

The De-Nationalisation of Helium.

By HENRY B. MILNER.

THE disaster to the British airship *R101*, still fresh in the public mind, torn between sad memory and impatience to learn the findings of experts now holding a court of inquiry, has had, as it was bound to do, world-wide repercussion. Everywhere dirigible construction, either in project or in progress, has received an abrupt check. Whatever may be the ultimate technical findings of this court, it is safe to assume consensus of opinion on at least one point: the danger of hydrogen, the urgency of helium. In Germany the Zeppelin Company was engaged in laying down a new airship to be known as *LZ128*, but the lesson was quickly learnt. Complete revision of plans of construction was undertaken, in which the salient factors were provision for the exclusive use of helium and heavy, virtually non-inflammable, oil-fuel, in place of hydrogen and the 'Blau' gas fuel hitherto employed in Zeppelins. Clearly, even at the expense of a year's delay, Dr. Eckener is in no mind to chance a re-enactment of the deplorable tragedy which we have just witnessed.

At the same time, such plans might well be frustrated and progress reduced to complete standstill if resources of helium were not forthcoming. Since the United States holds a virtual monopoly of this valuable gas, then clearly the question of future supplies is the crux of the situation for everyone concerned. Dr. Eckener announced to the American Chamber of Commerce in Berlin last month (*Times*, Nov. 6) that the embargo on helium export from the United States had just been removed, which made practicable the execution of the revised plans for *LZ128*. It is interesting to review the situation and the chain of events which have made possible this release.

The original law relating to the export of helium from the United States is contained in Section 4 of the Act approved March 3, 1927—Public, No. 758, 69th Congress—which states: "That hereafter no helium gas shall be exported from the United States . . . until after application for such exportation has been made to the Secretary of Commerce and permission for said exportation has been obtained from the President of the United States, on the joint recommendation of the Secretary of War, the Secretary of the Navy, and the Secretary of Commerce. . . ." The Act also authorises "the conservation, production, and exploitation of helium gas, a mineral resource pertaining to the national defence . . .", and places the jurisdiction of Government plant under the Bureau of Mines, from which Bureau the Army, Navy, and other branches of the Federal service will requisition it as required.

Specific mention of the Government plant recalls the existence of the U.S. Helium Production Plant near Fort Worth, Texas, the helium being actually extracted from natural gas of the Petrolia-field, Clay County, Texas. Until 1928, practically all the helium produced came from this source, but it was then found that this source of supply was

inadequate to international demands. The effect of the Act was to stimulate investigations by the Bureau of Mines into supplementary resources, and in April of that year a contract was made between the Government with the Amarillo Oil Company of Amarillo, Texas, to exploit the gas from leases on what is known as the Cliffside Structure in that region. While it was a vital matter to develop such helium-bearing gas resources as could be found, questions of the prospective life of such supply, also facilities for disposing of the 'treated' gas, had to be faced. The estimates proved satisfactory so far as the first point is concerned, and the Company having agreed to take care of the treated gas, developments went ahead, so that in August of that year the new plant-site was selected at Soncy, some six miles from Amarillo, and almost coincidentally the Company brought in a new gas well having an open flow volume of more than seven million cubic feet per day, with a helium content of about $1\frac{3}{4}$ per cent by volume, the average for gas produced from this particular structure.

By May of last year the first tank-car filled with about 200,000 cubic feet of helium was dispatched from Soncy to a place in Virginia. This helium was transported under a pressure of 2000 pounds per square inch and ultimately discharged into stationary containers for use in connexion with the U.S. Army dirigibles. Thereafter the new plant continued more than ever to justify initial confidence, both in itself and in the quality of the gas handled. In September 1929 there was produced from Amarillo 874,840 cubic feet of helium with the remarkable factor of 97.7 per cent purity, at an operating cost of 17.63 dollars per thousand cubic feet of contained helium, a much reduced cost compared with that previously involved. In January 1930 the output of helium was more than a million cubic feet of gas with a purity factor of 97.85 per cent, at a still further reduced cost of 9.64 dollars per thousand cubic feet.

The significance of this purity factor will be more readily understood when it is realised that a Navy dirigible (U.S.) of $6\frac{1}{2}$ million cubic feet capacity has about 5 tons more lift when filled with helium of 98 per cent purity than when the purity factor is only just over 95 per cent, the average of the Fort Worth product.

A Department of Commerce 'Press release', dated Aug. 20, 1930, shows that the helium output for the fiscal year ending June 30, 1930, attained the high figure of 9,801,060 cubic feet, the largest ever achieved, and it is pointed out that the plant was only operated at a fraction of its real capacity, the latter determined almost entirely by the U.S. Army and Navy demand. This communication also contains the statement, "Under present conditions it costs less to operate Government airships with non-inflammable helium than it would cost to operate them with flammable hydrogen". At this point we leave this amazing record of progress

until *R101* showed the vital need of de-nationalisation of helium.

With such resources at her command, with her service and commercial needs amply provided for, an international call for exported helium could not remain for long unheeded, in the interests both of humanity and the future of the airship. On Oct. 11, 1930, the Department of Commerce, apparently satiated with inquiries relative to the helium export situation, cleared the air by publishing a

memorandum setting forth the provisions to be observed when sanction for export was requested. These provisions are entirely reasonable, including among others, the quantity to be exported, the purpose for which the helium was destined, and the country to which it was being sent. It is therefore obvious that Section 4 of the Act is to all intents and purposes inoperative, and that this invaluable commodity is henceforward available to all *bona fide* demands.

The Testing of Wood Preservatives.

THE problem of carrying out tests in the laboratory to give a rapid indication of the probable effectiveness of any material as a wood preservative is one which has arisen on many occasions in different countries and a number of different methods have been evolved. Unfortunately the results obtained have frequently been in no way comparable and efforts are being made to standardise the different methods. Following a conference of American workers, early this year at St. Louis, on the standardisation of laboratory methods for the measurement of the toxicity of wood-preserving materials, the wish was expressed that the European investigators should gather together at a similar congress to discuss the conclusions which had been reached at the American meeting, and to describe the methods up till now used in Europe, which differ considerably from those used in America.

The conference, which was convened on the initiative of Dr. Hermann von Schrenk of St. Louis, met in June at the Biologische Reichsanstalt, at Berlin-Dahlem, and included representatives from Austria, Denmark, Germany, Great Britain, Holland, Japan, Norway, Switzerland, and the United States of America. The Department of Scientific and Industrial Research was represented by Mr. W. P. K. Findlay, of the Forest Products Research Laboratory, Princes Risborough. The matter for discussion was put forward under the following three heads:

1. Which method of investigating wood preserving materials appears, in the light of experience so far obtained, to be the most certain and the most reliable?
2. Which wood-destroying fungi should be used for carrying out these experiments?
3. What conclusions as to the value of a wood preservative in actual practice may be drawn from a determination of its toxicity?

1. METHODS.

It was stated, according to the conclusions of the American conference referred to above, that in the United States the fungicidal power of wood preservatives under test is determined only by the method of using petri dish cultures of certain fungi upon agar medium containing the preservative. The reason for accepting this method is the exactitude with which the amounts of preservative and the point of inhibition may be determined. Experiments have, indeed, been made in the United

States using the wood block method customary in Europe, but the results obtained there by this method have not proved satisfactory, because the use of different species of wood, or of woods of the same species of different resin contents or containing different proportions of spring and summer wood, or, finally, of woods with a varying capacity for impregnation, has introduced so many variables into the method that strictly comparable results could scarcely be expected. The use of sawdust, or of discs made of wood meal, has certainly lessened these difficulties, but, nevertheless, the agar method is considered as far exceeding all others in accuracy and as particularly convenient, because results can be obtained from it in a shorter time than from any other method.

In opposition to the American point of view, all the European research institutes were of the opinion that the wood block method should have first place in importance, the following arguments being advanced in support of this view:

All laboratory experiments on the preservation of materials should in general be carried out on the material in question, using as the attacking agent the appropriate micro-organism concerned. Experience has shown that a preservative may easily inhibit the growth of a micro-organism in agar or gelatine for example, while this same organism will develop quite unchecked by the preservative used in another substratum. The difference in behaviour may be due to such causes as chemical reactions, absorption phenomena, changes in the coefficient of dispersion, and so on, which cannot always be foreseen. Such phenomena have been observed in the case of wood-preserving materials and a number of instances were quoted during the discussions. It was shown by means of tables and figures how some wood preservatives may have the same effect in wood as in agar, while others produce a many times greater effect in agar than in wood. Values obtained in agar cannot, therefore, be taken as applying for wood without further investigation; it was considered that an opinion as to the preservative properties of an antiseptic can only be established by experiments carried out with all necessary precautions upon wood blocks.

Against the objection of the American workers, put forward by Dr. von Schrenk, that the use of wood blocks introduces too great a variability into the experiments, which is absent in the agar method, it was shown that while the undeniable variability of wood may introduce differences amounting to