubbles approaching the throat or formed by impact with the impeller are thus continually ejected backwards and rise to the surface of the tank.

With the booster system, a constant discharge pressure could be maintained at simulated altitude conditions up to 40,000 feet, rate of climb 1,000 to 4,000 feet per minute, the fuel temperature being between 80° to 100°F.

High Performance Fins for Heat Transfer. (R. H. Norris and W. A. Spofford, Trans. A.S.M.E., Vol. 64, No. 5, June, 1942, pp. 489-496.) (105/20 U.S.A.)

Earlier investigations have determined the forced-convection heat transfer of a single isolated plane or cylinder and of continuous parallel fins. This paper presents test results for groups of small discontinuous fins and pins. These results have been correlated on the basis of Reynolds number in order to show a common quantitative relationship. The heat-transfer coefficients are found to increase in substantially inverse proportion to the square root of the size, or perimeter of the surface element, and can be more than doubled, compared to continuous fins. The relationship between heat transfer and fluid friction is covered quantitatively. Tests of applications show that the data may be rationally applied with satisfactory results.

The Effect of Diametral Clearance on the Load Capacity of a Journal Bearing. (J. T. Burwell, Trans. A.S.M.E., Vol. 64, No. 5, June, 1942, pp. 457-461.) (105/21 U.S.A.)

It has been found that there is an optimum value of the diameter clearance ratio of a journal bearing for any given applied load. When the ratio has this value, operation is characterised by a minimum temperature rise in the bearing and a constant value of the Sommerfield variable $(D)^2/(C\mu N/P$ where

D = diameter.
C = clearance viscosity.
N = r.p.m.
P = load per unit projected area.

These values of the diameter clearance ratio, while considerably larger than those used in commercial practice, may quite easily be attained by present machining methods. The use of these closer fits will result in increased load capacities and lower operating temperatures. The present paper is devoted to an investigation of the effect of D/C on the load capacity in a quantitative manner, considering both the hydrodynamic and thermodynamic aspects of bearing operation.

Theory of Heat Transfer and Hydraulic Resistance of Oil Radiators. (N. B. Mariamov, C.A.H.I., No. 444, Moscow, 1939.) (R.T.P., Translation No. T.M. 1,020.) (105/22 U.S.S.R.)

In the present report the coefficients of heat transfer and hydraulic resistance are theoretically obtained for the case of laminar flow of a heated viscous liquid in a narrow rectangular channel. The results obtained are applied to the computation of oil radiators, which to a first approximation may be considered as made up of a system of such channels. In conclusion, a comparison is given to the theoretical with the experimental results obtained from tests on aeroplane oil radiators.

1. The theoretical values obtained for the coefficient of heat transfer from the liquid to the wall for laminar flow of the liquid in a rectangular channel for $Pe_h d_h/L < 150$ give satisfactory agreement with the test results. Where Pe_h = Peclet number referred to hydraulic diameter, dh = hydraulic diameter of passage; L = length of passage.

2. The theoretical values obtained for the resistance coefficient likewise give satisfactory agreement with test results for honeycomb radiators in which the flow of the oil is directed perpendicular to the direction of the flow of the air in the tube.

High Duty Bearings Made of Synthetic Pressed Resins. (E. Gilbert and K. Lurenbaum, Z.V.D.I., Vol. 86, No. 9-10, 7/3/42, pp. 139-144.) (105/23 Germany.)

Bearings made of synthetic pressed resins have been in use for some time. Such bearings in general resembled in design the previously employed metal bearing and could only be used where the conditions of working were relatively simple and the continuous loading did not exceed 40-60 kg./cm.^{2}. Even in these cases special attention had to be paid to cooling, necessitating increase in the rate of flow of the lubricant. Larger loads could only be carried if the thickness of the bearing was increased and a metallic anchoring provided. In rolling mills, for example, plastic bearings have proved successful.

The fact that synthetic resins are home produced (and thus form a valuable replacement material) combined with the knowledge that their development possibilities are very great, justifies attempts to use such materials for high duty bearings, especially in cases where the installation necessitates a relatively thin bearing shell. The new type of construction tested by the authors consists in winding flax tape soaked in resin on to the journal. The thickness of the band is of the order of 0.2 mm. and after compression an excellent bond with the metal surface is obtained. After compression a subsequent hardening by immersion in oil at 100°C. for 150 hours is carried out.

As an alternative, the new bearing material is supplied in the form of foil covering a range of standard thickness and already hardened. Such foils need only be glued on to the journal or inside the brush. This type of foil bearing has proved very successful for the support of blade roots in the hub of airscrews since it is not subject to fretting corrosion. Other applications have been in the design of guides for the spring legs of undercarriages.

Laboratory experiments on the adhesion of such glued bearings on the metal base are described as well as changes in the dimensions after long period (immersion in oil and fat). Subsequently synthetic bearings of various types were investigated in a bearing testing machine and this was followed by full-scale engine tests, both motor car and aero engines being employed (Argus As. 8 135 h.p. and Jumo 205C, 600 h.p.). Other practical application reviewed include the aircraft undercarriage (already mentioned above), and machine tools.

Although the new material cannot yet be considered as fully equivalent to high duty lead bronze or light alloy bearings in engines (the main drawback being increased wear) nevertheless both the Jumo and Argus engines could be operated for periods of the order of 200 hours at three-quarter load without the bearing surfaces showing any deterioration. It is interesting to note that this corresponded to maximum bearing loads of over 260 kg./cm.^{2} and rubbing speed of the order of 10 m./sec.

In view of the fact that the resins, as already mentioned, are capable of considerable further improvement, it appears that further experiments on these lines are fully justified.

Not only should a performance fully equivalent to that of standard metallic bearing ultimately be reliable, but in certain respects the new material may introduce important advantages.

Some of these are listed below :—

(1) Small sensitivity to edge pressure and reduction in friction compared with metal bearings if bearing support or shaft distorts.

(2) Complete elimination of all corrosion troubles.

(3) Consistent surface hardness and running qualities over the temperature range $-180°$C. to $+135°$.

(4) Good emergency running qualities due to absorption of oil or fat molecules.

(5) Greater freedom in design of shaft and choice of material for crankshaft. By adopting the synthetic tape bearing, a surface hardening of the pin and journal is no longer required. Machining is simplified and the risk of cracks due to hardening avoided. A shaft material of sufficient toughness and insensitive to notch effects can be chosen without requiring the quality of surface hardenability. In the case of cast shaft it may be possible to press the tape on the shaft without preliminary machining.

Stresses and Deformation Under Torsion of Thin-Walled Cylinders with Circular Cut Outs. (D. Thoma and M. Schillhansl, L.F.F., Vol. 19, No. 6, 20/6/42, pp. 210-219.) (105/24 Germany.)

The torsion of a thin-walled tube without cut outs is accompanied by a very simple stress distribution which is identical with that of flat sheet under pure shear subsequently rolled up to form the cylinder. In this case the rolling up does not alter the equilibrium at any point. If the same process is, however, repeated for a plate with a circular hole, only displacements along the wall remain in equilibrium. Since, however, the neighbourhood of the hole is not subjected to pure shear, the equilibrium for displacement perpendicular to the wall is disturbed. As a result, the cylinder wall in the neighbourhood of the hole undergoes a three-dimensional distortion and bending stresses arise. The authors investigate the stresses in the immediate neighbourhood of the hole on the assumption that the cylinder is infinitely long and that the radius of the hole is small compared with that of the cylinder. It is shown that the bending stresses and displacements perpendicular to the cylinder wall can be obtained by subjecting the untwisted cylinder to a certain internal pressure distribution. The resultant bending stress at the hole occurs approximately along the 45° diameter and is given very nearly by $\sigma = \pm(6a^2/SR)\,\tau_\infty A$

when R = radius of cylinder.

a = radius of hole.

S = thickness of material.

τ_∞ = constant shearing stress at some distance from hole.

$A = f = (\sqrt{SR}/a)$, given below.

$4.88\sqrt{(SR/a)}$			A
2	...	...	0.22
3	...	...	0.36
4	...	...	0.46
5	...	...	0.53
10	...	...	0.73

In order to obtain the maximum total stress at the edge, the maximum tangential stress due to the shear distribution prior to folding up the cylinder must be added. As is well known, this amounts to $\pm 4\tau_\infty$.

In a practical case ($a = 1$ cm., $R = 62.5$ cm., $S = 1$ cm.) σ_{max} becomes $8.4\,\tau_\infty$.

It is interesting to note that on the edges of fuselage cut-outs, stresses up to $10\,\tau_\infty$ (*i.e.*, ten times the mean shearing stress in the uncut portion) have been observed.

A New Surface Hardening Process. (Das Industrieblatt, Vol. 47, No. 13, 6/4/42, p. 515.) (105/25 Germany.)

Serrated shafts, gear wheels and other parts with projections are usually case hardened, nitrided or subjected to a local hardening by quenching. Those processes can generally only be applied to special steels and are rather complicated. The firm of Krupp has lately developed a relatively simple salt hardening process which can be applied to ordinary carbon steels (carbon content about 0.8 per cent. with small additions of Vanadium). The finished product is in many cases equivalent to that obtained by the more complicated processes in use up to now and moreover conserves alloying constituents in short supply.

The new process consists in drying the finished article in an air oven at 200°C., followed by a preheating to 580°-600°C. in a salt bath. This is followed by immersion into a further salt bath for hardening (810°-840°C.) and subsequent quenching in a final salt bath at 200°C. This bath is of such a composition (specific heat and conductivity) that no Martensite is formed in the steel, the hardening only taking place subsequently as the material cools to room temperature in still air.

After cooling, salt adhering to the parts is removed by boiling water and the material is finally tempered to the requisite hardness at 150°-200°C. in an oil bath or air oven. The duration of this treatment depends on the dimensions of the parts and takes from half to two hours.

The hardness depth can be controlled by slight changes in the composition of the carbon steel.

It appears that the most important part of the new process is the exact composition of the quenching bath. The rate of quenching is affected by the absorption of atmospheric moisture. Even if the bath is in continuous use, it must be heated for six hours at 350°C. every fortnight to remove trace of moisture.

The Adhesion of Tin-Base Bearing Metals. (W. T. Pell-Walpole, J. Inst. Metals, Vol. 68, No. 97, July, 1942, pp. 217-230.) (105/26 Great Britain.)

A theoretical consideration of the ideal requirements of a bond between two metals united to form a bi-metal, which must withstand severe variations of stress and temperature, and detailed examination of the metallurgy of the processes involved in the manufacture of tin-base lined bearings, indicates that at every stage of the operations there are factors which may affect the efficiency of this bond between the lining and the backing.

In addition to the generally recognised factors such as cleaning and fluxing of the shell and the control of time and temperature of the tinning process, it has been shown that during the actual casting operation careful attention must be paid to the composition of both backing and lining the temperature and mass of metal and mould, and particularly the rate and direction of cooling, from the liquid state down to normal temperature. It is suggested that the formation of shrinkage cavities close to the bond may be a frequent cause of poor adhesion, and experimental evidence is offered in support of this. The cooling conditions necessary to minimise the possibility of such cavities forming during solidification are discussed.

The composition of the lining material with respect to the nature and proportions both of intentional alloying elements and of accidental impurities is shown to be an important factor affecting the ease of obtaining a sound bond.

Measurement of the Adhesion of Tin-Base Bearing Metals of Various Backing Materials. (J. C. Prytherch, J. Inst. Metals, Vol. 68, No. 7, July, 1942, pp. 230-253.) (105/27 Great Britain.)

The strength of the bond between tin-base white metals and steel cast iron, wrought iron, copper, bronze, and brass, has been determined in tension, and some times in shear, from room temperature to 150°C. The influence of time and temperature of pre-tinning, surface condition, thickness of pre-tinned coating, type of flux, composition of tinning materials, mould temperature, and rate of cooling on the bond between steel and a standard white metal has been determined. A standard set of conditions was arrived at, which gives the maximum bond strength. The influence of changes in composition of the white metal has been studied, including those metals which are likely to be present as impurities. Certain of the new alloys examined are susceptible to heat treatment, and the influence of this treatment on bond strength has been investigated.

Adhesion Testing in Bearings. (B. Chalmers, J. Inst. Metals, Vol. 68, No. 7, July, 1942, pp. 257-258.) (105/28 Great Britain.)

1. The current practice is to judge the adhesion by means of the chisel test and by the effect of bending the lined shell. The chisel test consists in forcing a chisel between the shell and the lining, so that the two are separated by a wedge action.

2. In the bend test, the behaviour of the white metal is noted when the shell is bent back on itself with the white metal on the outside of the bend. The appearance of the surface and the extent of separation are used for judging the adhesion.

3. These methods should only be regarded as rough control methods, and any attempt to apply them to experimental work on new alloys is likely to lead to confusion.

4. The author proposes measuring the tensile strength of adhesion directly in the following manner:—

A small plug A of the white metal is isolated from the surrounding white metal by cutting with a pipe drill; the internal diameter of this drill is 0.35 in. A hole B, $\frac{1}{4}$ in. diam., is then drilled through the steel shell, being finished with a flat-ended or D drill, so that it just penetrates into the white metal. The two holes are co-axial.

The test consists of pushing the plug A away from the shell by means of a force applied by a plunger through the hole B, using a tensile testing machine for this purpose.

Magnetic Inspection of Cylinders. (C. S. William, Metal Progress, Vol. 42, No. 1, July, 1942, p. 70.) (105/29 U.S.A.)

Cylindrical parts, small ones like bearing races, and larger longer ones as well, can be adequately inspected for metallurgical uniformity by using a standard oscilloscope, a synchronous motor driving a suitable chuck, and a scanning device consisting of a simple electro magnet—an alloy bar surrounded by a coil. In the test the part is first demagnetised completely, next chucked and rotated at high speed around its axis of symmetry, and at the same time strongly magnetised so that the flux extends outward from the surface being tested. Finally, this flux is explored by bringing the electro magnet near the rotating piece. If there are any flaws, hard spots or other defects in the piece, they will cause the magnetic field to vary, and such variations induce a voltage in the exploratory coil, which is amplified and indicated by means of the oscilloscope. The test piece is rotated synchronously with the cathode-ray sweep, so that a uniform field is traced on the screen as a luminous straight line, but faults show up in the oscilloscope trace as dips. A second trace on the screen acts as a reference line and shows marks corresponding to 30° angles around the test piece. By this means a fault can be spotted to within a few degrees.

Case with Controlled Carbon. (Metal Progress, Vol. 42, No. 1, July, 1942, pp. 70-71.) (105/30 U.S.A.)

Highly stressed alloy steel parts are given high surface hardness without excess carbides and corresponding low fatigue resistance in the following manner. Carburise to correct depth, whereupon the surface carbon is about 1.20 per cent. Next the piece is copper-plated for surface protection, and heated a little above the critical long enough to diffuse the carbon inward and convert the surface to eutectoid structure (carbon about 0.65 per cent.). Oil quenching such a piece retains so much soft austentite that to acquire the maximum of Vickers 800 the quenched pieces are refrigerated in dry ice and alcohol, and the fully transformed structure is then tempered.

The State of German Research on Wear, with Special Reference to the Wear of Cylinders and Piston Rings. Part II. (R. Poppinga, A.T.Z., Vol. 44, No. 11, 10/6/41, pp. 272-279.) (105/31 Germany.)

The author describes an interesting laboratory machine in which it is possible to estimate the thickness of the oil film between ring and wall for a reciprocating piston, by measuring the electrical resistance of the film. The applied voltage is very small (of the order of 2.5 millivolts) and the voltage drop after suitable amplification is recorded photographically on a stroke basis, with the help of a cathode ray oscillograph. The corresponding film resistance varies between approximately zero (piston at rest) to about 1 megohm (appreciable thickness of oil film, showing that hydrodynamic lubrication is established). Records were taken over the speed range from rest to 600 r.p.m., the top of the piston being either exposed to the atmosphere or subjected to a maximum compression pressure of 50 atmospheres. Rings of various stiffness were also employed. From the figures the following conclusion can be drawn:—

(1) At all speeds, there is a metallic contact between ring and wall at the ends of the stroke (dead centre).

(2) At speeds above 100 r.p.m., a non-conducting oil film of appreciable thickness ($R \sim 1$ megohm) is established over parts of the central portion of the stroke. Over most of the stroke, however, the lubrication is of the "mixed" type until a speed of 600 r.p.m. is reached.

(3) Neither ring pressure nor gas pressure affect the phenomena appreciably over the higher speed range. When starting up, however, the compression pressure considerably prolongs the period of metallic contact at the upper dead centre and this effect persists to some extent up to a maximum speed, *i.e.*, the lubricating film at the top end of the stroke is less satisfactory than at the bottom end.

The above experiments were supplemented by measuring both cylinder and ring wear on an actual engine under various operative conditions.

The following are the principle conclusions:—

(1) Cylinder wear is always more marked at the top end of the stroke. This is in agreement with the film thickness measurements under purely motoring conditions described above. In the actual engine, however, matters are complicated by temperature effects. Thus cold starting increases wear, but it is not yet certain whether this is due to insufficient oil supply, washing away of oil film by condensed fuel, or corrosion.

In any case the oil film near top dead centre is exposed to the combustion temperature and therefore works under most onerous conditions.

(2) Wear generally increases with age of oil. This is mainly due to the gradual accumulation of solid particles acting as abrasives and this can be largely obviated by efficient filtering. Oxidation products of the oil may however cling to the ring grooves and thus escape filtering. These products will affect wear (by preventing proper functioning of the rings) and their nature depends not only on the type of oil but also on the fuel, as well as on operative conditions. (Iron carbonyl seems to exert a greater deleterious effect than tetraethyl lead.)

Wear increases very considerably if the induction air is dusty and under these conditions an air filter is essential.

(3) It is generally difficult to operate engines under constant conditions for the relatively long period required before measurable wear takes place and this accounts for the contradictory nature of some of the results obtained in practice.

Laboratory experiments, on the other hand, especially those of the so-called "accelerated" type do not conform to practical conditions and results obtained in this manner can only be applied with caution, since it is not known how the relative importance of the various factors on which wear depends change with operative conditions.

A Theory for the Buckling of Thin Shells. (M. S. Tsien, J. Aeron. Sci., Vol. 9, No. 10, Aug., 1942, pp. 373-384.) (105/32 U.S.A.)

In a series of papers written by the present author in collaboration with Th. von Kármán and Louis G. Dunn, the effect of curvature of a structure on its buckling characteristics was investigated. The purpose of these investigations was to find an explanation for the discrepancy between the " classic " theory and the experiments. For the case of a thin spherical shell under external pressure and for the case of a thin cylindric shell under axial compression, equilibrium states involving large deflections are discovered which can be maintained by loads far less than the so-called buckling load calculated by the classic theory of infinitesimal deflections. It was felt then that since some of these newly found equilibrium states closely approach the observed phenomena the shell must " jump " suddenly from the unbuckled configuration to these equilibrium states and the structures fail as a result of this sudden change. However, the reason why the shell should jump to these particular equilibrium states and not others was not explained. In the present paper a new principle involving the energy level and the geometric restraint is developed to determine this sudden change in equilibrium states. By means of this new principle the buckling load of both the spherical shell and cylinder shell can be calculated. The agreement with experiments is good.

Pressure Die Casting of Igamid Plastic. (H. Beck and F. Schaupp, Kunststoffe, Vol. 32, No. 7, July, 1942, pp. 205-209.) (105/33 Germany.)

Linear poly condensation products, for example, from diamines and dicarbonic acids (polyamides) are manufactured in the U.S.A. under the name of nylons, and in Germany under the name of Igamid. These plastics have a relatively high melting point and the molten product has very small viscosity. Pressure die casting, especially on mass production lines thus requires special precautions to prevent leakage loss at the injection nozzle when the die is changed, or solidification of plastic in the nozzle when in contact with the relatively cool die. The author has developed a special needle-controlled injection nozzle which only opens when the die is in position and which is closed automatically by an external spring on withdrawal of the die. The cone-shaped recess of the cup on the die into which the nozzle fits is undercut to reduce cooling losses, and elaborate electric heating devices are incorporated on the body of the valve to prevent plugging. It is stated that the valve has given satisfaction in practice, and the mass production of die castings in this type of plastic has now become possible. Since these polyamides possess most valuable characteristics (great impact strength and deformability) this development in die casting for mass production is thought to have great commercial possibilities.

Influence of Heat Treatment on the Impact Strength (Plain and Notched) of Plastics with Paper or Fabric Fillers. (C. Brinkmann, Kunststoffe, Vol. 32, No. 7, July, 1942, pp. 205-209.) (105/34 Germany.)

V.D.E. Specification 0318 lays down that plastic with paper or fabric fillers should not be exposed continuously to temperature above 110°C., but that short time exposures to 150°C. are permissible. The author carried out tests on the impact strength of such materials at room temperature after exposure to temperatures between 110° and 170°C. for periods up to 800 hours. Two quantities of so-called " hard paper " (*i.e.*, plastic with paper filler) made by three different manufacturers were tested as well as one sample of " hard fabric " (fabric filler). The results confirm that such plastics will stand continuous exposure to 110°C., the impact strength (both plain and notched), after undergoing a relatively small drop over the first 50-100 hours remaining practically constant over the remaining period (800 hours). For the notched specimen the value ranges between 10 and 30 cm.^{2} kg./cm. for the " hard paper " samples and averages about 17 cm. kg./cm.^{2} for the plastic fabric.

At higher storage temperatures, however, the material undergoes a serious drop in impact strength which continues to diminish with length of storage.

Apart from gradual destruction of the filter, loss of moisture and ageing of the plastic (molecular changes) seem to be mainly responsible for the drop in strength.

It must, however, be emphasised that the tests discussed above only cover impact strength. It is however highly probable that its other mechanical qualities will be affected in a similar manner.

Theoretical Stress Distribution in Notched Plates. (H. Neuber, Z.A.M.M., Vol. 20, No. 4, August, 1940, pp. 199-209.) (105/35 Germany.)

The author considers the case of thick plates of flat central section subjected to forces acting perpendicular to this section or to movements, the axes of which are parallel to this section. Previous investigations (Michell and Love) obtained stress functions involving in addition to terms in z and δ higher powers such as z^3, δ^3 and δ^5 (z = distance from central plane, δ = thickness of plate).

The author shows how the elastic equation can be recast so as to obviate terms in δ^5. Stresses involving z correspond directly to moments whilst additional terms containing z and $\delta^2 z$ are in equilibrium over the sides of a plate element and their effect on the stress distribution can be neglected.

Rigid solutions are obtained for the two basic problems of the notched plate, *i.e.*, bent plate with lateral hyperbolic notches and bent plate with central elliptic hole. In each case the maximum stress divided by the elementary bending stress is plotted as a function of $\sqrt{(a/\rho)}$ and $\sqrt{(t/\rho)}$ respectively.

$2a$ = width of plate between external notches.
$2t$ = length of elliptic hole.
ρ = radius of curvature of notch.

The results show that the stress increase due to the notch effect is about 60 per cent. less for the bent plate than for the rod under tension.

Numerical Estimation of Surface Roughness. (G. Schmältz, Investigation on Engineering Surfaces, pp. 112-124.) (105/36 Germany.)

It is assumed that a profile curve of the surface is available. The problem is to evaluate the corresponding roughness numerically. The following characteristics of the profile curve are discussed.

1. Mean Height of Profile Curve.

This obviously depends on position of base line adopted. We may choose for the latter either a line passing through c.g. of curve (areas included by the curve above and below this line are equal) or we may take as base a line passing through the lowest points of the profile.

In the former case, the portion of the curve respectively above and below the base line will have the same mean height $\overline{h}/2$, the mean height of the profile as a whole being given by $\overline{h}$. This definition of $\overline{h}$ has the advantage that its value depends on every point of the profile curve and can be accurately defined. If the mean height is measured, on the other hand, from a base line passing through the lowest points of the profile curve, it may be seriously affected by some accidental variation in the lowest point considered. Provided, however, precautions are taken in this respect, the mean height h_m defined in this manner has the advantage that it gives a direct measure of the amount of solid material above the base line and is thus useful in determination of wear.

2. From Factor K of Profile.

This is defined as $K = h_m/H$,

where h_m = mean height measured from base line passing through lowest point of profile.

H = maximum height of profile.

K gives a measure of the distribution of the material above the base line and approaches unity for a flat plate with a few narrow grooves and zero for the plate with a few sharp projections.

K for commercial ground surfaces is usually of the order 0.2.

3. THE ABBOTT OR LOAD CURVE.

This curve is obtained from the profile curve by drawing a number of evenly spaced lines parallel to the base line and replotting the lengths of the intercepts in the material as a function of distance from base line. The Abbott curve thus gives the increase in bearing surface with progressive flattening of the profile. The inclination of the Abbott curve at any point gives the mean value of the inclination of the profile curve at the same height for the base line (sign of inclination disregarded).

4. As an alternative to the above, instead of plotting the total length of the intercept at the various levels, the number of intersections with the curve at each level are plotted for the full range of ordinates. *The resultant curve limits the so-called* "frequency area."

5. ORDINATE DISTRIBUTION:

The height h_m of the curve above the base line is plotted as a function of the frequency of its occurrence.

In connection with the above, it should be noted that both $\bar{h}$ and h_m are independent of frequency or wave-length of the profile curve. This is obvious, since a rearrangement of the ordinate strips along a given base line will produce a curve of entirely different shape without affecting the mean height.

The same applies to the form factor K, the Abbott function and the ordinate frequency distribution curves.

The only profile characteristic definitely depending on wave-length is the so-called "frequency curve" giving number of intersection of ordinate with lines at different levels. It thus appears that the numerical evaluation of surface roughness is a complicated matter and several factors such as h_m, H, Abbott and frequency curves will in general require consideration.

From experiments on surface finish, it appears however that most engineering surfaces have a form factor of about 0.5. In this case a classification based on maximum profile length H alone appears to be possible and the author gives details of such a proposal. The range H from 1 μ to 100 μ is covered according to the 5/10 law (factor 1.6) and a surface with the classification number S16, thus has H varying between 10 μ and 16 μ. If K is less or greater than 0.5, the classification for the same H is increased or decreased by two classes respectively.

Above 100 μ the classification is geometric with the factor 1.315. Below 1 μ the classification is carried out optically with a factor of 2,000 (dark field photometry).

Determination of Shearing Strength by X-Ray Diffraction. (G. Kemmnitz, Z. für Technische Physik, Vol. 23, No. 3, 1942, pp. 77-81.) (105/37 Germany.)

As is well known, changes in the grid constant can be estimated directly from the observed displacement of the interference fringe under stress and this has been utilised to calculate the normal stress and elastic constants of the material. In the present paper the author shows how to calculate the shearing stress corresponding to any stress distribution without knowledge of the normal stress by either measuring the displacement of the fringes in two directions for a constant angle of incidence or taking observations at two angles of incidence.

The method is illustrated by these examples, referring respectively to the shearing stress in a shaft under torsion, residual shearing stress in a groove after torsion, and residual shearing stresses in the surface of fracture of a steel shaft broken under torsional fatigue. In both the latter cases, the residual stresses are very small (~ 1 kg./mm.^{2}). For these experiments, Co radiation was employed with Au as calibrator. As the method depends on the comparison of photographs not taken simultaneously, a correction for possible temperature changes in the material must be applied.

In the case of steel, the correction is negligible, provided the change in temperature is less than 10°C.

Relaxation Resistance of Nickel Alloy Springs. (B. B. Betty and others, Trans. A.S.M.E., Vol. 64, June, 1942, pp. 465-474.) (105/41 U.S.A.)

As a result of a series of tests reported in this paper, stresses required to produce 2, 4, and 6 per cent. load loss, or relaxation, in coil springs, held at constant height and constant temperature, have been determined by the authors for several alloys, namely, Monel, "K" Monel, "Z" nickel, and Inconel. Successive test temperatures from 300°F. to 700°F. were used. The range of temperature over which these several alloys can be used successfully, when load loss is a criterion, has been determined. "K" Monel, "Z" nickel, and Inconel have been found to be comparable, in this respect, to high alloy spring steels, while Monel is more nearly comparable to low alloy steels.

Experiments on the Dusk Performance of Telescopes. (M. Nagel and A. Klughardt, Z. für Inst. Kunde, Vol. 62, Jan., 1942, pp. 16-18.) (105/42 Germany.)

As a result of previous work, the authors proposed to measure the performance of telescopes under conditions of poor illumination (dusk or dawn) as the ratio L_F/L_A, where L_F=visual performance of eye+telescope and L_A=visual performance of naked eye under similar conditions. Such a definition rules out purely objective and subjective factors, such as contrast of object with background, and colour of illuminating light.

It was shown that

$$L=0.93+0.33\ M \log c.d.^2$$

where M=magnification of telescope.
d=diameter of exit pupil (in the limit=diam. of eye pupil).
c=constant.
=6.2 for Galilean glasses.
=4.6 for prismatic glasses.

Blackening the inside of the telescope produced no appreciable effect on L and the above equation thus represents a general performance coefficient, provided the text illumination is such that the amount of accommodation associated with the use of the telescope can be specified.

For the further tests described in the present paper, the surface brightness of the background was fixed at 0.034 Stilb (Hefner candles per cm.^{2}). This corresponds to the illumination provided by the full moon under thin cloud cover. The test object consisted of a complicated silhouette placed at a distance of 8 m. on to which the telescope was focussed. This silhouette (previously unknown to the observer) had to be described, marks being given to various recognition details. In this manner 10 telescopes were graded and the order of merit compared with that of the theoretical formula given above. The agreement is satisfactory. It must, however, be pointed out that the performance as defined above is only a measure of the improvement in vision due to the telescope, and that field of view is not considered.

Thus a supplementary grading on the basis of the latter factor is still required.

The Range of Optical Signals in Daylight (Digest). (B. Schönwald, Z. für Instrum., Vol. 62, Jan., 1942, pp. 35-36.) (105/43 Germany.)

The range t is defined as the limiting distance at which the physiological threshold value of the eye is reached, the signal subtending an angle 0.1 to 0.4 minutes of arc.

From laboratory experiments, the author obtains for clear air

$$t \text{ (in m.)} = 50.4\sqrt{(I/B_H)}$$

where I = light intensity of signal in Hefner candles.

B_H = surface brightness of sky in stilb (Hefner candles/cm.^{2}).

In the case of atmospheric absorption, t is reduced to

$$t = 50.4\sqrt{(Ie^{-at}/B_H)}$$

where a = absorption coefficient of atmosphere, $= 1/s \log e\ (1/\epsilon)$.

ϵ = threshold interval of eye = 0.02.

s = distance at which large black objects just fail to be recognisable.

The above gives a relationship between s and t which was plotted for constant I (30,000 H.c.) and varying B_H (0.01 to 1 stilb) and for constant B_H (0.5 stilb) and varying I (30 H.c. to 10^6 H.c.). The following conclusions are drawn:—

(1) For constant I, t is affected much more by change in s than by difference in B_H.

(2) In a hazy atmosphere with constant B_H an excessive increase in I only produces a relatively slight increase in t.

Experiments were also carried out on the effect of positioning of image with respect to retina. It appears that the response of the eye to an optical signal on a bright background (sky) diminishes as the image departs from the centre of the retina, the diminution being more marked in the vertical direction.

(It is interesting to note that the opposite holds at night, *i.e.*, when the eye is adapted to darkness. In this case, extra foveal vision has the smaller threshold value.)

In conclusion, it is pointed out that in the above equations, the effect of flicker and other factors influencing the recognisability of the signal are not considered.

Research on Developers for Aerial Photographs (Fine Details). (A. Charrion and S. Rocher-Valette, Pub. Scient. Techn. du Secrétariat d'Etat à l'Aviation, B.S.T., No. 97, 1941.) (105/44 France.)

The sensitivity of a photographic emulsion increases with the size of the original halogen crystals. On the other hand, the fineness of details which can be distinguished on the negative obviously diminishes as the reactive centres increase in size. In aerial photography, sensitivity and resolving power must be continued and this naturally leads to a compromise in the type of emulsion employed. The authors have investigated a large number of emulsions from both points of view and conclude that for a given film the nature of the developer employed plays an important rôle.

The following developer is recommended:—

Genol 2 g. (methol).
Hydroquinone 5 g.
Sodium sulphite (anhyd.) 100 g.
Sodium borate 8 g., distilled water to 1,000 cc.
Boric acid 8 g.

This developer is ready for immediate use or will keep for a week in well-stoppered bottles.

At 20°C., a normal exposure requires 7-10 minutes immersion. The resultant negatives are relatively soft and must be printed on hard paper for best results.

Generally speaking, the emulsion on the original film should be as thin as possible.

In conclusion, the authors refer to the possibility of replacing the silver halogens commonly employed by light sensitive agents by an organic dye.

This would have the advantage of providing a much finer grain, but considerable research work appears to be necessary before sufficiently dense images can be obtained by this method.

Loss of Definition in Aerial Photographs Due to Translation of Camera as Affected by Density of Negative. (M. Nagel, Zeitsch. für Wissenschaftliche Photographie, Vol. 38, No. 9-10, Sept.-Oct., 1939, pp. 181-209.) (Digest in Z. fur Instrumentenkunde, Vol. 61, No. 11, 1941, p. 386.) (105/45 Germany.)

The displacement of the geometrical image on the screen of a camera due to the latter's motion can be calculated exactly. The observed broadening of the recorded image on the film is, however, in general less than this, since a portion of the edges of the image are exposed for a shorter period than corresponds to the minimum type of exposure to produce a recognisable change in density under the particular conditions of the exposure. The author has investigated this experimentally by photographing a rotating sector, such points as background contrast, brightness of object, type of shutter and time of development receiving particular attention. If the object is to obtain very sharp record (line reproduced as a line) it appears that the negative should be thin and for a given camera distance and speed of translation, the following alternatives present themselves :—

(1) Reduced sensitivity of emulsion.
(2) Short time of development.
(3) Small stop.
(4) Object of small brightness.
(5) Gradual opening and closing of shutter.
(6) Background of small brightness..

If, on the other hand, as complete a record as possible of the actual displacement of the ground during the exposure time is required, the background should be bright enough to produce by itself the lower limit of density response for the film. The other five factors mentioned above should also be applied in the reverse sense, *i.e.*, high emulsion sensitivity, etc. As already explained, the dimensions of the recorded image will always fall short of the geometrical displacement. If, however, the exposure time is sufficiently long, it is possible to estimate the true width of image from the response characteristics of the emulsion and the light value of the object. The equation given by the author is of the form

$$b-d=A\{1-(2X/Y)+K\}/(1-K)$$

where b = measured width of image (edge limited by 0.1 contrast).
d = true width of stationary object.
A = geometrical displacement of image due to motion of camera.
X = minimum quantity of light required by emulsion to produce a contrast of 0.1.
Y = quantity of light received at end of exposure time.
K = photographically effective brightness of background/brightness of object.

Loss of Definition in Aerial Photography Due to Translation and Vibration of Camera (Digest). (M. Nagel, Z. für Instrumentenkunde, Vol. 61, No. 11, 1941, pp. 386-387.) (105/46 Germany.)

The effect of translation and vibration of cameras was studied by photographing from a relatively low altitude a point source on the ground, for various times of exposure.

Of special interest was a study of the effects of camera suspension, location of camera and aircraft type. Vibration of the camera will produce image displacements of the order of several tenths of millimetres, the frequency being about 20 vibrations/sec., the actual amount depending markedly on the type of aircraft and location of camera.

The author proposes rating the camera installation from the point of view of vibration effects by a coefficient $Ca = tf$, where

t = exposure time in seconds producing a displacement of 0.1 mm. of the image.

f = focal length in cm.

Mechanical Compensation for Image Displacement During Exposure of Aerial Photographs (Digest). (M. Nagel, Z. für Instrumentenkunde, Vol. 61, No. 11, 1941, p. 387.) (105/47 Germany.)

Aerial photographs taken at dusk or during the night without the help of flares require considerable exposure times. The corresponding image displacement reduces the definition but can be largely compensated by giving a suitable angular motion to the camera. The author provides this in a simple manner by attaching a lever of length h′ to the axis of rotation of the camera. This lever is connected to the sleeve operated by a worm and moves at a speed $v' = vh'/h$, when

v = flying speed.

h = altitude.

In this manner the camera points constantly at the same ground object, and since the compensation does not depend on focal length, several cameras with different objectives can be controlled by one mechanism. The compensation velocity is controlled by a suitable governor and experiments show the exposure time can be increased tenfold without any further loss in definition.

Electro-Magnetic Waves in Metal Tubes of Rectangular Cross-Section. (J. Kemp, J. Inst. Elect. Engineers, Vol. 88, Part III, Sept., 1941, pp. 213-218.) (105/48 Great Britain.)

The attenuation of electromagnetic waves propagated through the interior of metal tubes of rectangular cross-section is calculated by the familiar telephone transmission formulæ, the top and bottom of the tube being regarded as zigzag flat-strip transmission lines while the side walls are regarded, when suitably disposed, as transmission lines of another type. From the losses occurring in these lines, the attenuation offered by the tube is obtained in a simple manner. The results are found to be in agreement with those established by more elaborate means by other investigators. The characteristic advantage of the method here described is its simplicity and the directness with which the final results emerge. The method also provides a link between electrical communication through the interior of hollow metal tubes and the transmission of waves along telegraph lines of conventional type.

500 *H.C. Relay System (Digest).* (J. E. Smith, Communications, Vol. 22, Jan., 1942, p. 29.) (105/49 U.S.A.)

The author deals with the design of point-to-point relay systems, special reference being made to experiments in which television signals were successfully transmitted through several unattended radio repeaters without demodulation or remodulations in the repeater equipment.

If TD and RE are the vertical transmitter and receiver antennas respectively with a direct separation $TR = d$ miles, and if the reflecting plane (parallel to TR)

meets the earth surface at B (D and E being the base of the antennas), the following expression gives the attenuation factor over the distance DB.

$$N_{DB} = 10 \log \left\{ \frac{(2.97\ d^4 \times 10^{14})}{(h^2 a^2 G_1 G_2)} \right\}$$

where h and a = height of transmitter and receiver respectively above reflecting plane (in feet).

G_1 and G_2 = power gains of antennas.

This formula represents the loss in one link of the radio relay chain which must be offset by the gain of one repeater.

Formula as also given for the signal-to-noise ratio in two double modulation cases :—

1. When both sub-carrier and radio frequency carrier are amplitude modulated.
2. When sub-carrier is frequency modulated and the radio frequency carrier is amplitude modulated.

Foreign Labour in Germany. (Das Industrieblatt, Vol. 47, No. 13, 6/4/42, p. 523.) (105/50 Germany.)

The following table gives the numbers employed (Autumn, 1941) :—

COUNTRY OF ORIGIN.	NO.
Poland	1,007,000
Italy	271,000
Belgium	121,000
Jugoslavia	109,000
Netherlands	93,000
Slovakia	80,000
France	49,000
Hungary	35,000
Denmark	29,000
Bulgaria	15,000
Unspecified	190,000
Total	2,139,000

Of the total, approximately 50 per cent. are employed on the land and the rest in industry.

Only a very small percentage are employed in offices and households.

Foreign Labour in Germany. (Inter. Avia., No. 828-829, 7/8/42, p. 17.) (105/51 Germany.)

The number of foreign workers engaged in Germany, including prisoners of war working for the Germans, is at present estimated with due reserve at about 5,000,000 persons. This figure grows continuously with the flow of new workers from the east and from France. Since under the optimum employment conditions the total labour force working in Germany was estimated at about 25,000,000, the proportion of foreigners now amounts to roughly one-fifth of the German labour force. It is possible, the source states, that the time is not far away when every fourth worker in Germany will be a foreigner. The supply of labour is not unlimited, however, because workers are required also in occupied territories in the east and because in their retreats the Russians endeavour to "carry off to the east" all skilled workers. However, the labour pool is not yet drained, and care is being taken above all to put every foreign worker, like the German workers, in a place suited best to his capacities in order to obtain optimum results.

On Some Essentials in Control Chart Analysis. (E. G. Olds, Trans. A.S.M.E., Vol. 64, No. 5, June, 1942, pp. 521-527.) (105/52 U.S.A.)

In this paper the author indicates the possibility of a new approach to control chart technique in connection with manufacturing processes. The advantages of quality control of product are widely recognised, and the principles pioneered by Walter A. Shewhart in 1924 have since that time been the object of intensive investigation. Primarily, the present paper is concerned with control with respect to a given standard. By analysing hypothetical examples, illustrated graphically, the basis of the control chart method is clarified. However, in exemplifying the control chart technique, the author indicates a method of reversing the usual procedure, by creating uncontrolled conditions, and then noting whether the tests made locate the " assignable causes " which have been introduced in the experiments. The investigation is carried out with the aid of H. C. Tippett's tables of " Random Sampling Numbers."

LIST OF SELECTED TRANSLATIONS.

No. 49.

NOTE.—Applications for the loan of copies of translations mentioned below should be addressed to the Secretary (R.T.P.3), Ministry of Aircraft Production, and not to the Royal Aeronautical Society. Copies will be loaned as far as availability of stocks permits. Suggestions concerning new translations will be considered in relation to general interest and facilities available.

Lists of selected translations have appeared in this publication since September, 1938.

AERODYNAMICS.

TRANSLATION NUMBER AND AUTHOR.		TITLE AND REFERENCE.
1543	Schwarz, L. ...	*Calculations of the Pressure Distribution on a Wing Subjected to Harmonic Deformation in a Two-Dimensional Stream.* (L.F.F., Vol. 17, No. 11-12, pp. 379-386.)
1545	Eujen, E.	*Flight Measurements on the Effect of the Airscrew on the Downwash and Dynamic Pressure on the Tail (Second Report).* (L.F.F., Vol. 18, No. 10, 27/10/41, pp. 345-351.)
1555	Baronoff, A. V. ...	*Effect of the Propeller Slipstream on Downwash.* (L.F.F., Vol. 19, No. 1, 20/1/42, pp. 1-10.)
1556	Schallenkamp, A. ...	*Flutter Calculations for Profiles of Small Chord.* (L.F.F., Vol. 19, No. 1, 20/1/42, pp. 11-12.)

AIRCRAFT, AIRSCREWS AND ACCESSORIES.

1544	Getto ... ... Henn	*The Influence of the Surrounding Medium in the Determination of the Moments of Inertia of Aircraft by Pendular Oscillation.* (L.F.F., Vol. 18, No. 10, 27/10/41, pp. 352-355.)
1559	Messerschmitt ...	*Device for Heating Cabins on Aircraft or Transport Vehicles by Means of Exhaust Heat Transferred to Fresh Air.* (Patent No. 713,439.) (Flugsport, Vol. 33, No. 26, 24/12/41.)
1560	Weinig, F.	*Glossary of Standard Terms and Definitions Used in Airscrew Investigations.* (Aerodynamics of the Airscrews, Appendix N.)

SUPERCHARGER DESIGN.

1549	Pantell, K.	*Some Notes on Three-Dimensional Flow in Centrifugal Impellers.* (Forschung, Vol. 8, No. 1, Jan.-Feb., 1937, pp. 21-34.)
1550	Sorensen, E. ...	*The Effect of Wall Roughness on the Performance of Turbo Machinery.* (Forschung, Vol. 8, No. 1, Jan.-Feb., 1937, pp. 25-29.)

TRANSLATION NUMBER AND AUTHOR.		TITLE AND REFERENCE.
1552	Eicke, S. ... ... Treuenfels, W. von	*Measurements of the Twist of Flow Behind Bends.* (Forschung, Vol. 8, No. 1, Jan.-Feb., 1937, pp. 6-9.)
1565	Pfleiderer, C. ...	*A Table for the Coefficients of Gas Friction in Superchargers* (*η Diagrams*). (L.F.F., Vol. 19, No. 1, Jan., 1942, pp. 13-32.)

ENGINES (INDICATING, KNOCK RATING, TORSIONAL).

1554	Staiger, K.	*Direct Reading (Electrical) Torsional Oscillation Recorder Based on the Method of Opposed Inductance.* (L.F.F., Vol. 18, No. 10, 27/10/41, pp. 356-357.)
1561	Lichtenberger, F. ...	*Piezo-Electric Indicator with Long Distance Cable Transmission (Distance Reading Indicator for I.C. Engines).* (E.T.Z., Vol. 33, No. 11-12, 26/3/42, pp. 134-139.)
1562	Funk, P.	*Electric Acoustic Examination of Knocking.* (A.T.Z., Vol. 45, No. 2, 25/1/42, pp. 21-25.)
1566	Schmidt, A. W. ...	*Octane Number and Multi-Cylinder Engines.* (A.T.Z., Vol. 45, No. 2, 25/1/42, pp. 26-31.)

SURFACE PROTECTION.

1553	Jager, W.	*Surface Protection of Light Metals in Aircraft Construction by Means of Pigments.* (Der Flieger, Vol. 21, No. 1, Jan., 1942, p. 20.)
1557	Sonbanov, T. A. ...	*Defects in Nitre-Cellulose Lacquer Coatings on Non-Metallic Surfaces.* (Civil Aviation, V.S.S.R., Vol. 2, No. 5, March, 1941, p. 21.)

MISCELLANEOUS.

1548	——	*Ammonia-Acetylene Fuel for Motor Vehicles.* (A.T.Z., Vol. 44, No. 21, 10/11/41, pp. 540-541.)
1558	Holm and others ...	*Wear and Friction in Slip Contacts, Particularly Between Carbon Brushes and Copper Rings.* (Wiss. Veroff, a.d. Siemens Werken, Vol. 18, No. 1, 1939, pp. 73-100.)
1567	Freise, H.	*Mechanical Optical Extensometer for Static Measurements.* (Z.V.D.I., Vol. 85, No. 47-48, 29/11/41, pp. 919-920.)

TITLES AND REFERENCES OF ARTICLES AND PAPERS SELECTED FROM PUBLICATIONS REVIEWED IN R.T.P.3.

Requests for further information or translations should be addressed to R.T.P.3, Ministry of Aircraft Production.

THEORY AND PRACTICE OF WARFARE.

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
1	3911	U.S.A. ...	*Anti-Aircraft Training with Special Reference to British Experience.* (Lt.-Col. O. D. McNeely, Coast Artillery J., Vol. 85, No. 3, May-June, 1942, pp. 4-9.)
2	3912	U.S.A. ...	*Camouflage Problems.* (H. Saint-Gaudens, Coast Artillery J., Vol. 85, No. 3, May-June, 1942, pp. 10-15.)
3	3913	U.S.A. ...	*Disembarking Operations.* (P. Belleroche, Coast Artillery J., Vol. 84, No. 3, May-June, 1942, pp. 24-29.)
4	3914	U.S.A. ...	*A.A. Battery, Lateral and Vertical Lead Charts for Diving Targets.* (H. Spaans, Coast Artillery J., Vol. 84, No. 3, May-June, 1942, pp. 34-41.)
5	3931	U.S.A. ...	*Military Rockets.* (A. Klemin, Sci. Am., Vol. 166, No. 2, Feb., 1942, pp. 97-98.)
6	3932	Switzerland ...	*Aircraft Carrier Operations.* (Inter. Avia., No. 827, 30/7/42, pp. 1-10.)
7	3933	U.S.A. ...	*Proposed Mass Construction of Martin PB2M-1 "Mars."* (Inter. Avia., No. 827, 30/7/42, p. 12.)
8	3934	U.S.A. ...	*Douglas C-54 Transport (Military Version of DC4).* (Inter. Avia., No. 827, 30/7/42, p. 13.)
9	3935	U.S.A. ...	*Fairchild Trainer Built by Duramold Process.* (Inter. Avia., No. 827, 30/7/42, p. 13.)
10	3937	Japan ...	*Japanese Float Plane Fighter.* (Inter. Avia., No. 827, 30/7/42, p. 17.)
11	3938	U.S.A. ...	*Curtis C46 Transport on the China Supply Route.* (Inter. Avia., No. 827, 30/7/42, p. 19.)
12	3939	G.B.	*Wire Net Runway Used by the R.A.F.* (Inter. Avia., No. 827, 30/7/42, p. 21.)

ITEM NO.	R.T.P. REF.		TITLE AND JOURNAL.
13	3940	Germany ...	*Rubber Dinghies on German Aircraft.* (Inter. Avia., No. 827, 30/7/42, p. 22.)
14	3942	Italy ...	*Savoia Marchetti SM. 75 for Rome-Tokio Flight.* (Inter. Avia., No. 827, 30/7/42, p. 23.)
15	3943	U.S.A. ...	*Beech AT-11 Advanced Trainer (Photograph).* (Inter. Avia., No. 827, 30/7/42, p. 1.)
16	3961	U.S.A. ...	*Optimum Time of Delay for Parachute Opening.* (W. A. Wildhack, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 293-301.)
17	3965	U.S.A. ...	*North America XP-64 Fighter (Photograph).* (Inter. Avia., No. 827, 30/7/42, p. 1.)
18	3966	U.S.A. ...	*Boeing B17E (Fortress II) (Photograph).* (Inter. Avia, No. 827, 30/7/42, p. 1.)
19	3997	Switzerland ...	*Possible Evasive Manœuvres of Aircraft Under A.A. Fire.* (H. Donatsch, Flugwehr und Technik, Vol. 4, No. 6, June, 1942, pp. 141-144.)
20	3999	Germany ...	*Some Notes on the Unsymmetrical Aircraft B.V. 141.* (W. Pfenninger, Flugwehr und Technik, Vol. 4, No. 6, July, 1942, p. 155.)
21	4000	Germany ...	*A.A. Artillery Fire Control Gear.* (A. Kuhlenkamp, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 417-429.)
22	4043	G.B.	*Attack on Tanks by Diving Aircraft Fitted with Cannon.* (Engineer, Vol. 174, No. 4,517, 7/8/42, p. 115.)
23	4045	U.S.A. ...	*Grumman Avenger (Photograph).* (Flight, Vol. 42, No. 1,753, 30/7/42, p. 112.)
24	4048	Italy ...	*Reggiane 2001 Single-Seat Fighter (Photograph).* (Flight, Vol. 42, No. 1,753, 30/7/42, p. 119.)
25	4049	U.S.A. ...	*Republic P.47 Thunderbolt Fighter.* (Flight, Vol. 42, No. 1,753, 30/7/42, p. 120.)
26	4050	U.S.A. ...	*Martin 187 Baltimore Bomber (Recog. Details).* (Flight, Vol. 42, No. 1,753, 30/7/42, p. a.)
27	4051	U.S.A. ...	*Martin B.26 Marauder (Recog. Details).* (Flight, Vol. 42, No. 1,753, 30/7/42, p. b.)
28	4052	G.B.	*Torpedo Aircraft.* (M. Waddell, Flight, Vol. 42, No. 1,753, 30/7/42, p. 121.)
29	4053	U.S.A. ...	*North America Va. 73 Mustang Fighter.* (Flight, Vol. 42, No. 1,753, 30/7/42, pp. 122-123.)
30	4054	G.B.	*Fighter Take-off Weight (Rapid Estimator for New Designs).* (W. Nichols, Flight, Vol. 42, No. 1,753, 30/7/42, pp. 126-127.)
31	4070	U.S.A. ...	*Some Engineering Aspects of Protective Construction Against Bombs.* (A. M. Prentiss, Army Ordnance, Vol. 22, No. 133, July-Aug., 1942, pp. 54-58.)
32	4075	G.B.	*Tactics of the Aircraft Carrier.* (H. W. Richmond, Engineering, Vol. 154, No. 3,997, 21/8/42, pp. 143-144.)
33	4084	U.S.A. ...	*Curtiss SO3C-1 Seagull Observation Plane (Photograph).* (Am. Av., Vol. 6, No. 2, 15/6/42, p. 4.)
34	4089	U.S.A. ...	*Organisation of the U.S. Army Air Force.* (Inter. Avia., No.828-829, 7/8/42, pp. 1-10.)
35	4091	U.S.A. ...	*Curtiss C-76 Transport (Wooden Construction).* (Inter. Avia., No. 828-829, 7/8/42, p. 12.)

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36	4092	Germany ...	*Armament of Do. 215, He. 111, BV. 138, Do. 21.* (Inter. Avia., No. 828-829, 7/8/42, pp. 16-17.)
37	4093	U.S.A. ...	*Consolidated B-24D Liberator III.* (Inter. Avia., No. 828-829, 7/8/42, pp. 12-13.)
38	4094	U.S.S.R. ...	*Russian Twin-Engined Bomber, S.B. 2 and S.B. 3, A.N.T. 40.* (Inter. Avia., No. 828-829, 7/8/42, p. 15.)
39	4095	U.S.A. ...	*Lockheed A-29 (Hudson).* (Inter. Avia., No. 828-829, 7/8/42, p. 13.)
40	4098	U.S.A. ...	*Lockheed P-38 Lightning in Australia.* (Inter. Avia., No. 828-829, 7/8/42, p. 22.)
41	4100	G.B.	*Avro Lancaster.* (Inter. Avia., No. 828-829, 7/8/42, p. 15.)
42	4101	Switzerland ...	*Swiss Underground Power Stations.* (Inter. Avia., No. 828-829, 7/8/42, pp. 23-24.)
43	4102	U.S.A. ...	*Main Wheel of Douglas B-19 (Photograph).* (Inter. Avia., No. 828-829, 7/8/42, p. 1.)
44	4103	U.S.A. ...	*Glen Martin BB2M-1 "Mars" (Photograph).* (Inter. Avia., No. 828-829, 7/8/42, p. 1.)
45	4104	G.B.	*Photographic Equipment in the Royal Air Force.* (A. Falorde, Aeronautics, Vol. 7, No. 1, Aug., 1942, pp. 31-38.)
46	4105	Germany ...	*Silhouette of Some German Military Aircraft (F.W. 187, He. 115, A.R. 96, F.W. 189, F.W. 58).* (Aeronautics, Vol. 7, No. 1, Aug., 1942, p. 47.)
47	4107	G.B.	*Parachute Training.* (R. G. Collins, Aeronautics, Vol. 7, No. 1, Aug., 1942, pp. 54-55.)
48	4108	U.S.A. ...	*American Glider Trainers (Photographs).* (Aero Digest, Vol. 40, No. 6, June, 1942, p. 58.)
49	4109	U.S.S.R. ...	*Russian I-16 Fighter (Photograph).* (Aero Digest, Vol. 40, No. 6, June, 1942, p. 62.)
50	4115	U.S.A. ...	*Training Paratroops.* (S. R. Winters, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 95-99 and 102.)
51	4123	Japan ...	*Aircraft of the Japanese Air Force.* (Aero Digest, Vol. 40, No. 6, June, 1942, pp. 160-163.)
52	4126	U.S.A. ...	*Comfort in Military Aircraft.* (A. G. Arnhym, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 188-211.)
53	4127	Italy ...	*Modern Tanks (III).* (A. Nanni, l'Auto Italiana, Vol. 23, No. 17, 20/6/42, pp. 21-24.)
54	4131	G.B.	*Avro Lancaster.* (Aeroplane, Vol. 63, No. 1,629, 14/8/42, pp. 178-181 and 190-191.)
55	4132	Germany ...	*Focke Wulf F.W. 190 A3.* (Aeroplane, Vol. 63, No. 1,629, 14/8/42, pp. 186-187.)
56	4133	U.S.A. ...	*Curtiss "Commando" Military Transport (Photograph).* (Aeroplane, Vol. 63, No. 1,629, 14/8/42, p. 196.)
57	4134	U.S.A. ...	*Douglas C-33 (Dc. 2) and C-47 (Dc. 3) Dakota I (Recognition Details).* (Aeroplane, Vol. 63, No. 1,629, 14/8/42, pp. 200-201.)
58	4135	U.S.S.R. ...	*M.I.G. 3 Single-Seat Fighter Bomber (Photograph).* (Flight, Vol. 42, No. 1,755, 13/8/42, p. 164.)
59	4137	G.B.	*Avro Lancaster.* (Flight, Vol. 42, No. 1,755, 13/8/42, pp. 174-179.)

https://doi.org/10.1017/S0368393100140672 Published online by Cambridge University Press

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60	4138	Germany	...	*Focke Wulf F.W.* 190. (Flight, Vol. 42, No. 1,755, 13/8/42, pp. 182-185.)
61	4139	U.S.A.	...	*Boeing AT-15 Trainer (Photograph).* (Flight, Vol. 42, No. 1,755, 13/8/42, p. 186.)
62	4143	G.B. ...	...	*Avro Lancaster (Recog. Details).* (Flight, Vol. 42, No. 1,756, 20/8/42, pp. a, 204.)
63	4144	U.S.A.	...	*Flying Fortress II (Recog. Details).* (Flight, Vol. 42, No. 1,756, 20/8/42, pp. b, 204.)
64	4145	Germany	...	*Do. 217E Tail Brake.* (Flight, Vol. 42, No. 1,756, 20/8/42, p. 205.)
65	4146	G.B. ...	...	*Estimating Take-off Weight (II Bombers).* (W. Nicholls, Flight, Vol. 42, No. 1,756, 20/8/42, pp. 207-208.)
66	4147	U.S.A.	...	*North American "Mustang."* (Flight, Vol. 42, No. 1,756, 20/8/42, pp. 209-211.)
67	4162	U.S.A.	...	*Douglas C-47 (Dakota I) Military Transport (Photograph).* (Aeroplane, Vol. 63, No. 1,631, 28/8/42, p. 243.)
68	4163	Germany	...	*Focke Wulf F.W. 190 A3 (Sectional Drawing).* (Aeroplane, Vol. 63, No. 1,631, 28/8/42, pp. 248-249 and 262.)
69	4164	U.S.A.	...	*Curtiss Wright C.W. 20 Transport (Photograph).* (Aeroplane, Vol. 63, No. 1,631, 28/8/42, p. 256.)
70	4165	Germany	...	*Heinkel He. III HaE. (Recog. Details).* (Aeroplane, Vol. 63, No. 1,631, 28/8/42, p. 258.)
71	4166	G.B. ...	...	*Bristol Beaufort I (Recog. Details).* (Aeroplane, Vol. 63, No. 1,631, 28/8/42, p. 209.)
72	4177	G.B. ...	...	*Westland Whirlwind.* (Flugsport, Vol. 34, No. 13, 24/6/42, pp. 201-202.)
73	4183	Germany	...	*Cupola Shaped Gun Post Rotated Electrically. Pat. Series* 31 (720,256). (Heinkel, Flugsport, Vol. 34, No. 13, 24/6/42, pp. 125-126.)
74	4195	Germany	...	*The Importance of India as a Supplier of War Material.* (H. Ochmen, W.T.M., Vol. 46, No. 6, June, 1942, pp. 131-136.)
75	4198	Germany	...	*External Ballistics (the Evaluation of Uncomplete Dispersion Records).* (H. H. Kritziner, W.T.M., Vol. 46, No. 6, June, 1942, pp. 144-149.)
76	4203	U.S.A.	...	*Douglas Boston III (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 148.)
77	4204	U.S.A.	...	*North American B-25B Mitchell II (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 149.)
78	4205	G.B. ...	...	*Supermarine Spitfire S.B. (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 151.)
79	4206	U.S.A.	...	*American Three-Seat Training Glider (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 152.)
80	4207	U.S.A.	...	*Northrop N.3 P.B. Float Plane (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 152.)
81	4208	U.S.A.	...	*Martin XPB2M-1 "Mars" (Photograph), Loading Weight* 140,000 *lbs.* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 155.)
82	4209	U.S.A.	...	*Curtis C-14 Two Motor Transport (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 155.)
83	4210	U.S.A.	...	*Douglas B-19 (Loaded Weight 160,000 lbs.) (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 156.)

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84	4211	U.S.A.	...	*Design for Air Supremacy.* (J. L. Atwood, Mech. Eng., Vol. 64, No. 6, June, 1942, pp. 470-472.)
85	4212	U.S.A.	...	*Vought Sikorsky V.S.-44A "Excalibur" (Photograph).* (Aeroplane, Vol. 63, No. 1,628, 7/8/42, p. 156.)
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87	4214	G.B. ...	...	*Parachute Rockets for A.A. Defence (Photograph).* (Aeroplane, Vol. 63, No. 1,630, 21/8/42, p. 212.)
88	4215	U.S.A.	...	*Boeing B-17E Flying Fortress (Photograph).* (Aeroplane, Vol. 63, No. 1,630, 21/8/42, pp. 214 and 215.)
89	4216	Germany	...	*Details of F.W.* 190 *(Photograph).* (Aeroplane, Vol. 63, No. 1,630, 21/8/42, pp. 216-217.)
90	4217	Germany	...	*Do.* 217 *B2 Tail Brake (Photographs).* (Aeroplane, Vol. 63, No. 1,630, 21/8/42, p. 218.)
91	4218	U.S.A.	...	*North American "Mustang" (Photograph).* (Aeroplane, Vol. 63, No. 1,630, 21/8/42, pp. 228-229.)
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93	4220	G.B. ...	...	*Handley Page "Halifax" (Detail Sketches and Identification Details).* (Flight, Vol. 42, No. 1,754, 6/8/42, pp. 146-147 and a.)
94	4221	Germany	...	*Ju.* 88 *Gun Position in Rear of Cockpit (Photograph).* (Flight, Vol. 42, No. 1,754, 6/8/42, p. 148.)
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96	4223	G.B. ...	...	*Liquid Fuel Rocket Propulsion.* (C. Giles, Flight, Vol. 42, No. 1,754, 6/8/42, pp. 155-156.)
97	4224	G.B. ...	...	*Avro Manchester Bomb Rack (Photograph).* (Flight, Vol. 42, No. 1,754, 6/8/42, p. 161.)
98	4228	G.B. ...	...	*Adhesion and Adhesives, with Special Reference to Anti-Scatter Treatments for Windows.* (B. Butterworth, Chem. and Ind., Vol. 61, No. 33, 15/8/42, pp. 350-351.)
99	4229	U.S.A.	...	*Flame Proof Fabrics.* (Sci. Am., Vol. 166, No. 4, April, 1942, pp. 200-202.)
100	4232	U.S.A.	...	*The Aircraft Carrier.* (W. L. Robinson, Sci. Am., Vol. 167, No. 2, Aug., 1942, pp. 52-54 and 82.)
101	4235	U.S.A.	...	*Fire Resisting Roofing Material.* (Sci. Am., Vol. 167, No. 2, Aug., 1942, pp. 58-59.)
102	4238	Germany	...	*British Reports on the Dornier Do.* 217 *E-1.* (Airc. Eng., Vol. 14, No. 162, Aug., 1942, pp. 214-222.)
103	4239	U.S.A.	...	*North American NA-VOC (B-25 C) Twin-Engined Medium Bomber.* (Airc. Eng., Vol. 14, No. 162, Aug., 1942, pp. 228-229.)
104	4252	G.B. ...	...	*Avro Lancaster (II).* (Engineer, Vol. 174, No. 4,519, 21/8/42, pp. 156-159).
105	4263	G.B. ...	...	*Repair of Bomb Damaged Houses.* (Engineering, Vol. 154, No. 3,998, 28/8/42, p. 166.)
106	4269	U.S.A.	...	*Picking Up Gliders by an Aircraft in Flight (Photograph).* (American Av., Vol. 6, No. 3, 1/7/42, p. 4.)

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108	4271	U.S.A.	...	*Convertible Cargo Passenger Air Liners.* (E. J. Foley, American Av., Vol. 6, No. 3, 1/7/42, pp. 42 and 49.)
109	4272	U.S.A.	...	*Collapsible Rubber Tanks for Bulk Transport.* (G. L. Martin, American Av., Vol. 6, No. 3, 1/7/42, p. 49.)
110	4273	U.S.A.	...	*Curtiss Condor III Transport (Photograph).* (American Av., Vol. 6, No. 3, 1/7/42, p. 52.)
111	4279	G.B. ...	...	*Handley Page Halifax II.* (M. W. Bourdon, Autom. Ind., Vol. 86, No. 12, 15/6/42, pp. 20-24 and 64.)
112	4285	U.S.A.	...	*Boeing AT-15 Trainer (Photograph).* (Autom. Ind., Vol. 86, No. 12, 15/6/42, p. 47.)
113	4291	G.B. ...	...	*Welding of Tank Armour (from the British).* (Metal Progress, Vol. 41, No. 5, May, 1942, pp. 700-706.)
114	4338	G.B. ...	...	*Ship Borne Aviation.* (Engineer, Vol. 174, No. 4,520, 28/8/42, p. 172.)
115	4342	G.B. ...	...	*Lanchester's N^2 Law on Effective Strength.* (Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 123-124.)
116	4346	Germany	...	*F.W. 190 Fighter.* (Engineering, Vol. 154, No. 3,996, 14/8/42, p. 137.)
117	4347	G.B. ...	...	*Avro Lancaster.* (Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 127 and 130.)
118	4351	U.S.A.	...	*Mass Bombings Change Conduct of War.* (J. A. Ward, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 70-72 and 372-374.)
119	4366	G.B. ...	...	*Short Stirling (Design Details).* (Aero Digest, Vol. 40, No. 7, July, 1942, pp. 174-176.)
120	4380	Germany	...	*Heinkel He. 177 and He. 274.* (Inter. Avia., No. 183, 28/8/42, p. 11.)
121	4382	Italy	...	*Reggiane Re. 2001 Fighter Bomber (Photograph).* (Inter. Avia., No. 831, 28/8/42, p. 1.)
122	4383	G.B. ...	...	*Bristol Beaufort.* (Inter. Avia., No. 831, 28/8/42, pp. 13-14.)
123	4384	U.S.A.	...	*Republic P-47 Thunderbolt (Silhouette).* (Inter. Avia., No. 831, 28/8/42, p. 1.)
124	4386	U.S.A.	...	*Curtiss Wright AT9 Trainer (Silhouette).* (Inter. Avia., No. 831, 28/8/42, p. 1.)
125	4387	U.S.A.	...	*North American NA.-73 "Mustang" P-51 Apache.* (Inter. Avia., No. 831, 28/8/42, pp. 14-15.)
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129	4400	Germany	...	*Long Distance Photograph of English Coast near Dover, Taken from the French Shore.* (Luftwelt, Vol. 9, No. 12, 15/6/42, pp. 228-231.)
130	4401	Germany	...	*German A.A. Guns in the West (Photographs).* (Luftwelt, Vol. 9, No. 12, 15/6/42, pp. 228-231.)

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132	4416	U.S.A.	... *Chemical Detection of War Gases for Civilian Defence.* (T. F. Bradley, Ind. and Eng. Chem., Vol. 20, No. 14, 25/7/42, pp. 893-896.)
133	4432	G.B. ...	... *Avro Lancaster Heavy Bomber.* (Engineer, Vol. 174, No. 4,518, 14/8/42, pp. 129-130.)
134	4435	Germany	... *F.W.* 190 *Fighter.* (Engineer, Vol. 174, No. 4,518, 14/8/42, pp. 137-138.)
135	4440	G.B. ...	... *Miles Master III Trainer (Photograph).* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 268.)
136	4441	G.B. ...	... *Miles Martinet I Target Tower (Photograph).* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 269.)
137	4442	U.S.A.	... *Republic P-47b Thunderbolt (Photograph).* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 271.)
138	4444	G.B. ...	... *Handley Page Hampden Used as a Mine Layer.* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, pp. 276-277.)
139	4446	U.S.A.	... *Glen Martin "Mars" (Photograph).* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 288.)
140	4449	Germany	... *Arado AR.* 196 *in the Bay of Biscay.* (Inter. Avia., No. 830, Aug., 1942, pp. 17-18.)
141	4450	G.B. ...	... *Foreign Air Units in the R.A.F.* (Inter. Avia., No. 830, Aug., 1942, p. 21.)
142	4451	G.B. ...	... *Holman Projector (Rocket with Wire Released by Parachute for A.A. Defence).* (Inter. Avia., No. 830, Aug., 1942, p. 23.)
143	4452	U.S.A.	... *American Military Transport System (Present and Future).* (Inter. Avia., No. 830, Aug., 1942, pp. 1-9.)
144	4453	U.S.A.	... *Martin* 187 *"Baltimore."* (Inter. Avia., No. 830, Aug., 1942, p. 14.)
145	4454	Germany	... *Focke Wulf F.W.* 189 *Gun Mounting.* (Inter. Avia., No. 830, Aug., 1942, pp. 11-12.)
146	4455	Germany	... *Focke Wulf* 190. (Inter. Avia., No. 830, Aug., 1942, p. 12.)
147	4456	U.S.A.	... *Beech Trainer AT*-10. (Inter. Avia., No. 830, Aug., 1942, p. 14.)
148	4460	G.B. ...	... *Avro Lancaster.* (Inter. Avia., No. 830, Aug., 1942, p. 15.)
149	4461	U.S.A.	... *Boeing XPBB*-1 *Flying Boat Bomber ("Sea Ranger").* (Inter. Avia., No. 830, Aug., 1942, pp. 13-14.)
150	4462	G.B. ...	... *New Equipment of the R.A.F.* (Inter. Avia., No. 830, Aug., 1942, p. 15.)
151	4464	U.S.A.	... *Northrop N-3P Patrol Seaplane (Photograph).* (Flight, Vol. 42, No. 1,759, 10/9/42, p. 276.)
152	4465	G.B. ...	... *Glider Pilot Training.* (Flight, Vol. 42, No. 1,759, 10/9/42, pp. 277-279.)
153	4466	Germany	... *Me.* 110 *(Identification Details).* (Flight, Vol. 42, No. 1,759, 10/9/42, p. a.)
154	4467	Germany	... *Do.* 217*E (Identification Details).* (Flight, Vol. 42, No. 1,759, 10/9/42, p. b.)

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157	4490	G.B. ...	*Air Power and Civilisation. (M. J. Bernard Davy. George Allan Unwin, Ltd.) . (Book Review by Brabazon of Tara.)* (Nature, Vol. 150, No. 3,796, 1/8/42, pp. 132-133.)
158	4493	U.S.A. ...	*Martin P.B.M.-1 Flying Boat Bomber (Photograph).* U.S. Air Services, Vol. 27, No. 6, June, 1942, p. 17.)
159	4494	U.S.A. ...	*Curtiss Observation Plane SO3C-1 "Seagull" (Photograph).* U.S. Air Services, Vol. 27, No. 6, June, 1942, p. 26.)
160	4495	U.S.A. ...	*Curtiss "Tomahawk" at the Leningrad Front.* (S. Marvich, U.S. Air Services, Vol. 27, No. 7, July, 1942, p. 37.)
161	4496	U.S.A. ...	*Grumman "Avenger" Torpedo Bomber (Photograph).* (U.S. Air Services, Vol. 27, No. 7, July, 1942, p. 40.)
162	4517	Germany ...	*Military Transport Aircraft (Italy, G.B., U.S.A., France, U.S.S.R. and Germany).* (W. Wagner, Luftwissen, Vol. 9, No. 7, July, 1942, pp. 201-208.)
163	4522	Germany ...	*Curves of Pursuit (Errata in Original Article).* (F. Gabriel, Luftwissen, Vol. 9, No. 7, July, 1942, p. 220.)
164	4540	Switzerland ...	*The Employment of 75mm. A.A. Guns Against Ground Targets.* (W. M. Graf, Flugwehr und Technik, Vol. 4, No. 8, Aug., 1942, pp. 206-207.)
165	4541	Switzerland ...	*The Effect of Increased Resistance Due to Compressibility on the Tactical Employment of Fighter Aircraft.* (E. Muhlemann, Flugwehr und Technik, Vol. 4, No. 8, Aug., 1942, pp. 208-210.)
166	4543	G.B. ...	*Westland Whirlwind.* (Flugwehr und Technik, Vol. 4, No. 8, Aug., 1942, p. 214.)
167	4552	G.B. ...	*Handley Page Halifax.* (N. E. Goff, Airc. Prod., Vol. 4, No. 45, July, 1942, pp. 452-464.)
168	4556	U.S.A. ...	*U.S. Army Glider (Photograph).* (Am. Av., Vol. 6, No. 4, 15/7/42, pp. 13 and 26.)
169	4557	U.S.A. ...	*Martin "Mars" Initial Flight.* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 14.)
170	4561	U.S.A. ...	*Vought Sikorsky Navy Fighter "Corsair" (Photograph).* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 38.)
171	4574	Germany ...	*Design Features of Do. 217.* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 524-525.)

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172	3901	Germany ...	*Flow Research and Aircraft Design.* (A. Busemann, Luftwissen, Vol. 9, No. 6, June, 1942, pp. 173-176.)
173	*3944	U.S.A. ...	*Steady Flow in the Transition Length of a Straight Tube.* (H. Langhaar, J. App. Mech., Vol. 9, No. 2, June, 1942.)
174	*3949	U.S.A. ...	*Graphical Solution of Fluid-Friction Problems.* (E. S. Dennison, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 82-84.)

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175	3962	U.S.A. ...	*A New Two-Parameter Model Suspension System for the Galcit 10 ft. Wind Tunnel.* (A. L. Klein and others, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 302-308.)
176	*3989	U.S.S.R. ...	*Friction Losses in Rotating Discs.* (L. Kissina and K. Chebisheva, C.A.H.., No. 211, pp.166-174.)
177	*3991	U.S.S.R. ...	*Influence of the Setting Angle on the Readings of a Pitot Static Tube.* (V. Polykowsky, C.A.H.I., No. 211, pp. 179-185.)
178	4005	Germany ...	*Resistance Co-efficient of Pipe Lines Under Pulsating Flow and Propagation of Finite Amplitude Disturbances (Digest).* (F. Schultz and Grunow, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 435.)
179	4007	Germany ...	*The Theory for Two-Dimensional Gas Wave of Large Amplitude (Digest).* (H. Pfrum, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 436.)
180	4008	Germany ...	*The Inflow Condition of Two-Dimensional Slots (Digest).* (H. Hahnemann, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 436.)
181	4009	Germany ...	*Heat Transfer During Steam Condensation with Turbulent Water Skin.* (V. Grigwell, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 444-445.)
182	4010	Germany ...	*Leakage Losses in Stuffing Boxes and Labyrinth Packings (Digest).* (W. Hartmann, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 436-437.)
183	4011	Germany ...	*Flow Phenomena in Packing and Seals (Digest).* (G. Hutarew, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 437.)
184	4013	Germany ..	*The Behaviour of Blade Profiles in the Vicinity of Sonic Velocities (Digest).* (A. Busemann, Z.V.D.I., Vol. 86, No. 27-28, p. 437.)
185	4015	Germany ...	*The Laws of Free Turbulence (Digest).* (H. Reichardt, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 438.)
186	4016	Germany ...	*Investigation of Flow Phenomena in Branched Pipe Lines by a Graphical Numerical Method (Digest).* (G. Reyl, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 438.)
187	4035	G.B.	*Comments on Schumann's Paper on "An Investigation Concerning G. I. Taylor's Correlation Coefficient of Turbulence."* (C. L. Pekeris, Phil. Mag., Vol. 33, No. 222, July, 1942, pp. 541-543.)
188	4266	G.B.	*Modernisation of Windmills (Dekker Design).* (Engineering, Vol. 154, No. 9, 28/8/42, p. 173.)
189	4563	U.S.A. ...	*North American High Speed Wind Tunnel (8′ × 11′ 327 m.p.h.).* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 44.)

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190	3900	Italy ...	*Mechanical De-Icers, from the Italian.* (A. Boschi, Luftwissen, Vol. 7, No. 5, May, 1940, p. 188.)
191	3915	Germany ...	*Rapid Graphical Determination of Section Moments by Means of Specially Ruled Tracing Paper.* (A. Spiegler, Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, p. 378.)

* Abstract available.

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192	3936	U.S.A. ...	*High Altitude Flying Developments by the Air Research Company*. (Inter. Avia., No. 827, 30/7/42, p. 14.)
193	3959	U.S.A. ...	*Preliminary Static Test of a Magnesium Alloy Wing*. (E. W. Colon and J. C. Mathes, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 284-287.)
194	3963	U.S.A. ...	*Technical Development of the V.S. 300 Helicopter during* 1941. (I. I. Sikorsky, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 309-311.)
195	3972	U.S.A. ...	*Development of Impact Resisting Windshields*. (S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 319-320.)
196	3998	Switzerland ...	*The Effectiveness of the Aileron at High Flying Speeds*. (W. Witz, Flugwehr und Technik, Vol. 4, No. 6, June, 1942, pp. 146-155.)
197	4022	G.B.	*Cargo Aircraft*. (Engineer, Vol. 174, No. 4,516, 31/7/42, p. 94.)
198	4029	U.S.A. ..	*The Langley Plywood Plane*. (A. Klemin, Sci. Am., Vol. 166, No. 1, Jan., 1942, p. 36.)
199	4046	G.B.	*New Rotol Light Weight Airscrew for Trainers (Fully Feathering)*. (Flight, Vol. 42, No. 1,753, 30/7/42, p. 113.)
200	4085	U.S.A. ..	*Wood Plastic Trainer A.T.* 10 *with Wooden Fuel Tanks*. (Am. Av., Vol. 6, No. 2, 15/6/42, p. 40.)
201	4111	U.S.A. ...	*The Handling of Flying Boats on the Water*. (F. Smith, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 73-74 and 220.)
202	4112	U.S.A. ...	*Co-ordination in Aerobatics*. (Casey Carl Ferrante, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 82 and 232.)
203	4117	U.S.A. ...	*The Technique of Flying in Rough Air*. (H. M. Cone, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 106-110.)
204	4121	U.S.A. ...	*Pay Load and Accessories*. (L. R. Hackman, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 138 and 216-219.)
205	4122	U.S.A. ...	*Graphical Analysis of Tripod Landing Gears*. (S. Arkawy, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 157-158 and 314.)
206	4158	Switzerland ...	*Propeller Blade Milling Machine (Escher-Wyss)*. (Engineering, Vol. 154, No. 3,995, 7/8/42, p. 106.)
207	4176	Germany ...	*B.V.* 141 *Unsymmetrical Aircraft*. (Flugsport, Vol. 34, No. 13, 24/6/42, pp. 197-201.)
208	4178	Germany ...	*Aircraft Icing—Review of Problems and Remedies*. (H. Stener, Flugsport, Vol. 34, No. 13, 24/6/42, pp. 203-207.)
209	4180	Germany ...	*Rigid Centre Rod Connection at the Root of Folding Wings (Pat. Series No.* 31—720,255). (Fiesler, Flugsport, Vol. 34, No. 13, 24/6/42, p. 125.)
210	4181	Germany ...	*Device for Setting Control Tab Angles (Pat. Series* 31—720,873). (Rostock, Flugsport, Vol. 34, No. 13, 24/6/42, p. 125.)
211	4182	Germany ...	*Automatic Variation in Tab Setting Dependent on Control Force Magnitude (Pat. Series* 31—720,486). (Focke Wulf, Flugsport, Vol. 34, No. 13, 24/6/42, p. 125.)

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212	4184	Germany ...	*Self-Locking Turnbuckle.* (Heinkel, Flugsport, Vol. 34, No. 13, 24/6/42, p. 126.)
213	4185	Germany ...	*Aircraft Ski Mounting (Pat. Series No. 31—720,920).* (Messerschmitt, Flugsport, Vol. 34, No. 13, 24/6/42, p. 127.)
214	4186	Germany ...	*Spring Mounting for Aircraft Wheels.* (V.D.M., Flugsport, Vol. 34, No. 13, 24/6/42, p. 128.)
215	4187	Germany ...	*Retractable Undercarriage (Pat. Series No. 31—720,194).* (Heinkel, Flugsport, Vol. 34, No. 13, 24/6/42, p. 128.)
216	4189	G.B.	*Plastic Wood in Aircraft.* (British Plastics, Vol. 13, No. 159, Aug., 1942, pp. 159-160.)
217	4170	G.B.	*Theory of Aircraft Undercarriages in Relation to Absorption of Initial Launching Impact.* (P. B. Walker, J. Roy. Aeron. Soc., Vol. 46, No. 380, Aug., 1942, pp. 198-209.)
218	4234	U.S.A. ...	*Rubber Bushings for Aircraft Control Surfaces.* (Sci. Am., Vol. 167, No. 2, Aug., 1942, p. 58.)
219	4237	U.S.A. ...	*Curtiss C-76 Cargo Plane (Made of Wood).* (Sci. Am., Vol. 167, No. 2, Aug., 1942, pp. 86-87.)
220	4241	G.B.	*Servicing and Maintenance of Civil Aircraft.* (Airc. Eng., Vol. 14, No. 162, Aug., 1942, pp. 228-229.)
221	4274	Italy ...	*Some Notes on Static Longitudinal Stability, with Special Reference to Aircraft of the "Canard" Type.* (E. Pistolesi, L'Aerotecnica, Vol. 22, No. 5, May, 1942, pp. 213-223.)
222	4275	Italy ...	*Stresses and Deformation of a Twisted Cylinder with Rectilinear Axis Subjected to Tension, Torsion and Bending, with Special Reference to Airscrews.* (P. Giovannizzi, L'Aerotecnica, Vol. 2, No. 5, May, 1942, pp. 187-205.)
223	4277	Italy ...	*List of Aircraft Patents.* (L'Aerotecnica, Vol. 22, No. 5, May, 1942, pp. 246-248.)
224	4280	U.S.A. ...	*Steel Propeller Blades (Seamless Tubing).* (Autom. Ind., Vol. 86, No. 12, 15/6/42, pp. 28-29.)
225	4283	U.S.A. ...	*Rotol Contra-Rotating Propeller.* (M. W. Bourdon, Autom. Ind., Vol. 86, No. 12, 15/6/42, pp. 36-37 and 54.)
226	4294	G.B.	*Lanolin Resin Paints for Aircraft.* (Ind. and Eng. Chem. (News Ed.), Vol. 20, No. 12, 25/6/42, p. 793.)
227	4321	G.B.	*Bibliography of Published Information (including Translations) on Pressure Cabins (I, General; II, Pressure Cabin Design; III, Cabin Supercharging; IV, Cabin Heating; V, Experimental Equipment; VI, Military Aspects).* (R.T.P.3, Bibliography No. 24, July, 1942.)
228	4322	G.B.	*List of References on Steel Propellers.* (Prepared by R.T.P.3, Sept., 1942.)
229	4367	U.S.A. ...	*Glue in Wooden Aircraft.* (J. G. McDermot, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 186 and 267-270.)
230	4368	U.S.A. ...	*Low Carbon Low Alloy Steel in Shell Type Aircraft Structures.* (E. Schmued, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 191-199 and 370.)

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231	4369	U.S.A. ...	*Uses of Plywood in Aircraft.* (T. D. Perry, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 200-206.)
232	4377	U.S.A. ...	*The Present State of Aircraft Finishes.* (M. A. Coler and E. de Nio, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 254 and 263-267.)
233	4390	U.S.A. ...	*Auxiliary Air Fields (Flight Strips).* (Inter. Avia., No. 831, 28/8/42, p. 21.)
234	4385	G.B.	*Wood in British Aircraft.* (Inter. Avia., No. 831, 28/8/42, p. 14.)
235	4434	G.B.	*Cargo Aircraft.* (Engineer, Vol. 174, No. 4,518, 14/8/42, p. 135.)
236	4443	U.S.A. ..	*C.G.-4A 15-Seat Glider (Photograph).* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 272.)
237	4447	G.B.	*New Rotol Variable Pitch Airscrew for Trainers.* (Inter. Avia., No. 830, Aug., 1942, pp. 15-16.)
238	4470	U.S.A. ..	*American Air Transport Proposals.* (Flight, Vol. 42, No. 1,759, 10/9/42, p. 288.)
239	4511	U.S.A. ...	*Tricycle Landing Gear Design.* (E. S. Jenkins and A. F. Donovan, J. Aeron. Sciences, Vol. 9, No. 10, Aug., 1942, pp. 385-396.)
240	4513	U.S.A. ...	*Dynamic Balancing as Applied to Transport Aircraft Propellers.* (D. Speas and J. C. Luttrell, J. Aeron Sci., Vol. 9, No. 9, July, 1942, pp. 334-336.)
241	4515	U.S.A. ...	*Use of Plastics and Allied Materials in Aircraft Construction.* (G. W. de Bell, J. Aeron. Sci., Vol. 9, July, 1942, pp. 341-349.)
242	4518	Germany ...	*Sea Rudders on Aircraft Floats.* (W. Lante, Luftwissen, Vol. 9, No. 7, July, 1942, p. 209.)
243	4520	Germany ...	*Surface Protection in Aircraft Construction.* (W. Lante, Luftwissen, Vol. 9, No. 7, July, 1942, p. 202.)
244	4542	Switzerland ...	*Basic Laws of Fabrication and Their Effect on the Design of Structural Elements and Aircraft Type.* (E. J. Ritter, Flugwehr und Technik, Vol. 4, No. 8, Aug., 1942, pp. 210-212.)
245	4550	U.S.A. ...	*Steel Airscrew Blades (Curtiss).* (Airc. Prod., Vol. 4, No. 45, July, 1942, pp. 446-451.)
246	4559	U.S.A. ...	*Curtiss Steel Propeller of 19′ Diameter (Photograph).* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 36.)
247	4560	U.S.A. ...	*Steel Studded Tyre Tread for Winter Operations.* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 35.)
248	4562	U.S.A. ...	*American Cargo Planes.* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 48.)
249	4564	G.B.	*Wing Tips of Synthetic Material (Pytram).* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, p. 483.)

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250	3896	G.B.	*Examples of Enemy Aircraft Engines.* (E. Michaelis, Luftwissen, Vol. 7, No. 5, May, 1940, pp. 149-158.)
251	3899	Germany ...	*Some Consideration on the Maximum Pressure Head of Single Stage Radial Aero Engine Superchargers.* (W. Von der Null, Luftwissen, Vol. 7, No. 5, May, 1940, pp. 173-174.)

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252	3904	Germany ...	*B.M.W.* 801 *Twin Row Radial.* (Luftwissen, Vol. 9, No. 6, June, 1942, pp. 182-183.)
253	3906	Italy ...	*Exhaust Gas Turbines (from the Italian).* (G. Serragli, Luftwissen, Vol. 9, No. 6, June, 1942, p. 191.)
254	3920	Germany ...	*Balancing Axial Thrust in Multi-Stage Centrifugal Pumps.* (F. Krisman, Z.V.D.I.., Vol. 86, No. 22-23, 13/6/42, p. 381.)
255	3927	Germany ...	*Operation of Two-Stroke Engine with Liquid Butane.* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, pp. 375-376.)
256	*3945	U.S.A. ...	*Model Tests on Two Types of Vibration Dampers of the Tuned Absorber Type.* (C. A. Meyer and H. B. Saldin, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 59-64.)
257	*3948	U.S.A. ...	*A Simple Air Injector.* (S. H. Keeman and E. P. Newman, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 75-81.)
258	3952	G.B.	*Tin Economy in Plain Bearings.* (P. T. Holligan, Metal Industry, Vol. 61, No. 5, 31/7/42, pp. 66-68.)
259	*3957	U.S.A. ...	*Heavy Duty Bearings.* (Metal Industry, Vol. 61, No. 5, 31/7/42, p. 76.)
260	*3964	Japan ...	*Some Notes on Features of a Captured Mitsubishi Kinsei Engine (14-Cylinder Radial, 1,000 h.p. Take-off). (Discussion on p.* 46.) (W. G. Ovens, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 253-266.)
261	3970	U.S.A. ...	*The Root Type Supercharger (with Discussion).* (J. L. Ryde, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 304-313. Discussion pp. 55-56 Digest.)
262	3975	U.S.A. ...	*Aircraft Engine Oiling System (Digest).* (S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 43 and 46.)
263	3976	U.S.A. ...	*The Ford Aircraft Engine Museum (Photograph of Exhibits).* (S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 44-45.)
264	3977	U.S.A. ...	*Piston Rings and Oil Control in Two-Cycle High Output Diesel Engines (Digest).* (F. G. Shoemaker, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 50.)
265	3978	U.S.A. ...	*Control of Oil Consumption in the High Speed Four-Cycle Automotive Diesel (Digest).* (A. T. Stahl, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 50.)
266	3979	U.S.A. ...	*Control of Oil Consumption in Four-Cycle Air-Cooled Diesel (Digest).* (W. M. McLaurin, S.A.E.J., Vol. 50, No. 7, July 1942, pp. 50-51.)
267	3980	U.S.A. ...	*Piston Rings for High Speed Diesels (Digest).* (P. S. Lane, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 51.)
268	3981	U.S.A. ...	*Recent Developments in High Speed Diesel Piston Rings.* (J. O. Holls, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 51-52.)
269	3982	U.S.A. ...	*Importance of Compression Rings in Oil Consumption.* (M. O. Teetor, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 52.)

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270	3983	U.S.A.	...	*Control of Oil Consumption in High Speed Four-Cycle Automotive Diesel Engines by Piston Designs (Digest).* (P. B. Jackson, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 52.)
271	3984	U.S.A.	...	*Solution of the Diesel Piston Problems (Digest).* (F. Zollner, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 52.)
272	3985	U.S.A.	...	*Lubricating Oil Consumption of High Speed Diesels and Effect by Nature of Oil (Digest with Discussion).* (C. G. Rosen, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 52-54.)
273	*3987	U.S.S.R.	...	*Straight-Flow Centrifugal Fan.* (E. Struve, C.A.H.I., No. 211, pp. 266-275.)
274	*3988	U.S.S.R.	...	*Reversible Fan of the C.A.H.I.* (N. Sournoff and E. Struve, C.A.H.I., No. 211, pp. 276-284.)
275	*3992	U.S.S.R.	...	*A New Dust Fan of the C.A.H.I. Type.* (M. Kalinushkin, C.A.H.I., No. 211, pp. 255-263.)
276	*3995	U.S.S.R.	...	*The Parallel and Series Work of Fans.* (V. Ovchinnikov, C.A.H.I., No. 211, pp. 186-202.)
277	*3994	U.S.S.R.	...	*Investigations on the Influence of Different Variations in the Design on the Performance of Centrifugal Fan Sirocco.* (V. Polikowsky and V. Ovchinnikov, C.A.H.I., No. 211, pp. 241-250.)
278	*3995	U.S.S.R.	...	*Investigation of a Fan Rateau System for Mine Ventilation.* (M. Nevelson, C.A.H.I., No. 211, pp. 216-240.)
279	3996	U.S.S.R.	...	*Steady Performance of Fans Working in Parallel.* (V. Ovchinnikov and V. Polikovsky, C.A.H.I., No. 211, pp. 203-215.)
280	4003	Germany	...	*Unsteady Flow Phenomena in Internal Combustion Engines (Digest).* (G. Eichelberg, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, p. 435.)
281	4014	Germany	...	*The Accuracy of Measurements Carried Out on Steam Turbines (Digest).* (K. Jaroschek, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 437-438.)
282	4024	G.B. ...	...	*Measurement of Torsional Vibrations.* (R. Stansfield, Engineer, Vol. 174, No. 4,516, 31/7/42, pp. 101-102.)
283	4037	G.B. ...	...	1,000 *Kw. Wind Power Generating Plant.* (Engineering, Vol. 154, No. 3,994, 31/7/42, pp. 81-83 and 90.)
284	4039	G.B. ...	...	*The Supercharging of Two-Stroke Diesel Engines.* (Engineering, Vol. 154, No. 3,994, 31/7/42, pp. 97-100.)
285	4047	G.B. ...	...	*Steam Power Plant for Aircraft.* (V. L. Gruberg, Flight, Vol. 42, No. 1,753, 30/7/42, pp. 115-118.)
286	4090	France	...	*Potez Four-Bank Radial 28-Cylinder Project.* (Inter. Avia., No. 828-829, 7/8/42, pp. 15-16.)
287	4097	U.S.A.	...	*N.A.C.A. Engine Research.* (Inter. Avia., No. 828-829, 7/8/42, p. 13.)
288	4106	G.B. ...	...	*Jet and Rocket Aerial Propulsion.* (G. W. Walton, Aeronautics, Vol. 7, No. 1, Aug., 1942, pp. 48-50.)

https://doi.org/10.1017/S0368393100140672 Published online by Cambridge University Press

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289	4110	U.S.A.	...	*Forged Cylinder Heads for Cyclone Engines.* (H. E. Linsley, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 151-142.)
290	4128	Italy	...	*Exhaust Driven Supercharger.* (G. Piantanida, l'Auto Italiana, Vol. 23, No. 18, 30/6/42, pp. 22-24.)
291	4129	Italy	...	*Exhaust Driven Supercharger.* (G. Piantanida, l'Auto Italiana, Vol. 23, No. 19, 10/7/42, pp. 14-16.)
292	4130	Italy	...	*Surface Treatment of Pistons with Graphite.* (l'Auto Italiana, Vol. 23, No. 19, 10/7/42, p. 17.)
293	4136	Germany	...	*B.M.W. 801A Engine.* (F. C. Sheffield, Flight, Vol. 42, No. 1,755, 13/8/42, pp. 169-173.)
294	4140	G.B. ...	...	*Developments in Engine Production.* (F. R. Banks, Flight, Vol. 42, No. 1,756, 20/8/42, pp. 197-199.)
295	4141	G.B. ...	...	*Rotol Gear Box for Auxiliary Drives.* (Flight, Vol. 42, No. 1,756, 20/8/42, p. 199.)
296	4142	Germany	...	*B.M.W. 801A Engine.* (F. C. Sheffield, Flight, Vol. 42, No. 1,756, 20/8/42, pp. 201-202.)
297	4156	U.S.A.	...	*Aeroplane Engine Cylinders, Castings Sprayed Al. to Reduce Corrosion (Photograph).* (Ind. and Eng. Chem., Vol. 20, No. 13, 10/7/42, p. 884.)
298	4161	G.B. ...	...	*The Supercharging of Two-Stroke Diesel Engine (Sulzer).* (Engineering, Vol. 154, No. 3,995, 7/8/42, pp. 118-120.)
299	4188	G.B. ...	...	*Marine Bearings Made of Plastic Material.* (H. C. Irvin, British Plastics, Vol. 13, No. 159, Aug., 1942, pp. 146-148.)
300	4199	G.B. ...	...	*The Adhesion of Tin Base Bearing Metals.* (W. T. Pell-Walpole, J. Inst. Metals, Vol. 68, No. 97, July, 1942, pp. 217-230.)
301	*4200	G.B. ...	...	*Measurement of the Adhesion of Tin Base Bearing Metals to Various Backing Materials.* (J. C. Prytherch, J. Inst. Metals, Vol. 68, No. 7, July, 1942, pp. 230-253.)
302	*4201	G.B. ...	...	*Adhesion Testing in Bearings.* (B. Chalmers, J. Inst. Metals, Vol. 68, No. 7, July, 1942, pp. 257-258.)
303	4228	U.S.A.	...	*New Diesel Fuel Filter.* (Sci. Am., Vol. 166, No. 4, April, 1942, pp. 173-175.)
304	4268	G.B. ...	...	*The Measurement of Torsional Vibrations.* (R. Stansfield, Engineering, Vol. 154, No. 9, 28/8/42, pp. 178-180.)
305	4276	Italy	...	*Some Design Developments of the Taccona Carburettor and Their Theoretical Basis.* (L. Poggi, L'Aerotecnica, Vol. 22. No. 5, May, 1942, pp. 206-212.)
306	4282	U.S.A.	...	*Engine Installation Testing.* (Autom. Ind., Vol. 86, No. 12, 15/6/42, p. 49.)
307	4302	G.B. ...	...	*Applications of the Laplace Transformations to a Problem on Elastic Vibrations.* (C. J. Tranter, Phil. Mag., Vol. 33, No. 223, Aug., pp. 614-622.)
308	4303	U.S.A.	...	*Bearings for Diesel Engine.* (A. B. Willi, Mech. Eng., Vol. 64, No. 6, June, 1942, pp. 439-448.)

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309	4313	Germany	...	*The State of German Research on Wear, with Special Reference to the Wear of Cylinders and Piston Rings (Part II).* (R. Poppinga, A.T.Z., Vol. 44, No. 11, 10/6/41, pp. 272-279.)
310	4323	G.B. ...	...	*Bibliography of Published Information (including Translations) on Turbines: 1, Steam Turbines; 2, Gas Turbines; 3, Water Turbines; 4, Piston Compressors (including Free Piston Types); 5, Blade Design and Friction; 6, Mechanical Vibration and Critical Speeds; 7, Specific Speed and Non-Dimensional Coefficients.*
311	4324	G.B. ...	...	*Bibliography of Published Information (including Translations) on Supercharger Problems: 1, Blowers; 2, Engine Supercharging; 3, Mechancial Engine Supercharger; 4, Exhaust Driven Supercharger.* (R.T.P.3, Bibliography No. 29, Aug., 1942.)
312	4326	G.B. ...	...	*The Erren Combustion Cycle (H_2 Injected Under Pressure into O_2—Steam Mixture) Spark Ignition.* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, pp. 299-302.)
313	4332	U.S.A.	...	*Polonium Sparking Plugs.* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, p. 330.)
314	4391	U.S.A.	...	*Gear Making by the Wright Aeronautical Corporation.* (Trade Winds, Aug., 1942, pp. 12-14.)
315	4439	G.B. ...	...	*Measurement of Torsional Vibrations.* (R. Stansfield, Engineering, Vol. 154, No. 3,999, 4/9/42, pp. 198-200.)
316	4445	G.B. ...	...	*Rolls Royce Unit Power Plants.* (Aeroplane, Vol. 53, No. 1,632, 4/9/42, p. 280.)
317	4492	U.S.A.	...	*New Engine Laboratory of the N.A.C.A.* (U.S. Air Services, Vol. 28, No. 6, June, 1942, pp. 13-14.)
318	4514	U.S.A.	...	*Optimum Performance of Pendulum Type Vibration Absorber.* (A. H. Shieh, J. Aeron. Sci., Vol. 9, No. 9, July, 1942, pp. 337-340.)
319	4545	G.B. ...	...	*Non-Ferrous Metals in Modern Aero Engines.* (E. Wood, Metal Industry, Vol. 60, No. 3, 16/1/42, pp. 34-37.)
320	4549	G.B. ...	...	*Manufacture of Rolls Royce Merlin XX.* (J. A. Oates, Airc. Prod., Vol. 4, No. 45, July, 1942, pp. 433-444.)
321	4551	G.B. ...	...	*Rolls Royce Vulture Engine.* (Airc. Prod., Vol. 4, No. 45, July, 1942, p. 451.)
322	4566	G.B. ...	...	*Aircraft Engine Testing (Return of Power to Mains).* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 484-485.)
323	4567	G.B. ...	...	*Engine Packing (Pliofilm Envelope).* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, p. 485.)
324	4568	G.B. ...	...	*Manufacture of Rolls Royce Merlin XX.* (J. A. Oates, Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 486-497.)
325	4569	G.B. ...	...	*Rotary Engine Test Rig (Full-Scale Wing Section).* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, p. 501.)
326	4508	U.S.A.	...	*The Correction of Engine Output to Standard Conditions.* (D. S. Hersey, J. Aeron. Sciences, Vol. 9, No. 10, Aug., 1942, pp. 355-371.)

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327	4519	Germany ...	*Possible Cylinder Arrangements for Aircraft Power Units of the Order of 4,000 h.p.* (W. Wagner, Luftwissen, Vol. 9, No. 7, July, 1942, pp. 201-208.)
			FUELS AND LUBRICANTS.
328	3967	U.S.A. ...	*Fuels and Lubricants for U.S. Army Motorised Ground Force.* (G. A. Round, S.A.E. Journal, Vol. 50, No. 7, July, 1942, pp. 267-275.)
329	3969	U.S.A. ...	*Heavy Duty Lubricating Oil for Naval Diesel Engines.* (E. N. Klemgard, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 284-298.)
330	3986	U.S.A. ...	*Effect of Diesel Fuel on Exhaust Smoke and Odour.* (R. S. Wetmiller, S.A.E.J., Vol. 50, No. 7, July, 1942, p. 54.)
331	4004	Germany ...	*Alcohol Production from Molasses in the Tropics.* (W. Humell, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 442-443.)
332	4055	G.B.	*Fuel Research Intelligence Section, Summary of Work for Weeks Ending the 25th July and 1st August,* 1942.
333	4056	G.B.	*Fuel Research Intelligence Section, Summary of Work for Weeks Ending the 8th and 15th August,* 1942.
334	4073	G.B.	*The Effect of Aerated Oil on the Lubrication of a Plain Bearing.* (L. Rosenfeld, Reports Inst. Autom. Eng.,No. 1,942-1,947, 24/6/42.)
335	4077	G.B.	*Motor Car Gear Lubricants (II).* (H. D. Mansion, Engineering, Vol. 154, No. 3,997, 21/8/42, pp. 158-159.)
336	4153	U.S.A. ...	*Detergents from Petroleum.* (L. Flett, Ind. and Eng. Chem., Vol. 20, No. 13, 10/7/42, pp. 844-848.)
337	4156	Germany ...	*New German Methods in Raffination of Petrol.* (Ind. and Eng. Chem., Vol. 20, No. 13, 10/7/42, p. 857.)
338	4225	U.S.A. ...	*High Octane Petrols.* (S. J. French, Sci. Am., Vol. 166, No. 4, April, 1942, pp. 167-170.)
339	4330	G.B.	*Gear Lubricants (including High Pressure Addition Agents).* (H. D. Mansion, Autom. Eng., Vol. 32, No. 426, Aug., 1942, pp. 327-330.)
340	4343	G.B.	*Motor Car Gear Lubricants.* (H. D. Mansion, Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 138-140.)
341	4381	Germany ...	*Synthetic Fuel Production (from Lignite) in Germany.* (Inter. Avia., No. 831, 28/8/42, p. 13.)
342	4438	G.B.	*Wear-Inhibiting Agents in Lubricating Oils.* (Engineering, Vol. 154, No. 3,999, 4/9/42, pp. 195-196.)
343	4463	Sweden ...	*Liquid Fuel from Peat (Lamme Process).* (Inter. Avia., No. 830, Aug., 1942, pp. 16-17.)
344	4472	G.B.	*Reid Vapour Pressure of Alcohol Blends.* (S. J. W. Pleeth, J. Inst. Petrol., Vol. 28. No. 222, Jan., 1942, pp. 113-114.)
345	4531	G.B.	*Fuel Research Intelligence Section, Summary of Work for Two Weeks Ending 22nd and 29th Aug.,* 1942.

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			MATERIALS AND ELASTICITY.
346	3897	Germany ...	*The Problem of Stress Corrosion.* (L. Graf, Luftwissen, Vol. 7, No. 5, May, 1940, pp. 160-169.)
347	3907	U.S.A. ...	*Stress-Strain Relationships in the Drawing of Metals.* (G. A. Brewer and M. M. Rockwell, Metal Progress, Vol. 41, No. 6, June, 1942, pp. 806-810.)
348	3909	U.S.A. ...	*Determination of Recalescent Points in Steel.* (Metal Progress, Vol. 41, No. 6, June, 1942, pp. 822-824.)
349	3916	Germany ...	*Proposed Standard Definition for the Terms Crack and Fracture.* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, p. 379.)
350	3917	Germany ...	*Electron—Optical Investigation on Structure of Steel.* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, p. 382.)
351	3919	Germany ...	*The Use of Hard Paper Linings in Wooden Moulds.* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, p. 382.)
352	3921	Germany ...	*Beneficial Effects .2 – 1 per cent. Thorium Addition on the Properties of Cast Iron.* (W. Blankloh, Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, p. 381.)
353	3926	Germany ...	*The Preparation of Stress-Free Models of Synthetic Resin for Stress Optical Investigation.* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, pp. 371-372.)
354	3928	U.S.A. ...	*Study of Machine Tool Cutting Edge by High Speed Motion Picture.* (B. L. McKenzie, Sci. Am., Vol. 166, No. 2, Feb., 1942, pp. 60-62.)
355	3929	U.S.A. ...	*The Corronizing Process (Two Layer Plating) Conserves Tin and Zinc.* (Sci. Am., Vol. 186, No. 2, Feb., 1942, pp. 63-64.)
356	*3946	U.S.A. ...	*Self-Excited Oscillations in Dynamical Systems Possessing Retarded Actions.* (N. Minorsky, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 65-71.)
357	*3947	U.S.A. ...	*Torsion of Multi-Connected Thin-Walled Cylinders.* (F. M. Baron, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 72-74.)
358	*3950	U.S.A. ...	*Correlation of Residual Stresses in the Fatigue Strength of Axles.* (O. J. Horger and H. R. Neifert, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 85-90.)
359	*3951	U.S.A. ...	*Plastic Flow as an Unstable Process.* (L. H. Donnell, J. App. Mech., Vol. 9, No. 2, June, 1942, pp. 91-95.)
360	3953	G.B.	*Lithium in Non-Ferrous Castings.* (Metal Industry, Vol. 61, No. 5, 31/7/42, p. 68.)
361	3954	G.B.	*Electro-Chemical Deposition of Ni in Automobile Engineering.* (R. E. Wilson, Metal Industry, Vol. 61, No. 5, 31/7/42, p. 69.)
362	3956	G.B.	*Discussion on Low-Tin and Tin-Free Bronze and Brasses.* (Metal Industry, Vol. 61, No. 5, 31/7/42, pp. 72-74.)
363	3973	U.S.A. ...	*Standard Classification and Tests for Natural Rubber.* (S.A.E.J., Vol. 50, No. 7, July, 1942, p. 25.)

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364	3974	U.S.A. ...	*Test Data on N.E. Steel (National Emergency).* (S.A.E.J., Vol. 50, No. 7, July, 1942, p. 37.)
365	*3990	U.S.S.R. ...	*Fibrolite, a New Material.* (M. Gembargevsky, C.A.H.I., No. 211, pp. 175-178.)
366	4001	Germany ...	*The Choice of Material for Efficient Engineering Structures, Comparison Between Steel and Light Alloys.* (P. Schwerber, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 431-437.)
367	4017	Germany ...	*Studies on the Recrystallisation of Metals After Plastic Deformation.* (G. Masing and P. Y. Long, Zeit. Metalk., Vol. 32, No. 7, July, 1940, pp. 217-225.)
368	4018	Germany ...	*The Recrystallisation of 99.9 per cent. Mg. After Various Degrees of Hot and Cold Rolling.* (Y. Lin and W. Hoffman, Zeit. Metalk., Vol. 32, No. 7, July, 1940, pp. 226-231.)
369	4019	Germany ...	*The Influence of Surface Compression on the Torsional Endurance Strength of Light Alloy Shafts Provided with a Transverse Hole.* (F. Bollenrath and H. Cornelius, Zeit. Metalk., Vol. 32, No. 7, July, 1940, pp. 202-249.)
370	4025	U.S.A. ...	*Fluorescent Fabrics for Use in Blackout.* (Sci. Am., Vol. 166, No. 3, March, 1942, pp. 123-124.)
371	4026	U.S.A. ...	*Developments in Plywood by the Use of Synthetic Adhesives.* (T. D. Perry, Sci. Am., Vol. 166, No. 3, March, 1942, pp. 125-128.)
372	4027	U.S.A. ...	*Duplicating Without Dies (Hand Operated Tools).* (A. P. Peck, Sci. Am., Vol. 166, No. 3, March, 1942, pp. 128-129.)
373	4028	U.S.A. ...	*Aluminium for Clay (New Process).* (Sci. Am., Vol. 166, No. 3, March, 1942, p. 130.)
374	4030	U.S.A. ..	*Welding Aeroplane Armour by the Breeze Process.* (Sci. Am., Vol. 166, No. 1, Jan., 1942, p. 37.)
375	4031	U.S.A. ...	*Synthetic Rubbers (Elastomers).* (S. J. French, Sci. Am., Vol. 166. No. 7, July, 1942, pp. 10-13.)
376	4033	G.B.	*The Transverse Vibrations of a Helical Spring with Pinned Ends and no Axial Load.* (J. Dick, Phil. Mag., Vol. 33, No. 222, July, 1942, pp. 513-519.)
377	4038	G.B.	*Uniform Steel for Light Castings.* (C. H. Kain and L. W. Landers, Engineering, Vol. 154, No. 3,994, 31/7/42, pp. 95-96.)
378	4040	G.B.	*Air Seasoning of Green Timber.* (Engineer, Vol. 154, No. 3,994, 31/7/42, p. 100.)
379	4044	G.B.	*Protective Coatings for Steel (Phenol Resinol, Tung Oil Varnish).* (C. H. Ellaby, Engineer, Vol. 174, No. 4,517, 7/8/42, p. 122.)
380	4068	U.S.A. ...	*Surface Tension Measurements with the Film Balance as an Aid to Constitutional Research.* (S. E. Byrd and W. D. Harkins, Ind. and Eng. Chem. (Anal. Ed.), Vol. 14, No. 6, 15/6/42, pp. 496-502.)
381	4071	Germany ...	*The Replacement of Lead Bath by Salt Bath Quenching in the Drawing of Steel Wire (with Discussion).* (E. Jaemichen, Stahl und Eisen, Vol. 62, No. 31, 30/7/42.)

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382	4072	G.B.	*Combined Co-Ni Electroplating.* (C. C. Downie, Nature, Vol. 150, No. 3,797, 8/8/42, pp. 187-188.)
383	4074	G.B.	*Apparatus for Particle Size Analysis.* (Engineering, Vol. 154, No. 3,997, 21/8/42, pp. 141-142.)
384	4076	G.B.	*Protective Painting of Structural Steel.* (Engineering, Vol. 154, No. 3,997, 21/8/42, pp. 144-145.)
385	4078	G.B.	*The Mechanism of Metallic Friction.* (F. B. Bowden and D. Tabor, Nature, Vol. 150, No. 3,798, 15/8/42, pp. 197-199.)
386	*4086	Germany ...	*A New Surface Hardening Process.* (Das Industrieblatt, Vol. 47, No. 13, 6/4/42, p. 515.)
387	4149	U.S.A. ...	*Selenium and Tellurium (Commercial Uses).* (Metal Industry, Vol. 61, No. 6, 7/8/42, p. 84.)
388	4150	G.B.	*Electro-Chemical Deposition in Automobile Engineering.* (R. E. Wilson, Metal Industry, Vol. 61, No. 6, 7/8/42, pp. 85-87.)
389	4151	U.S.A. ...	*Storage of Metallographic Specimens.* (Metal Industry, Vol. 61, No. 6, 7/8/42, p. 89.)
390	4152	G.B.	*Nickel Plating Magnesium Alloys.* (W. S. Loose, Metal Industry, Vol. 61, No. 6, 7/8/42, pp. 91-92.)
391	4154	U.S.A. ...	*Ordnance Department Plastic Developments.* (E. T. McBride, Ind. and Eng. Chem., Vol. 20, No. 13, 10/7/42, pp. 849-850.)
392	4157	G.B.	*Mechanical Detection of Wheel-Seat Flaws in Railway Axles.* (F. C. Johansen, Engineering, Vol. 154, No. 3,995, 7/8/42, pp. 101-104.)
393	4160	G.B.	*Uniform Steel for Light Castings (Part II).* (C. H. Kain and R. W. Sanders, Engineering, Vol. 154, No. 3,995, 7/8/42, pp. 117-118.)
394	4167	U.S.A. ...	*The Manufacture and Properties of Tungsten and Molybdenum.* (G. A. Persival, Electronic Engineering, Vol. 14, No. 174, Aug., 1942.)
395	4171	G.B.	*The Hardness Test as a Means of Estimating the Tensile Strength of Metals.* (W. T. Taylor, J. Roy. Aeron. Soc., Vol. 46, No. 380, Aug., 1942, pp. 198-209.)
396	4175	G.B.	*The Use of Plastics in Building.* (R. T. Schaffer, Chem. and Ind., Vol. 61, No. 34, 22/8/42, pp. 357-361.)
397	4196	U.S.S.R. and U.S.A. ...	*New Source of Natural Rubber in South America and White Russia (Kok-Sagys Plant).* (F. Ruprecht, W.T.M., Vol. 46, No. 6, June, 1942, pp. 138-141.)
398	4202	G.B.	*The Effect of Zinc, Nickel, Lead and Tin on the Properties of L3 Alloy Sheet (Discussion).* (M. Cook and R. Chadwick, J. Inst. Metals, Vol. 68, No. 7, July, 1942, pp. 257-258.)
399	4233	U.S.A. ...	*Special Glasses for Iron-Glass Seals.* (Sci. Am., Vol. 167, No. 2, Aug., 1942, pp. 57-58.)
400	4243	G.B.	*Graphs of Comparative Hardness v. Ultimate Tensile.* (Airc. Eng., Vol. 14, No. 162, Aug., 1942, p. 240.)
401	4245	G.B.	*Physical Properties of Brass Cartridge Cases.* (R. S. Pratt, Metal Industry, Vol. 61, No. 8, 21/8/42, pp. 114-116.)

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402	4246	Germany ...	*Al-Mg Alloys Containing Lead (from the German).* (Metal Industry, Vol. 61, No. 8, 21/8/42, p. 117.)
403	4247	G.B. ...	*Anodic and Surface Conversion Coatings on Metals.* (Metal Industry, Vol. 61, No. 8, 21/8/42, pp. 119-120.)
404	4248	G.B. ...	*Silver Plating of Optical Glass Ware.* (R. D. Barnard, Metal Industry, Vol. 61, No. 8, 21/8/42, p. 124.)
405	4254	G.B. ...	*Alloys of High Purity Manganese.* (Metal Industry, Vol. 61, No. 9, 28/8/42, p. 132.)
406	4258	G.B. ...	*Evaporation of Molten Metal from Hot Filaments.* (W. A. Caldwell, Metal Industry, Vol. 61, No. 9, 28/8/42, pp. 136-137.)
407	4259	G.B. ...	*Effect of Arsenic on the Corrosion of Copper and Alpha Brass.* (Metal Industry, Vol. 61, No. 9, 28/8/42, p. 137.)
408	4261	G.B. ...	*Protective Painting of Structural Steel.* (Engineering, Vol. 154, No. 3,998, 28/8/42, pp. 165-166.)
409	4265	G.B. ...	*Helium and its Applications.* (Engineering, Vol. 154, No. 3,998, 28/8/42, p. 168.)
410	4281	U.S.A. ...	*Rubber Substitute.* (P. M. Heldt, Autom. Ind., Vol. 86, No. 12, 15/6/42, pp. 34-35 and 70.)
411	4288	U.S.A. ...	*Measurement of Drawing Properties of Al. Sheet.* (G. A. Brewer, Metal Progress, Vol. 41, No. 5, May, 1942, pp. 663-668.)
412	4289	U.S.A. ...	*Grain Size and Toughness (Notched Bar Test).* (R. J. Brown and S. T. Rosenberg, Metal Progress, Vol. 41, No. 5, May, 1942, pp. 685-687.)
413	4290	U.S.A. ...	*Phosphorus Located by Radio-Active Traces.* (W. M. Shoupp, Metal Progress, Vol. 41, No. 5, May, 1942, p. 688.)
414	4292	U.S.A. ...	*Manufacture of Boron Metal.* (Metal Progress, Vol. 41, No. 5, May, 1942, p. 718.)
415	4293	U.S.A. ...	*Effect of the Nature of Inclusions on the Metallic Structure.* (A. M. Portevin, Metal Progress, Vol. 41, No. 5, May, 1942, pp. 682-683 and 738.)
416	4305	U.S.A. ...	*Relative Effect of Elements on Alloy Steels.* (J. Mitchell, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 53-60.)
417	4312	U.S.A. ...	*Hardenability of Steel, Calculated from Chemical Composition.* (M. A. Grossmann, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 80 and 124-126.)
418	4316	Germany ...	*Epicyclic Gearing—Chart for the Determination of Sun Wheel Diameter Ratio for a Given Gear Ratio.* (K. Henze, A.T.Z., Vol. 44, No. 11, 10/6/41, pp. 274a-b.)
419	4317	Germany ...	*Review of Researces on Wear Carried Out Outside Germany.* (A.T.Z., Vol. 44, No. 11, 10/6/41, pp. 280-285.)
420	4328	U.S.A. ...	*Quick Method of Measuring Creep in Metals (from the U.S.A.).* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, p. 326.)
421	4331	U.S.A. ...	*Machined Surface, with Some Notes on Super Finish (from U.S.A.).* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, pp. 319-320.)

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422	4337	G.B.	*Chromium—Manganese—Molybdenum.* (Engineer, Vol. 174, No. 4,520, 28/8/42, p. 170.)
423	4340	U.S.A. ...	*U.S.A. N.E. Steels (National Emergency).* (Engineer, Vol. 174, No. 4,520, 28/8/42, pp. 178-179.)
424	4341	G.B.	*World's Mineral Resources (Digest of Papers) (V).* (British Association, Engineer, Vol. 174, No. 4,520, 28/8/42.)
425	4344	G.B.	*Corrosion of Buried Metals.* (J. C. Hudson and others, Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 124-125.)
426	4345	G.B.	*Economic Use of Arc Welding Electrode.* (Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 126-127.)
427	4348	G.B.	*The Quenching of Steel After Tempering and the Impact Test.* (L. E. Benson, Engineering, Vol. 154, No. 3,996, 14/8/42, pp. 134-135.)
428	4349	G.B.	*Loading Tests on a Plywood Girder.* (Engineering, Vol. 154, No. 3,996, 14/8/42, p. 128.)
429	4350	G.B.	*Mechanical Detection of Wheel Seat Flaws in Railway Axles.* (Engineering, Vol. 154, No. 3,996, 14/8/42, p. 133.)
430	4352	U.S.A. ...	*Beryllium—Copper Springs.* (R. W. Carson, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 150-153 and 272-273.)
431	4356	U.S.A. ...	*Strength Characteristics of Plaster Bonded Plywood.* (G. B. Parsons, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 160-165 and 273-274.)
432	4359	U.S.A. ...	*Scrap Metal Salvage.* (Aero Digest, Vol. 40, No. 7, July, 1942, pp. 120-124.)
433	4360	U.S.A. ...	*Non-Ferrous Alloys for Airframes and Engines.* (J. B. Johnson, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 130 and 275.)
434	4361	U.S.A. ...	*Drop Hammer Die (Making and Handling).* (C. J. Frey and S. S. Kogut, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 140-140 and 378-379.)
435	4362	U.S.A. ...	*Organisation for Weight Control.* (J. E. Ayers, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 166-168 and pp. 258-262.)
436	4363	U.S.A. ...	*Sciaky Welding Process (Variable Pressure).* (Aero Digest, Vol. 40, No. 7, July, 1942, p. 293.)
437	4364	U.S.A. ...	*Wasteful Oxy-Acetylene Welding Practises.* (Aero Digest, Vol. 40, No. 7, July, 1942, pp. 170-172.)
438	4365	U.S.A. ...	*Magnetic Inspection of Aircraft Steels.* (R. L. Fitch, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 178-184 and 270-272.)
439	4370	U.S.A. ...	*Lofting Problems in Streamline Bodies* (8). (C. M. Hartley and R. A. Liming, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 209-210 and 273.)
440	4371	U.S.A. ...	*Cold-Rolled Stainless Steel.* (R. Franks and W. O. Binder, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 213-220 and pp. 370-372.)
441	4372	U.S.A. ...	*Selection of Al. Alloys and Processes for Increased Aircraft Production.* (E. Engel, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 223-224 and 372.)

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442	4373	U.S.A. ...	*Plastics in Aircraft.* (W. T. Cruse, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 226-231 and pp. 250-252.)
443	4375	U.S.A. ...	*Plastic Drill Jigs and Forming Dies.* (Aero Digest, Vol. 40, No. 7, July, 1942, pp. 236-244.)
444	4376	U.S.A. ...	*Cloth Laminates for Non-Structural Parts.* (J. Delmonte, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 247-248.)
445	4378	U.S.A. ...	*Rubber Conservation.* (Mech. Eng., Vol. 64, No. 6, June, 1942, pp. 486-488.)
446	4379	U.S.A. ...	*New Corrosion Inhibitor (Ferri Chrome Glucosate).* (Mech. Eng. (News), Vol. 64, No. 6, June, 1942, p. 23.)
447	4393	G.B.	*Principles and Application of Stretch-Pressing.* (Light Metals, Vol. 5, No. 50, March, 1942, pp. 50-53.)
448	4394	G.B.	*Measurement of Local Extension by the Photogrid Method.* (Light Metals, Vol. 5, No. 50, March, 1942.)
449	4395	G.B.	*Heat Treatment for Magnesium Alloys.* (Light Metals, Vol. 5, No. 50, March, 1942, pp. 54-58.)
450	4396	G.B.	*Plastics in Germany.* (British Plastics, Vol. 14, No. 158, July, 1942, p. 84.)
451	4397	G.B.	*Detection of Cracks in Plastic Mouldings and Metals (Fluorescent Lighting).* (Plastics, Vol. 6, No. 64, Sept., 1942, pp. 289-291.)
452	4398	——	*Presses for Plastics.* (Plastics, Vol. 6, No. 64, Sept., 1942, pp. 292-299 and 315.)
453	4399	G.B.	*Structural Aspect of Styrene Polymers.* (B. J. Branikoff, Plastic, Vol. 6, No. 64, Sept., 1942, pp. 316-328.)
454	4402	G.B.	*Light Alloys in Optical Instrument Construction.* (Light Metals, Vol. 5, No. 54, July, 1942, pp. 256-257.)
455	4403	G.B.	*Extinction of Magnesium Fires.* (Light Metals, Vol. 5, No. 54, July, 1942, pp. 258-259.)
456	4404	G.B.	*Behaviour of Binary Al. Alloys During Rolling.* (Light Metals, Vol. 5, No. 54, July, 1942, pp. 260-261.)
457	4405	France ...	*Light Alloys in Bicycles and Light Weight Motor Cycles.* (Light Metals, Vol. 5, No. 54, July, 1942, pp. 264-282.)
458	4406	G.B.	*Technical Data on American Anodizing Practice.* (Light Metals, Vol. 5, No. 54, Feb., 1942, pp. 3-13.)
459	4407	G.B.	*Chemical Finishes for Protecting Aluminium-Base Alloys.* (Light Metals, Vol. 5, No. 49, Feb., 1942, pp. 14-21.)
460	4408	Germany ...	*Pressure Die Castings (from the German).* (Light Metals, Vol. 5, No. 49, Feb., 1942, pp. 22-26.)
461	4409	G.B.	*Corrosion of Magnesium-Base Alloys.* (Light Metals, Vol. 5, No. 49, Feb. 1942, pp. 30-36.)
462	4410	G.B.	*Gravity Die Casting of Magnesium Alloy.* (Light Metals, Vol. 5, No. 49, Feb., 1942, pp. 37-40.)
463	4411	G.B.	*Thermal Insulation by Aluminium Foil.* (Light Metals, Vol. 5, No. 49, Feb., 1942, pp. 41-46.)

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464	4413	G.B.	*Heavy Duty Bearings in Plastics.* (Plastics, Vol. 6, No. 63, Aug., 1942, pp. 253-260.)
465	4414	G.B.	*Fillers for Plastics.* (E. E. Hall, Plastics, Vol. 6, No. 63, Aug., 1942, pp. 267-278.)
466	4415	G.B.	*Cross-Polymers of Styrene.* (B. J. Brajnikoff, Plastics, Vol. 6, No. 63, Aug., 1942, pp. 267-278.)
467	4418	U.S.A. ...	*Powder Metallurgy—Rapid Method for Determining Grain Size.* (Ind. and Eng. Chem., Vol. 20, No. 14, 25/7/42, p. 923.)
468	4421	G.B.	*Powder Metallurgy of Tin.* (H. C. Watkins, Metal Industry, Vol. 61, No. 10, 4/9/42, pp. 146-149.)
469	4422	G.B.	*Electro-Deposition of Hard Nickel.* (W. A. Wesley and E. J. Roehl, Metal Industry, Vol. 61, No. 10, 4/9/42, pp. 154-155.)
470	4423	G.B.	*Inspection of Copper Welds.* (Metal Industry, Vol. 61, No. 10, 4/9/42, p. 156.)
471	4424	G.B.	*Section Stretcher and Detwister for Al. Alloys.* (N. C. Lake, Metal Industry, Vol. 61, No. 7, 14/8/42, pp. 98-101.)
472	4425	G.B.	*Silver as a Substitute Metal.* (J. S. Fullerton, Metal Industry, Vol. 61, No. 7, 14/8/42, pp. 101-102.)
473	4426	G.B.	*Anodic and Surface Conversion Coatings on Metals.* (J. D. Edwards, Metal Industry, Vol. 61, No. 7, 14/8/42, pp. 103-105.)
474	4427	G.B.	*Hardness of Metals as Affected by Alloying Agents.* (S. Seigel, Metal Industry, Vol. 61, No. 7, 14/8/42, pp. 106-108.)
475	4433	G.B.	*Spot Welding in Mild Steel.* (Engineer, Vol. 174, No. 4,518, 14/8/42, pp. 132-133.)
476	4436	G.B.	*Mineral Resources (British Association Lectures).* (Engineer, Vol. 174, No. 4,518, 14/8/42, pp. 139-140.)
477	4437	G.B.	*Apparatus for Particle Size Analysis.* (C. B. Bryant, Engineering, Vol. 154, No. 3,999, 4/9/42, pp. 181-182 and 185.)
478	4448	G.B.	*British Temperature - Indicating Paints.* (Inter. Avia., No. 830, Aug., 1942, p. 16.)
479	4458	U.S.A. ...	*Helium Production in the U.S.A.* (Inter. Avia., No. 830, Aug., 1942, p. 14.)
480	4471	U.S.A. ...	*Plywood and Plastic Construction (Vidal Process).* (H. W. Perry, Flight, Vol. 42, No. 1,759, 10/9/42, pp. 289-291.)
481	4473	G.B.	*Statistical Control of the Quality of Material and Manufactured Articles (Discussion).* (J. Inst. Elect. Eng., Vol. 89, No. 19, July, 1942, pp. 303-311.)
482	4474	G.B.	*Fifth Progress Report on Welding Research.* (Chemical Trade J., Vol. 111, No. 2,880, 31/7/42, p. 103.)
483	4475	G.B.	*Rubber Reclaiming.* (Chemical Trade J., Vol. 111, No. 2,880, 31/7/42, p. 104.)
484	4476	Germany ...	*Plywood Barrels.* (Chemical Trade J., Vol. 111, No. 2,880, 31/7/42, p. 106.)
485	4478	G.B.	*Developments in Powder Metallurgy.* (Machinery, Vol. 61, No. 1555, 30/7/42, pp. 119-120.)

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486	4480	G.B. ...	... *Magnetic Crack Detectors.* (Elect. Review, Vol. 131, No. 3,379, 28/8/42, pp. 267-268.)
487	4483	G.B. ...	... *A Type of Plastic Deformation New in Metals.* (E. Orowan, Nature, Vol. 149, No. 3,788, 10/6/42, pp.643-644.)
488	4484	G.B. ...	... *Properties of Rubber at Low Temperatures.* (Nature, Vol. 149, No. 3,788, 6/6/42, p. 645.)
489	4486	G.B. ...	... *Oxidation of Hydrocarbons at Low Temperatures.* (P. George and others, Nature, Vol. 149, No. 3,787, 30/5/42, pp. 601-602.)
490	4488	G.B. ...	... 165 *Abstracts on Welding.* (Welding Lit. Review, Vol. 4, No. 3, Aug., 1942.)
491	4489	G.B. ...	... *The Preservation of Timber (with Discussion).* (R. L. Brooks, J. Inst. Petroleum, Vol. 28, No. 220, April, 1942, pp. 63-81.)
492	4490	Germany	... *Photo-Electric Control Applied to Besseml Process (Flame Radiation).* (Stahl und Eisen, Vol. 62, No. 32, 6/8/42, pp. 678-679.)
493	4491	Germany	... *Experiences with Magnetic Powder Method for Crack Detection.* (Stahl und Eisen, Vol. 62, No. 32, 6/8/42, pp. 629-681.)
494	4493	G.B. ...	... *A Recording Paper for Field and General Use.* (A. G. Tarrant, Nature, Vol. 150, No. 3,796, 1/8/42, pp. 144-146.)
495	4494	G.B. ...	... *Tack and Sticky Materials—Physical Properties Involved.* (Nature, Vol. 150, No. 3,796, 1/8/42, pp. 159-160.)
496	4497	G.B. ...	... *War Time Preservation of Leather Belting.* (E. Hardy, Mechanical World, Vol. 112, No. 2,904, 28/8/42, p. 93.)
497	4498	G.B. ...	... *Micro-Straining Fabric.* (Mechanical World, Vol. 112, No. 2,904, 28/8/42, pp. 195-196 and 207.)
498	4499	G.B. ...	... *Rapid Carbon-in-Steel Determination Apparatus (Volumetric).* (Mechanical World, Vol. 112, No. 2,904, 28/8/42, pp. 202-205.)
499	4500	G.B. ...	... *Automatic Welding of Cylindrical Vessels.* (Mechanical World, Vol. 112, No. 2,904, 28/8/42, p. 210.)
500	4504	Germany	... *Comparison of Engineers' Materials on a Structural Design Basis.* (P. Schwerber, Aluminium, Vol. 24, No. 8, Aug., 1942, pp. 249-255.)
501	4505	Germany	... *Strength and Deformation of Light Alloy Tubes in Hydraulic Systems.* (F. T. Heis, Aluminium, Vol. 24, No. 8, Aug., 1942, pp. 256-262.)
502	4506	Germany	... *The Tin Content of Al. and its Effect on Electrical Conductivity.* (A. Roth, Aluminium, Vol. 24, No. 8, Aug., 1942, pp. 263-264.)
503	4507	Germany	... *A Rapid Method for the Determination of Mg. in Al. Alloys (Half Hour).* (A. Gotta, Aluminium, Vol. 24, No. 8, Aug., 1942, pp. 267-269.)
504	4509	U.S.A.	... *Strain Distribution by the Photogrid Process.* (G. A. Brewer, J. Aeron. Sciences, Vol. 9, No. 10, Aug., 1942, pp. 371-372.)
505	4510	U.S.A.	... *A Theory for the Buckling of Thin Shells.* (H. S. Tsien, J. Aeron. Sciences, Vol. 9, No. 10, Aug., 1942, pp. 373-384.)

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506	4512	U.S.A. ...	*Elastic Theory in Sheet Metal Forming Problems.* (F. R. Shanley, J. Aeron. Sci., Vol. 9, No. 9, July, 1942, pp. 313-333.)
507	4516	U.S.A. ...	*Review of Present-Day Welding of Aircraft Steels* (A. J. Williamson, J. Aeron. Sci., Vol. 9, No. 9, July, 1942, pp. 350-354.)
508	4527	G.B.	*Surface Preparation of Aluminium and Aluminium Rich Alloys Prior to Painting.* (Issued by the Aircraft Finishes Allocation Office.)
509	4546	G.B.	*The Flow of Metal in Brazing Aluminium.* (M. A. Miller, Metal Industry, Vol. 60, No. 3, 16/1/42, pp. 38-41.)
510	4547	G.B.	*Improved Zinc Base Alloy for Al. Stamping Dies.* (Metal Industry, Vol. 60, No. 3, 16/1/42, p. 42.)
511	4548	G.B.	*Cold Pressing of Dural Sheet.* J. C. Arrowsmith, Airc. Prod., Vol. 4, No. 45, July, 1942, p. 431.)
512	4553	G.B.	*Rubber Die Practice.* (Airc. Prod., Vol. 4, No. 45, July, 1942, pp. 469-473.)
513	4555	G.B.	*Electric Welding of Mg. in the Presence of Helium.* (Airc. Prod., Vol. 4, No. 45, July, 1942, p. 473.)
514	4558	U.S.A. ...	*Helaire Welding Process for Magnesium.* (Am. Av., Vol. 6, No. 4, 15/7/42, p. 35.)
515	4570	G.B.	*Plastics in Aircraft Tooling.* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 502-507.)
516	4572	G.B.	*Manufacture of Diamond Tools.* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 516-521.)
517	4573	G.B.	*Palladium and Germanium as Constituents of Mg. Alloys.* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, p. 521.)

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518	3898	Germany ...	*Working Conditions in the German Aircraft Industry.* (G. A. Ehrenkrook, Luftwissen, Vol. 7, No. 5, May, 1940, pp. 170-173.)
519	3903	Germany ...	*Explosive Rivets Used in the Construction of Completely Metal Covered Control Surfaces.* (O. Butter, Luftwissen, Vol. 9, No. 6, June, 1942, pp. 181-182.)
520	3925	Germany ...	*Gas Welding Processes (Method for Increasing Efficiency and Output).* (H. Schulz, Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, pp. 369-371.)
521	3958	U.S.A. ...	*X-Ray of Aircraft Castings—the Control and Value.* (B. C. Boulton, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 271-283.)
522	3968	U.S.A. ...	*Automatic Mass Production Method in the Aircraft Industry.* (J. Geschelin, S.A.E.J., Vol. 50, No. 7, July, 1942, pp. 276-283.)
523	4002	Germany ...	*The Avoidance of Temper Cracking of High Speed Tool Steels.* (O. Patterman, Z.V.D.I., Vol. 86, No. 27-28, 11/7/42, pp. 440-442.)
524	4012	Germany ...	*Prohibition of the Construction of Certain Type of Machines in Germany.* (Z.V.D.I., Vol. 86, No. 27-28, p. 446.)
525	4020	G.B.	*Model Quality Control Charts, Statistical Control.* (H. Rissik, Engineer, Vol. 174, No. 4,516, 31/7/42, pp. 86-89.)

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526	4021	G.B. ...	...	*Mineral Resources and the Atlantic Charter (Digest of British Association Paper).* (Engineer, Vol. 174, No. 4,516, 31/7/42, pp. 91-93.)
527	4023	G.B. ...	...	*Volumetric Determination of Carbon in Steel.* (Engineer, Vol. 174, No. 4,516, 31/7/42, p. 100.)
528	4032	U.S.A.	...	*The "Rivnut" Blind Rivet.* (Sci. Am., Vol. 166, No. 7, July, 1942, p. 38.)
529	4041	G.B. ...	...	*Model Quality Control Charts (III).* (H. Risnik, Engineer, Vol. 174, No. 4,517, 7/8/42, pp. 106-108.)
530	4080	G.B. ...	...	*Manufacture of Optical Glass.* (Nature, Vol. 150, No. 3,798, 15/8/42, pp. 214-215.)
531	*4087	Germany	...	*Foreign Labour in Germany.* (Das Industrieblatt, Vol. 47, No. 13, 6/4/42, p. 523.)
532	*4096	Germany	...	*Foreign Labour in Germany.* (Inter. Avia., No. 828-829, 7/8/42, p. 17.)
533	4099	U.S.A.	...	*U.S. War Production Board—Technical Development Office for Plastic Plywood Cargo Planes.* (Inter. Avia., No. 828-829, 7/8/42, p. 13.)
534	4113	U.S.A.	...	*Drop Hammer Methods in Aircraft Production.* (C. J. Frey and S. S. Kogut, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 147-152.)
535	4118	U.S.A.	...	*Electrotype Process of Template Reproduction.* (Aero Digest, Vol. 40, No. 6, June, 1942, pp. 120-122.)
536	4119	U.S.A.	...	*Aluminium Threads with Stainless Steel Inserts.* (Aero Digest, Vol. 40, No. 6, June, 1942, p. 125.)
537	4120	U.S.A.	...	*Rivet Standardisation.* (L. T. File, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 131-136 and 228.)
538	4124	U.S.A.	...	*Lofting Problems of Streamlined Bodies.* (C. M. Hartley and R. A. Liming, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 164-169.)
539	4179	Germany	...	*Simple Spring Clamp for Temporary Fixation of Chilled Metal Sheets.* (Arado, Flugsport, Vol. 34, No. 13, 24/6/42, p. 207.)
540	4197	Germany	...	*The World's Mercury Production.* (M. Austen, W.T.M., Vol. 46, No. 6, June, 1942, pp. 141-144.)
541	4230	U.S.A.	...	*Magnetic Strain Gauge to Protect Machine Tools.* (Sci. Am., Vol. 166, No. 4, April, 1942, pp. 203-204.)
542	4231	U.S.A.	...	*Time and Motion Research in the Factory.* (A. Ramond, Sci. Am., Vol. 167, No. 2, Aug., 1942, pp. 55-57.)
543	4242	U.S.A.	...	*Engineering Liaison and Production Control (from the S.A.E., U.S.A.).* (Airc. Eng., Vol. 14, No. 162, Aug., 1942, pp. 236-239 and 242.)
544	4251	U.S.A.	...	*Sponge Iron Production in the U.S.A.* (Engineer, Vol. 174, No. 4,519, 21/8/42, p. 155.)
545	4253	G.B. ...	...	*Timken Plug Gauge with Ball Guide.* (Engineer, Vol. 174, No. 4,519, 21/8/42, pp. 159-160.)
546	4255	G.B. ...	...	*Furnace Brazing of Aluminium (Alternative to Welding).* (Metal Industry, Vol. 61, No. 9, 28/8/42, p. 132.)
547	4256	G.B. ...	...	*Alternative to Tin in Cast Bronzes.* (A. P. Cartwright, Metal Industry, Vol. 61, No. 9, 28/8/42, pp. 133-135.)

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548	4257	Germany ...	*Recovery of Al. Scrap in Germany.* (Metal Industry, Vol. 61, No. 9, 28/8/42, p. 135.)
549	4260	G.B.	*Conservation of Arc Welding Electrodes.* (Metal Industry, Vol. 61, No. 9, 28/8/42, pp. 138-140.)
550	4262	U.S.A. ...	*Industrial Scrap Salvage in the U.S.A.* (*Organisation, Segregation, Machine Shop Operating, etc.*). (Mech. Eng., Vol. 64, No. 6, June, 1942, pp. 449-462.)
551	4264	G.B.	*Welding Calculator for Phillips' Electrodes.* (Engineering, Vol. 154, No. 3,998, 28/8/42, p. 167.)
552	4267	G.B.	*Mechanical Detection of Wheel-Seat Flaws in Railway Axles.* (H. O. Neill, Engineering, Vol. 154, No. 3,998, 28/8/42, p. 174.)
553	4278	U.S.A. ...	*Scrap Salvage in Aircraft Plants.* (R. R. Kay, Autom. Ind., Vol. 86, No. 12, 15/6/42, pp. 17-19 and 68.)
554	4284	U.S.A. ...	*Metal Degreasing* (*Stabilisation of Solvents*). (Autom. Ind., Vol. 86, No. 12, 15/6/42, p. 40.)
555	4286	U.S.A. ...	*Polishing and Storage of Metallographic Specimens.* (Metal Progress, Vol. 41, No. 5, May, 1942, pp. 651-654.)
556	4287	U.S.A. ...	*Sintering Furnaces and Atmospheres.* (R. P. Koehring, Metal Progress, Vol. 41, No. 5, May, 1942, pp. 657-662 and 722.)
557	4295	Germany ...	*Turbo Blowers for Blast Furnaces and Steel Works.* (F. Klinge, Stahl und Eisen, Vol. 62, No. 28, 9/7/42, pp. 588-591.)
558	4296	Germany ...	*Production of Cr. Ni. Steel in the Basic Electric Arc Furnace from Scrap.* (W. T. Goldman, Stahl und Eisen, Vol. 62, No. 28, 9/7/42, pp. 596-599.)
559	4298	Germany ...	*Electric Spot Welding* (*A.E.G. Advert.*). Stahl und Eisen, Vol. 62, No. 28, 9/7/42, p. 33.)
560	4299	G.B.	*The Grinding Wheel and Production* (*with Discussion*). (F. W. A. Vickery, J. Inst. Prod. Eng., Vol. 21, No. 8, Aug., 1942, pp. 311-318.)
561	4306	U.S.A. ...	*Some Factors Affecting the Drawability of Aluminium Sheet.* (G. A. Brewer and others, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 62-65.)
562	4309	U.S.A. ...	*The Chemico-Physical Role of the Cutting Fluid.* (M. C. Shaw, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 85-88.)
563	4308	U.S.A. ...	*Magnetic Inspection of Cylinders.* (C. S. Williams, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 70.)
564	*4309	U.S.A. ...	*Case with Controlled Carbon.* (Metal Progress, Vol. 42, No. 1, July, 1942, pp. 70-71.)
565	4310	U.S.A. ...	*Inspection of Copper Welds.* (Metal Progress, Vol. 42, No. 1, July, 1942, pp. 102-104.)
566	4311	U.S.A. ...	*The Electrolytic Polishing of Brass and Copper.* (G. A. Foss and L. Shiller, Metal Progress, Vol. 42, No. 1, July, 1942, pp. 102-104.)
567	4218	G.B.	*Methods of Rapid Analysis with Special Reference to Secondary Metals.* (R.T.P.3, Bibliography No. 60, Sept., 1942.)

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568	4319	G.B. ...	...	*Identification and Utilisation of Scrap Metal.* (R.T.P.3, Bibliography No. 61, Sept., 1942.)
569	4329	U.S.A.	...	*Salvaging of Worn Parts by Metal Coating (from the U.S.A.).* (W. J. Cumming, Autom. Eng., Vol. 32, No. 426, Aug., 1942, pp. 313-314.)
570	4334	G.B. ...	...	*Factory Ventilation.* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, pp. 331-333.)
571	4339	G.B. ...	...	*The Electric Arc Furnace.* (T. F. Wall, Engineer, Vol. 174, No. 4,520, 28/8/42, pp. 175-177.)
572	4353	U.S.A.	...	*Motor Car Mass Production Methods Applied to Aircraft.* (L. V. Spenser, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 73-76, 82-88 and 379.)
573	4354	U.S.A.	...	*Withdrawal of Thin Sheet Stamping by Suction Increases Production.* (Aero Digest, Vol. 40, No. 7, July, 1942, pp. 154-155.)
574	4355	G.B. ...	...	*British Aircraft Production.* (O. Lyttelton, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 93-94.)
575	4358	U.S.A.	...	*Identification Numbers to Weight and Cost Control (Douglas Systems).* (D. R. Watson, Aero Digest, Vol. 40, No. 7, July, 1942, pp. 106-114.)
576	4417	U.S.A.	...	*Bomb Damage to Industrial Plants.* (C. H. S. Tupholme, Ind. and Eng. Chem., Vol. 20, No. 14, 25/7/42, pp. 896-898.)
577	4429	G.B. ...	...	*Light and Colour in the Factory.* (N. G. Jones, Chem. and Ind., Vol. 61, No. 33, 15/8/42, pp. 352.)
578	4477	G.B. ...	...	*Machining Operations in the Production of the Browning Gun.* (Machinery, Vol. 61, No. 1,555, 30/7/42, pp. 113-116.)
579	4481	Germany	...	*Luminous Flames in Industrial Ovens.* (Gas, Vol. 14, No. 8, Aug., 1942, pp. 133-137.)
580	4485	G.B. ...	...	*X-Ray Technology in the Industrial Laboratory.* (H. P. Rooksby, Nature, Vol. 149, No. 3,787, 30/5/42, pp. 597-600.)
581	4491	G.B. ...	...	*The Human Factor in Production.* (M. Smith, Nature, Vol. 150, No. 3,796, 1/8/42, pp. 142-144.)
582	4554	G.B. ...	...	*Tracer Method for Producing Templates from Wind Tunnel Models.* (Airc. Prod., Vol. 4, No. 45, July, 1942, pp. 474-475.)
583	4565	G.B. ...	...	*Moving Line Assembly of Douglas Aircraft Factory.* (Airc. Prod., Vol. 4, No. 46, Aug., 1942, pp. 526-527.)
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584	3905	Germany	...	*The Fluorescent Screen and its Photoscopic Reproduction Applied to the X-Ray Examination of Materials.* (R. Berthold, Luftwissen, Vol. 9, No. 6, June, 1942, pp. 184-189.)
585	3918	Germany	...	*Cathode Ray Oscillograph for Ultra Short Wave Research (Resolution* 1.5×10^{-10} *s./mm.).* (Z.V.D.I., Vol. 86, No. 22-23, 13/6/42, pp. 379-380.)
586	3960	U.S.A.	...	*The Space Time Recorder.* (F. N. M. Brown, J. Aeron. Sci., Vol. 9, No. 8, June, 1942, pp. 290-291.)

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587	4036	G.B. ...	*Experiments with Helmholtz Resonators.* (H. M. Browning, Phil. Mag., Vol. 33, No. 222, July, 1942, pp. 551-556.)
588	4069	U.S.A.	*Electric Hygrometer (Water Content of Oils).* (R. N. Evans and J. E. Davenport, Ind. and Eng. Chem. (Anal. Ed.), Vol. 14, No. 6, 15/6/42, pp. 507-510.)
589	4172	Germany	*The Cyclotron for Investigation Nuclear Physics (with Lines of Development).* (H. Watzlawek, E.T.Z., Vol. 63, No. 27-28, 16/7/42, pp. 319-326.)
590	4335	Germany	*Piezo Electric Indicators (from the German).* (Autom. Eng., Vol. 32, No. 426, Aug., 1942, p. 309.)
591	4430	U.S.A.	*Photo-Electric Photometer for Rapid Grading of Naval Products.* (R. H. Osborn, Ind. and Eng. Chem. (Anal. Ed.), Vol. 14, No. 7, 16/7/42, pp. 572-575.)
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608	4492	G.B.	*Absorption and Emission of Radiation in the Atmosphere.* (Nature, Vol. 150, No. 3,796, 1/8/42, pp. 144-146.)
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620	4125	U.S.A. ...	*Selecting, Installing, and Maintenance of Electric Motors.* (O. F. Vea, Aero Digest, Vol. 40, No. 6, June, 1942, pp. 172-183 and 311.)
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629	4250	G.B. ...	... *Electrical Contact Problems in Switch Gear.* (Engineer, Vol. 174, No. 4,519, 21/8/42, pp. 146-149.)
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660	4079	G.B.	*British Association Conference on Mineral Resources.* (Nature, Vol. 150, No. 3,798, 15/8/42, pp. 201-203.)
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https://doi.org/10.1017/S0368393100140672 Published online by Cambridge University Press