

The composition appears to be approximately 60 per cent. nickel, 14 per cent. chromium, a little molybdenum, and the remainder iron. It is melted in crucibles and poured into sand moulds. Its tensile strength at air-temperature is 50,000 lb. per sq. in., while at 1800° F. it is still 30,000 lb. It melts at 2800° F., and withstands repeated heatings to 1800° F. and coolings without serious oxidation or diminution of strength. It works well, and can be drawn into wire. It is not acted on by chemicals even when heated, and is already being freely used for the valves and valve-seats of internal-combustion engines and for domestic utensils. The possibility of using the alloy in place of plumbago for crucibles is under investigation, and the results so far obtained are most encouraging. The field of usefulness of an alloy with these properties is obviously extensive, and it is unfortunate that the *Scientific American* gives no hint as to where the material can be obtained.

In the Proceedings of the Indian Association for the Cultivation of Science (vol. iv., part ii., 1918) Mr. S. Banerji deals with the vibrations of elastic shells partly filled with liquid. The problem here considered is chiefly of acoustical interest in relation to the theory of "musical glasses." This class of instrument consists of a series of thin-walled elastic shells the gravest modes of vibration of which are tuned to form a musical scale by partially filling them with a liquid, and are excited either by striking or by tangential friction on the rims. The principal features of interest requiring elucidation are (a) the dependence of the pitch of the vibration upon the quantity of liquid contained in the vessel, and (b) the mode of vibration of the liquid itself. These features are discussed in this paper for the three cases in which the elastic shell is respectively (1) a hemispherical one, (2) a cylindrical one with a flat bottom, and (3) a conical cup, these forms approximating more or less closely to those used in practice. The analytical expressions show that the motion of the liquid is very marked near the margin of the vessel, but is almost imperceptible near the centre and at some depth inside the liquid. Numerical results have also been obtained and tabulated, and the graphs plotted, showing the theoretical relations between the quantity of liquid in the vessel and the vibration frequency. The lowering of pitch due to addition of liquid is greatest when the vessel is nearly full.

MESSRS. BERNARD QUARITCH, LTD., 11 Grafton Street, W.1, have just issued a Catalogue (No. 352) of second-hand books and periodicals which they have for disposal. The 1700 odd works listed range over many branches of literature, but the sections relating to natural history and periodicals and transactions of learned societies will appeal more especially to readers of NATURE. In them we notice a set, with supplement, of Gould's "The Birds of Australia," Elwes and Henry's "The Trees of Great Britain and Ireland," Sargent's "The Sylva of North America: A Description of the Trees which Grow Naturally in North America exclusive of Mexico," Butler's "Illustrations of Typical Specimens of Lepidoptera Heterocera in the Collection of the British Museum," R. Bowdler Sharpe's "Hand-list of the Genera and Species of Birds," Edwards's "The Botanical Register" (a set), and long runs of the *Berichte* of the Deutsche Chemische Gesellschaft, and the *Quarterly Journal of Microscopical Science*, and the Proceedings and Transactions of the Zoological Society of London. The catalogue is published at 1s.

The following books of science and education are announced for early publication:—"Euclid in Greek" (Book i.), Sir T. L. Heath, and "A Short History of Education," Prof. J. W. Adamson (*Cambridge Uni-*

versity Press); "Practical Vaccine Treatment for the General Practitioner," Dr. R. W. Allen (*H. K. Lewis and Co., Ltd.*); "George Westinghouse: His Life and Achievements," F. E. Leupp (*John Murray*); "Scientific Factory Management," Dr. A. D. Denning (*J. Nisbet and Co., Ltd.*); "Gas and Oil Engine Operation," J. O'Kill (*Sir Isaac Pitman and Sons, Ltd.*).

OUR ASTRONOMICAL COLUMN.

THE APRIL METEORS OF 1919.—Observations were obtained at Bristol on the nights of April 18, 20, 21, and 22, but the display was by no means a rich one. The night of chief activity was April 21, when fourteen meteors were recorded between 8h. 40m. and 11h. 35m. G.M.T. Of these, nine were Lyrids and indicated a radiant point at $272^{\circ}+30^{\circ}$. Several fine meteors were observed on this night, and particularly at 9.30 and 9.40 G.M.T. The first of these appeared as bright as Sirius, and slowly floated from $236^{\circ}-1\frac{1}{2}^{\circ}$ to $246^{\circ}-2^{\circ}$ in about 5 secs. This must have been a fine object as seen from the eastern counties of England. The second was one of the true April meteors, with a bright streak, and moved swiftly from $297^{\circ}+65^{\circ}$ to $31^{\circ}+47\frac{1}{2}^{\circ}$. It was of about the same apparent magnitude as Jupiter.

THE METEORIC SHOWER OF HALLEY'S COMET.—The celebrated comet of Halley has an accompanying meteor system. The shower was discovered in 1870 by Capt. G. L. Tupman, and shown by Prof. A. S. Herschel, a few years later, to exhibit a significant resemblance to the cometary orbit. The meteors are visible in the mornings of the first week in May, and their flights are directed from a point near the equator in R.A. 337° in Aquarius, and close to the stars ζ and η in that constellation. The meteors have not been witnessed in the same splendour and abundance as those of November from Tempel's and Biela's comets, but they are individually very fine objects, traversing long paths extending occasionally over half the visible firmament, and worthy representatives of the notable comet from which they are derived.

The reappearance of this shower is now due, and it is very desirable that a watch for its meteors should be maintained on the next few mornings. We want more data with regard to its duration, whether or not the point of radiation moves eastwards, like that of the Perseids, and what annual differences affect the number of meteors appearing. Double observations of identical objects will be valuable as enabling their heights and velocities to be determined. The materials already acquired affirm that the observed motion is decidedly slower than that implied from theory, and this is probably due to the resistance of the atmosphere. The radiant does not rise until the morning twilight is in evidence, and when a short period only remains available for observation.

Heis, so far back as May 2, 1848, witnessed a rich display of streaking meteors, and this may quite possibly have been an early return of this system.

OCCULTATION OF STARS BY VENUS.—Mr. Arthur Burnet, honorary secretary of the Leeds Astronomical Society, who has achieved success previously in predicting phenomena of this kind, writes to us from France that the stars 79 Leonis, magnitude 5.5, and B.D. $+2.2422^{\circ}$, magnitude 8.6, No. 6927 in the d'Abbadia Catalogue (1900), will be occulted by the planet Venus on August 1 next as seen from certain places in the southern hemisphere. Geocentric conjunction of the planet with 79 Leonis will take place on August 1d. 8h. 54m. G.M.T., and the occultation may be seen from South America. Mr. Burnet computes that the duration of the occultation as seen from Rio de Janeiro will be about nine minutes.

Venus will be in geocentric conjunction with the second star on August 1d 18h. 40m. G.M.T., which is 6h. 10m. in the evening of August 2 by New Zealand standard time, and it is computed by Mr. Burnet that the occultation, which will be of twenty minutes' duration, may be seen from that part of the globe.

CIVILIAN AIR ROUTES.

THE ban on civil aviation is raised from to-day, as announced in the House of Commons on April 14, and the Air Ministry has issued details of some of the aerial routes which will be declared open. The routes are to be regarded as provisional, since

The main routes at present outlined are summarised below, the London terminus being situated at Hounslow:—(1) London-Scotland; (2) London-Dublin; (3) London-Manchester-Belfast; (4) Continental route *via* Lympe; (5) Dutch route *via* Hadleigh; (6) Scandinavian route *via* New Holland; (7) London-Plymouth; and (8) London-Bristol.

The various aerodromes along these routes are clearly shown on the map, and when any route has been declared open pilots using it will find petrol, accommodation, and, where possible, mechanics to handle their machines at each of these aerodromes. Such pilots must, of course, comply with the regulations as regards licensing and inspection of machines.

The Government makes no promise of help to aviators who descend, whether by choice or by force of circumstances, at places other than the official "air stations."

It has been decided to limit the overseas traffic for the present to four "appointed" aerodromes. Three of these will be those named under routes (4), (5), and (6) of the above list, while the fourth will be at Hounslow in order to facilitate direct communication between London and the Continent. These arrangements are, again, only provisional, the problem of the control of overseas traffic being a particularly difficult one, so that it is impossible to fix definitely the Customs stations at the outset.

Rigid supervision with regard to the construction and airworthiness of machines intended for passenger services will be insisted upon, but progress will not be hampered by any inspection of inventions or of purely experimental machines.

It is very encouraging to see the situation so well in hand, and, with the assistance that the Government proposes to give to civil aviators by means of the above scheme, commercial aviation will receive an excellent start in this country. There seems little doubt that full advantage will be taken of the facilities offered, and, in view of the experience gained during the war in the theory and practice of aeronautics, the development of the purely commercial machine should be even more rapid than that of the military aeroplane has been. It is very difficult to attempt a forecast of the future of commercial aviation, but the enterprise invited by the present announcement of the Air Ministry may be expected to provide experience which will very soon give a clear indication as to the possibilities of commercial aircraft.



Air routes and stations. Reproduced from the Times.

experience alone can decide upon the arrangement of aerodromes which is most suitable for carrying out the aerial business of the country. The accompanying map shows the routes and aerodromes which have so far been decided upon.

At the date of the armistice there were 337 aerodromes and landing grounds in the British Isles. About 100 will be required for the Royal Air Force, while 116 have already been relinquished for cultivation and other purposes. This leaves about 120 aerodromes, some with extensive accommodation, which will ultimately be available for civilian purposes. It is considered probable that many of these will eventually be acquired by public bodies and commercial firms, and a list will shortly be issued giving particulars of the aerodromes in question, with the facilities they possess and their distances from important centres, in order to assist intending purchasers.

FORESTRY RESEARCH IN SWEDEN.¹

THE Swedish Institute of Experimental Forestry, which occupies itself with systematic studies in sylviculture, the botany of trees, forest mensuration, and applied entomology, acquired new buildings near Stockholm in May, 1917, which will add much to its efficiency. The institute continues to publish excellent memoirs on these subjects. The combined volume, Nos. 13 and 14, of 1916-17 contains more than 1300 pages of Swedish text, supplemented by short

¹ Memoirs of the Swedish Institute of Experimental Forestry. Nos. 13-14, pp. 1301+clxxii. (Stockholm, 1916-17.) Price 18 kronor. Also No. 15, pp. 288+xxxii. (1918.) Price 4.50 kronor.