ABSTRACTS

Abstracts from the Scientific and Technical Press are issued by the Directorates of Scientific Research and Technical Development, Ministry of Aircraft Production.

Documentation. (W. Rahts and H. Joachim, Z.V.D.I., Vol. 88 (1944), pp. 125-126.) (127/1 Germany.)

Documentation implies the collection, classification and utilisation of documents of all kinds. The term document in this connection signifies any type of record, and thus besides printed matter includes exhibits in museums, films and gramophone records.

A special Society for Documentation was formed in Germany in 1941 under the auspices of the Ministry of Science and Education. From a preliminary survey of the problem it appears that a single central organisation is impracticable, nor can the methods of classification be made universal. It appears preferable that the various bodies interested in documentation should each set their own house in order, adopting the means of classification most suited for their special needs. The Society will function as a co-ordinating body and arrange for frequent meetings between librarians, abstractors and readers on the one hand, and technical editors, film specialists and museum directors on the other. Standardisation of journals and methods of reproduction will also be considered.

In the case of microfilms the provision of a cheap and efficient projector will be one of the first duties of the Society. Whilst documentation in the field of chemistry leaves little to be desired, the field of general engineering is not in a satisfactory state. The various engineering journals overlap to a considerable extent in their choice of articles, and this needless repetition clutters up the card index without adding anything to the store of knowledge. Any unification in this direction would be well worth while.

The abstracting of engineering articles also presents considerable difficulties, since the same article will appeal to different specialists in different ways. Thus even in the relatively simple case of an article covering an electrically operated crane, the electrical engineer will be interested primarily in the motors, the structural engineer in the design of the frame, whilst the works manager requires details of the loading capacity and ease of operation.

Documentation on Social Sciences has received an important impetus in Germany by the formation of the Central Library of the Institute of Labour of the D.A.F. This library held over 330,000 books in 1942, with a yearly accession of about 10,000 volumes. The classified card index covers more than 300,000 references.

Forestry is also well catered for by the Forestry Institute in Berlin, but much requires still to be done in the field of agriculture, although a start was made as long ago as 1909 by the creation of the International Institute of Agriculture in Rome. The German Ministry of Food has taken active steps to bring documentation on agriculture up to date. A central library of 100,000 volumes has been set up and over 500 journals are periodically reviewed.

A model of documentation is furnished also by the German Patent Office in Berlin. Up to now, most of their labours have been directed towards their special fields of enquiry, but steps are being taken to render their records more generally available to German industry.

As already explained, the German Society of Documentation has been set up to co-ordinate the activities of these various centres of documentation, and a special department has been set up to pass enquiries for information to the particular centre concerned.

The 10th Anniversary of the Creation of the Central Information Section (Z.W.B.) of the German Air Ministry. (K. Simon, Luftwissen, Vol. 10 (1943), pp. 316-317.) (127/2 Germany.)

The Z.W.B. was originally part of the D.V.L. (German Research Centre at Adlershof, Berlin) but became an independent unit in 1940, working in close conjunction with the Lilienthal Society.

The Central Information Section is responsible for passing on to the industry the results of all research work carried on in the Reich. Great importance is attached to the presentation of the results in a form facilitating their immediate utilisation. This implies in many cases editing the reports, since a research worker is not necessarily a good author. Special importance is attached to work which failed to achieve the final purpose for which it was undertaken. Such work is often regarded as of little importance by the original authors and the recording is apt to be neglected. Nevertheless there have been many instances where difficulties encountered or partial success achieved proved of paramount importance to workers in other fields.

The Z.W.B. is also responsible for the issue of the journal "Luftfahrtforschung" (which is stated to have a greater edition than any other scientific journal of equal standing) and before the war also produced the yearly volumes covering German aeronautical research activities. These volumes, both by the range of articles and high standard achieved, clearly indicated the presence of a competent editorial staff.

During the war, the Z.W.B. has also rendered great service to the German industry by making itself responsible for reprints of standard text-books and books of reference in sufficient numbers to cover requirements.

A large translation section is available which works in close co-operation with similar sections of the German Air Ministry, the German Academy of Aeronautical Research, and any translation sections operated by aircraft firms. In this way a large pool of efficient translators is rendered available and duplication avoided.

Extensive facilities are available for photostat and microfilm work, and copies of any journal or article in the Z.W.B. library can be prepared at short notice.

It is generally agreed that the Z.W.B. has achieved the objects for which it was created, and by the rapid dissemination of up-to-date information in a form suitable for its direct application by the industry has rendered possible notable achievements of the German aircraft and engine industry. Thus the rapid development of the D.B. engine has only been possible by the pooling of the design experience of the German motor industry as a whole. Instead of carrying out documentation as an object in itself, the results are analysed by practical engineering experts before being passed out. The permanent attachment of such a body of experts to any technical library is bound to improve its utility enormously.

On the Flow of Gases through a Nozzle with Velocities exceeding the Speed of Sound. (L. Fox and R. V. Southwell, Proc. Roy. Soc., Series A, Vol. 183, No. 992, 10th August, 1944, pp. 38-53.) (127/3 Great Britain.)

The discharge of gases through convergent-divergent nozzles was investigated as long ago as 1886 by O. Reynolds, who showed that the limiting mass flow is attained when the local velocity of sound is reached in the smallest section. In these circumstances two regimes of flow can exist in the downstream sections of the nozzle.

(*a*) After attaining sonic velocity at the throat, the gas may again contract with increase in pressure and the downstream flow be subsonic.

(b) The gas continues to expand, the flow becoming supersonic.

Reynolds assumed that the velocity is distributed uniformly over each cross-section (curvature of streamlines neglected) and in this case the limiting mass flow of both regimes is the same, although of course the exit pressures are different. When an attempt is made to improve the theory by making allowances for streamline curvature, the problem becomes very difficult, even if restricted to two-dimensional flow.

The authors utilise an iterative or strip integration method for this purpose, in which the nozzle is converted into a rectangle by conformal transformation.

The results indicate that the limiting mass flows of the two regimes (a) and (b) discussed above are not identical, as would be the case if the velocities were truly constant over the sections. The differences are, however, very small, regime (b) with supersonic flow exceeding (a) by only .045%. Similarly, Reynolds over-estimates the true value for (a) by .083%.

The most interesting conclusion from this more accurate investigation is that for maximum flow conditions in the (a) regime with subsonic flow both upstream and downstream of the throat, supersonic regions of flow are indicated in two localised regions adjoining the walls at the throat.

From the convergence of the iterative process it appears that irrotational flow is stable from low velocities up to those entailed in the limiting subsonic regime (a), but is unstable in the supersonic regime (b).

The physical bearing of the work will be discussed in a subsequent paper.

Abstractor's Note.—Accurate flow determinations for nozzles in the supersonic region can also be obtained by the method characteristics developed by Prandtl and Busemann. It is interesting to note that whilst increase in the cross-section of the nozzle beyond the throat necessarily leads to an increase in speed under these conditions, stable supersonic flows can also exist in cylindrical rotor elements if the flow has a rotary component before entry. (See "Present Problems of Flow Research," E. Sorensen, Z.V.D.I., Vol. 88 (1944), pp. 115-119.)

Simplification of Design for Production. The Avoidance of Unnecessary Refinements. (P. Leinweber, Z.V.D.I., Vol. 88 (1944), pp. 121-124.) (127/4 Germany.)

An efficient engineering product should satisfy the requirements for which it has been produced, but all refinements in excess of these should be rigidly excluded. In the case of a watch, for example, the expensive chronometer escapement is only justified in special cases. On the other hand, high quality steel springs should always be fitted. Turning the watch into a piece of jewellery is a departure from efficient design and only justifiable under peace-time conditions. The same applies to the keyless winding mechanism. It is expensive to produce and facilitates the entry of dust. As soon as standardised keys become available, the winding operation can be carried out almost as simply with a considerable saving in materials and cost of manufacture. These remarks apply with special force to war materials which in many cases still incorporate unnecessary refinements. As an example, the author instances the standard German machine gun holding bracket which formerly was provided with an expensive ratchet giving adjustment of a few centimetres by means of a handwheel. This adjustment was rarely used and has now been done away with, thus simplifying the bracket considerably. According to the author, the Soviet military authorities have gone far in simplifying their military equipment in this way without sacrificing striking power.

There are six main headings under which new designs should be examined to ensure that utmost simplification has been achieved.

1. Limitation of requirements to be met by the finished article to bare necessities.
2. Reduction of accuracy and manufacturing limits consistent with facility of replacement.
3. Limitation of surface finish to those parts where high finish or special surface qualities (hardness) are essential. This also applies to anti-corrosive treatment.
4. Limitation of types and far-reaching standardisation of parts.
5. Avoidance of bottlenecks due to specification of materials in short supply or difficult methods of manufacture.

All these points should be borne in mind before the design is actually undertaken, and not be left till a prototype has been constructed.

Close co-operation with specialists is indicated, especially as regards items (4) and (5).

Once an article has gone into wide production, simplification is often difficult to achieve. In this case the advantages due to a saving in material and labour must be carefully weighed up in comparison with a slowing up of production during the change-over period. Nevertheless, the difficulties under which German industry has to operate under present conditions make it urgent that simplifications in the design of products be carried out, and the author impresses all engineers with the importance of this problem.

Inertia Vibrator with Automatically Controlled Out of Balance Force. (H. Roos, L.F.F., Vol. 13 (1936), pp. 69-70.) (127/5 Germany.)

The vibration characteristics of aircraft structural elements are usually investigated by attaching to the part in question a rotary out of balance mass, the speed of which can be varied over wide limits. The disadvantage of this form of vibrator lies in the fact that the excitation force varies as the square of the r.p.m. and may thus induce dangerous amplitudes over the higher frequency range. If, on the other hand, the out of balance mass is reduced, the low frequency amplitudes become too small for routine investigations. To overcome these difficulties, the firm of Junkers have designed a new form of exciter in which the out of balance force, instead of increasing indefinitely with speed of rotation, tends to a finite limit. For this purpose, the single out of balance mass as usually fitted is replaced by two pendular masses supported by bearings placed along a diameter of the rotating disc at equal distances from the centre. Each support incorporates a spiral spring tending to approach the two pendulums to each other, so that with the disc at rest the point of contact of the two pendulum weights lies along a diameter of the disc. Rotation of the disc causes the two pendulums to separate, with the result that the centre of gravity of the pendular system approaches the axis of rotation. (In order to assure stability of operation, the outer bearing shells of the two pendulum supports are provided with intermeshing gear teeth.)

Since at any speed the moment of the centrifugal force must balance that of the control spring, it is easily shown that the out of balance force P (kg.) of such a system is given by

$$P=(2c/a)\ (\alpha+\phi)$$

where c = control spring constant in cm. kg.
a = distance between pendulum supports.
α = initial angular twist of control spring (disc at rest).
ϕ = angular deflection of pendulum from position of rest.

Maximum value of P is thus reached when $\phi=90-\delta$

where δ = angle which pendulum makes with contact diameter when disc at rest.

This finite asymptotic value is reached at infinite angular velocity when the common c.g. coincides with the axis of rotation.

At any other speed of rotation n (r.p.m.), the connection between P and n is given by the equation

$$n = \sqrt{\frac{45000\ P}{Gb\ \sin\ (90^\circ + \delta - \alpha + Pa/2c)}}$$

where b = length of pendulum.

G = weight of a single pendulum (kg.),

the other symbols having the same significance as before.

For small values of n, this relationship approximates to the normal square law increase in P. The curve, however, soon exhibits a point of inflexion after which P rapidly approaches a constant value, however high the speed of rotation.

For a particular vibrator designed on these lines, this point of inflexion occurred at about 300 r.p.m., as is shown by the following table:—

n (r.p.m.)	P (kg.)
100	5
200	15
400	44
800	82
1200	92
1600	95
∞	98

Over the speed range 1000 to 2000 r.p.m. or beyond, the exciting force is thus practically constant. It must be remembered, however, that this force rotates in the plane of the disc and has no constant direction in space. If such a unidirectional force is required, a combination of two pendular systems rotating in opposite directions must be employed.

Fatigue Testing Machine for Aircraft Structural Elements. (Junkers Aircraft German Patent No. 744942.) (127/6 Germany.)

The testing machine forming the subject of this patent is characterised by its compactness and light weight, and is thus specially suited for attachment to such aircraft elements which normally are difficult of access. The machine is essentially a vibrator, characterised by the fact that the stress amplitude is maintained constant during the test irrespective of the deflection of the specimen. For this purpose an opposed piston aggregate consisting of two open-ended cylinders and a straight-through connecting rod is employed.

The pistons are caused to oscillate by air pressure, and the resultant vibratory motion is transferred to the specimen under test by attaching one end of the latter to the connecting rod in question whilst the other end is rigidly held.

The special feature of the machine is the fact that the working cylinders are not rigidly fixed to a base plate, but are free to slide under the control of elastic abutments attached to the closed ends.

Confining our attention to one of the piston cylinder units, it is clear that on the admission of compressed air to the cylinder, the piston and cylinder will move in opposite directions, the respective travels depending on the resistance offered by the test specimen (attached to the connecting rod) and the cylinder abutment. Moreover, for a given spring characteristic of the latter, the position of the cylinder corresponding to a given stress in the specimen is fixed. As soon as this position is reached, the cylinder operates a suitable valve mechanism which releases the air pressure and at the same time allows compressed air to enter the second working cylinder which up to then was at atmospheric pressure. The cycle is then repeated, the specimen being strained in the opposite direction. In this manner the specimen is automatically subjected to cyclic stresses of constant amplitude irrespective of the actual piston travel or strain amplitude of the test specimen.

Moreover, for a given abutment elasticity, the frequency of the stress cycle can be varied over wide limits by simply altering the air pressure fed into the system.

The new designations divide the plastics into moulded and laminated products with the following code numbers:—

00 to 999 *Moulded Products.*
2000 to 2999 *Laminated Products.*

00 to 99 Phenol Resins, hot pressed.

- 00 to 09 without filler.
- 10 to 29 inorganic filler.
- 30 to 49 wood filler.
- 50 to 69 cellulose filler.
- 70 to 89 textile filler with organic fibres.
- 90 to 99 other fillers.

The last figure gives an approximate indication of the mechanical properties, 0 showing the lowest and 9 the highest strength in each class of 10 units.

100 to 149 Urea or thiourea.

- 100 to 109 not used at present.
- 110 to 119 inorganic filler.
- 120 to 129 wood filler.
- 130 to 139 cellulose filler.
- 140 to 149 not used at present.

Continued on next page

Type Designation of German Plastics with Special Reference to Insulating Materials. New edition. (E.T.Z., Vol. 63 (1942), pp. 267-269, and Vol. 64 (1943), pp. 26-27.) (127/7 Germany.)

Type. Old Designation.	Type. New Designation.	Composition.	Min. Mechanical Properties. Bending Stress Kg./cm.^{2}	Impact cm. Kg./cm.^{2}	Notch cm. Kg./cm.^{2}	Manufacture.
11	11	Phenol resin with inorganic filler.	500	3.5	1.0	Hot press.
11*	11.5		500	3.5	2.0	
12	12		700	15.0	15.0	
M	16					
O	30	Phenol resin with wood flour filler.	600	5.0	1.5	ditto.
O*	30.5					
S	31		700	6.0	1.5	
S*	31.5					
T_1	71	Phenol resin with textile fibre.	600	6.0	6.0	ditto.
T_2	74		600	12.0	12.0	
T_3	77		800	25.0	18.0	
Z_1	51	Phenol resin with cellulose (paper).	600	5.0	3.5	ditto.
Z_2	54		800	8.0	5.5	
Z_3	57		1200	15.0	10.0	
K	131	Urea resin with organic filler.	600	5.0	1.2	ditto.
K*	131.5					
6	916	Nat. resin, nat. or synth. bitumen with inorg. filler.	350	3.5	3.5	ditto.
7	917		250	1.5	1.5	
8	918	Nat. or synth. bitumen with inorg. filler.	180	1.2	1.2	ditto.
A	400	Acetyl cellulose with or without filler.	300	15.0	10 0	ditto.
A*	400.5					
2	212	Synth. resin with asbestos or other inorg. filler.	350	2.0	1 5	Cold press.
3	213	ditto	200	1.7	1.2	ditto.
4	914	Nat. or synth. bitumen with asbestos or other inorg. filler.	150	1.2	1.0	ditto.
Y		Lead borate with mica.	1000	5.0	5 0	Hot press.
X		Cement or isinglass with asbestos or other inorg. filler.	150	1.5	1 5	Cold press.

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150 to 199	other thermoplastics containing N_2 (*e.g.*, melamin resins).
200 to 299	cold pressed phenol resins.
300 to 399	other condensation products (*e.g.*, superpolyamides).
400 to 499	cellulose derivatives.
500 to 599	polymerisation products.
600 to 699	not used at present.
700 to 799	mixed polymerisation.
800 to 899	not used at present.
900 to 999	bitumen, natural resins.
1000 to 1999	not used at present.
2000 to 2999	laminated plastics.

The subdivision of this class of plastics is on the same lines as those of the moulded products.

Special properties are indicated by a single decimal figure following the code number. Thus .5 indicates specially high electrical qualities.

Reference to the table shows that the standard laminated products T_3 and Z_3 have been given the code numbers 77 and 57 respectively (which really belong to moulded products) instead of being included in the 2000 series. This is purely a wartime expediency

It should be pointed out that the coding of engineering materials by numbers is now being carried out quite generally in Germany and not confined to plastics.

The Strength of Internal Threads in Plastic Materials. (A. Thum and A. Boden, Z.V.D.I., Vol. 87 (1943), Nos. 31-32, pp. 506-507.) (127/8 Germany.)

The experiments covered static and fatigue strength of screwed connections of a moulded plastic nut (formaldehyde base resin) fitted to a steel bolt. The nuts (circular contour) were cut out of standard sheets, previously drilled and threaded, the thickness of the plate (height of nut) being usually three times that of the corresponding bolt diameter

Four different types of plastic material were tested, bearing the standard designations S, Z1, Z3 and T2 respectively. These differed in the nature of the filler employed, as shown below:—

Type	*Filler*
S	wood flour.
Z1, Z3	cellulose (paper).
T2	textile fibre.

Of the above, Z3 can be regarded as properly laminated. (For mechanical properties see Abstract 127/7.)

The majority of the bolts tested were made of "automatic" steel with an ultimate tensile of about 68 kg./mm.² For some of the fatigue tests, heat-treated bolts with an ultimate tensile of 80-90 kg./mm.² were employed. Since in practice the tensile strength of steel and light alloy bolts engaging with internally threaded plastic parts is usually limited to 50 and 35 kg./mm.² respectively, the minimum nut dimensions determined by the author should be amply sufficient.

Tensile Tests.

The minimum bolt dimensions to ensure that fracture under tensile load should occur in the bolt before stripping the thread are given in the following table:—

Type of Plastic.	Thread.	D/d	t/d
S	3 × .5	3	2
	8 × 1.25	3.5	2.5
	12 × 1.75	4	3
Z1	8 × 1.25	2.5	2.5
Z3	3 × .5	2	2
	8 × 1.25	2	2.5
	8 × 1.75	1.8	1.5
T2	3 × .5	2.5	3
	8 × 1.25	2.5	3

The threads throughout are metric, the first letter indicating the outside diameter and the second the pitch, both expresed in millimetres.

D = outside diameter of circular nut.
d = outside diameter of bolt.
t = length of bolt inside nut.

It will be noted that the nut dimensions are least for the laminated product Z3. This only holds provided the threads are cut at right angles to the laminations, since the material between the laminations is very weak.

The homogeneous product S, on the other hand, shows no such directional effect. Some coarse fillers, however, undergo marked stratification during manufacture, and in this case care must be taken to arrange the threads correctly so that maximum strength of the nut is achieved. In case of nuts made of Z1 (short fibre cellulose filler) the difference in ultimate load amounts to 11%, and for T2 (cut up textile filler) to as much as 23%, depending on whether the threads coincide or are at right angles to the direction of extrusion.

From the point of view of bolt strength, fine threads are obviously an advantage since for the same diameter the core area is increased. This is shown in the following table for an 8 mm. steel bolt fitted with various metric threads.

Pitch (mm.)	Ultimate load (kg.)
.75	2400
1.25	2200
1.75	1900

Using the corresponding nut made of Z3 material ($D/d=2$), the breaking load of the combination is of the same order for 1.25 and 1.75 mm. pitches (*i.e.*, 2200 and 1900 kg.) provided the length of bolt inside the nut exceeds 2.5 and 1.5 d respectively (see table). With a .75 mm. pitch, however, the threads will strip before the bolt breaks, however long the nut, and the ultimate breaking load ($t/d=3$) is only 1700 kg. against the 2400 kg. of the bolt by itself.

The only practical way of achieving high ultimate loads of the bolt/nut combination is to use coarse threads and make up for the reduced core area by employing a higher grade steel for the bolt.

In the case of an al. alloy 8 × 1.25 mm. bolt screwed into a Z3 nut ($D/d=2$), failure occurred due to bolt fracture, provided t/d exceeded 2. The breaking load in this case was of the order of 1600 kg. against 2200 kg. for a steel bolt.

For smaller values of t, failure is due to stripping of the threads in the plastic nut, and it might be thought that in this case the breaking loads should be the same whether a steel or alloy bolt is used. As a matter of fact, the light alloy bolt combination under these conditions will strip at the nut at a load which is about 50 to 100 kg. less than if a steel bolt is used. This is shown in the following table:—

t/d	P (kg.) Light alloy bolt.		Steel bolt.	
.5	600	failure	650	
1	1150	at	1230	failure
1.5	1550	nut	1650	at
2	1650		1950	nut
2.5	1650	bolt	2150	
3	1650	fracture	2200	bolt
3.5	1650		2200	fracture

The slightly smaller stripping loads of the nut in the case of the light alloy bolt is due to the reduction in the elastic modulus of the bolt material causing higher local stresses in the threads of the nut.

Fatigue Tests.

The minimum nut dimensions as determined by static tests and given in the table above also apply to fatigue loads and ensure that ultimate failure will be due to bolt fracture in every case. It is interesting to note that under these conditions the fatigue strength of the nut/bolt combination is considerably greater than if a steel nut is fitted. In the case of Z3 material, this advantage amounts to at least 25% for soft steel bolts and reaches nearly 40% for heat-treated steel bolts. Unfortunately, all plastic materials exhibit considerable creep under load even at room temperatures, and screwed combinations employing plastic nuts are therefore incapable of maintaining appreciable pretensions. There are, however, many cases of machine elements incorporating joints of small elasticity requiring only a limited pretension of the bolt. In all such cases (*e.g.*, couplings, slides, presses, etc.) the plastic nut/metal bolt combination has proved an outstanding success due to its high fatigue strength and freedom from corrosion and wear. The same naturally applies to the joining of plastic parts by means of internal threads and steel studs. In special cases a metal sheath can be fitted to the outside of the nut. This prevents distortion and increases the resistance of the plastic thread considerably.

The Degassing of Light Metal Alloys by Sonic Vibrations. (W. Esmarch, T. Rommel and K. Benther, W.V. Siemens Werke, Werkstoff Sonderhoft, Berlin, 1940, pp. 78-87.) (127/9 Germany.)

It is well known that the passage of an ultra sonic wave is accompanied by the formation of gas bubbles. These bubbles are partly due to the coalescence of microscopic bubbles already present in the liquid and are reinforced by previously dissolved gas being liberated in the low pressure regions of the sound wave.

Kruger in 1931 took out a patent for degassing metallic melts by this method (German Patent No. 604486), ultra sonic waves being generated in the melt by a dipper controlled by a magnetostrictive oscillator. The main difficulty in this process was the provision of suitable material for the dipper. Ceramic materials rapidly disintegrated whilst metallic dippers only proved suitable in rare instances. In addition, the process of wave generation in the melt is very inefficient, a considerable proportion of the energy of the oscillator being lost by reflexion at the surfaces of separation or absorbed by the dipper.

It appears that the only way of making the process commercially possible would be the generation of high frequency waves directly inside the melt. Now in the high frequency electric furnace the heat production is due to the formation of eddy currents in the charge. These eddy currents, moreover, are subjected to electrodynamic forces due to the magnetic field of the furnace circuit, and cause the well-known rotary motion of the melt in induction furnaces.

This rotary motion favours the absorption of air by the molten material and therefore counteracts to some extent the degassing effect of the rise in temperature.

By superimposing a steady magnetic field on the high frequency field of the furnace (the resultant field being in the direction of the coil axis) mechanical vibrations can be induced in the melt, the force at each point being proportional to the product of the local current density and field strength, and acting radially to the coil axis. Moreover, by suitable choice of bath dimensions, resonance effects can be produced which increase the intensity of the vibrations. We thus have a method of generating high frequency waves in the melt without the need of a dipper. On the other hand, the frequency range is restricted to that of the alternating current feeding the furnace.

The authors are, however, convinced from preliminary experiments that there is no advantage from the degassing point of view of employing frequencies in excess of 10,000/sec., provided that the intensity of the vibration is sufficient.

In their experiments, therefore, an A.C. generator of this frequency was employed for feeding the furnace coil, the average current consumption being of the order of 100 A. The superimposed steady magnetic field was produced by 450 A direct current fed into the same coil, the D.C. generator being protected by the insertion of suitable chokes and condensers. The total energy consumption amounted to about 15 kw., of which 10 kw. were supplied by the high frequency generator. The high D.C. wattage is largely due to the fact that a standard furnace was employed. With a specially designed heating coil the energy consumption for the steady magnetic field could have been reduced very considerably.

The experiments were carried out with 8-10 kg. melts of pure aluminium and aluminium-magnesium alloys, the temperature being kept constant at 700°C. Samples were drawn off every ten minutes and the gas content determined by the well-known vacuum method. Photographs were also taken of the polished sections.

It appears that alloys containing even relatively large % of Mg. can be completely degassed by this method in 30-60 minutes, provided the surface of the melt is protected by a fused salt layer and that dry air or nitrogen is directed on to the surface during the treatment.

Suitable salts can be obtained from the I.G. under the trade names Hydrosal and Elrasal. A laboratory product utilised by the authors and giving equally good results has the following composition:—

K Cl	40%
Na Cl	30%
Ca CO_3	15%
Na F	15%

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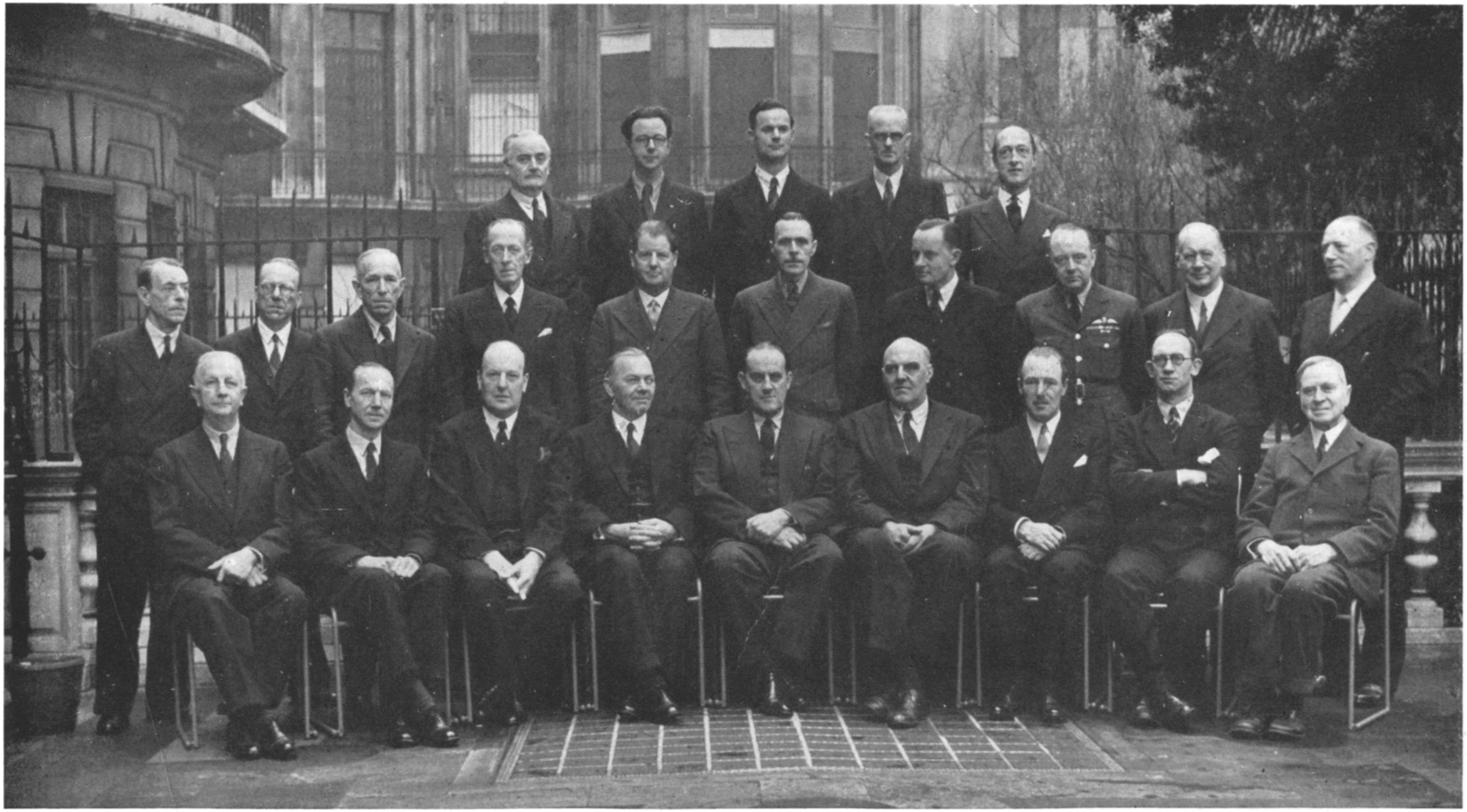

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