effort. This statement, however, was made in January, and things have not been standing still since. More especially there was no indication then that either the country or the Government was aware of the necessity for enormous efforts for the adequate supply of "munitions," amongst which must be included "optical appliances." As is well known, the only firm supplying optical glass in this country is the firm referred to in the House of Commons, namely, Messrs. Chance Brothers, of Birmingham; and a paragraph appeared in the *Times* on April 26 to the effect that this firm will now supply optical glass only to those manufacturers of optical instruments who can produce a War Office or Admiralty certificate showing that the glass is needed for the fulfilment of a Government contract. This means that, notwithstanding the large increase in the capacity of the plant at Birmingham, the whole of the optical industry of this country, other than that engaged in Government work, cannot be supplied at the present time with any optical glass whatever. When we consider the important trades which require such glass in fairly large quantities for other than Government purposes, there is no doubt of the great seriousness of the position. But so optimistic is the Government that it has declined a patriotic offer of Lieut.-Col. J. W. Gifford to hand over to the nation free of cost practically the whole of a collection of fine optical glass, considerably over a ton in weight, which he has accumulated during twelve years of laborious research, some of the results of which have been published by the Royal Society from time to time.

The definite proposal made in Dr. Walmsley's letter to the *Times* is that the Government should at once take over the optical glass branch of Messrs. Chance's factory. We understand that this proposal is, as yet, a suggestion of Dr. Walmsley's only, and that, for obvious reasons, he did not communicate beforehand with the firm in question. In passing, we may say that great credit is due to this firm for its very vigorous and patriotic efforts to deal with the situation, but the matter appears to us to have got beyond the point at which any private firm should be required, for the good of the whole community, to undertake such heavy capital expenditure as it has already made and to risk the great sacrifices which may be called for if this expenditure be rendered unproductive after the war. As pointed out by Dr. Walmsley, the natural solution, that competing firms should instal plant and enter the market, is not applicable in this case, because the whole amount involved is too small to make it worth while for any important firm to enter into competition. The supply of fine optical glass for the United Kingdom involves probably an outside turn-over of not more than 20,000*l.* a year, an amount which is not worth dividing. But the supply of this small quantity of raw material, in the form of unwrought optical glass, affects an industry in which the value of the finished products runs to millions of pounds' worth of goods per annum, and in which the greater part of the cost of output goes in wages to highly skilled labour.

It is true that the firm named already has risen to the occasion, has octupled its plant, and, if Ministerial replies are taken at their full face value, has succeeded so far as to supply present Government requirements. But what of the rest of the industry, and, moreover, what is to happen when the war is over? The foreign supply of this vital "key" product will doubtless be resumed, surrounded by the *ante bellum* "wire entanglements" to which Dr. Walmsley refers, such as restrictive contracts on users, the lodging of dummy and blocking patents in our Patent Office, and all those means by which officially-nurtured foreign competition in the past has endeavoured to kill the production in this country of the far more vital and more costly finished products. Is it too late in the day to ask that these methods of competition should not be used against private firms without any greater safeguards available than those which have proved so ineffective in the past?

It seems to us that the proper course is to act generally in the direction of Dr. Walmsley's suggestion, with such modifications as may be found desirable on full investigation. This would mean, in substance, that the Government should undertake the supply of this "key" product. With a Government department empowered to deal with eventualities, full attention could be given to the other important matters dealt with in the report of the British Science Guild, namely, the adequate development of research, better provision for the testing of the physical and optical properties of samples of glass, and, most important of all, provision for adequate technical training and research in applied optics, so that this country may recapture speedily the position it held for so long in the forefront of the world's optical developments.

ASPHYXIATING GASES IN WARFARE.

DR. J. S. HALDANE'S report on his investigation of the nature and effects of the asphyxiating gases, used by the Germans in their attack last week on the French and British lines near Ypres, leaves but little doubt that chlorine or bromine was the chief agent employed, whilst shells containing other irritant poisons were also used.

Prof. H. B. Baker, who accompanied Dr. Haldane, is carrying out an investigation as to the chemical side of the question, and until his report is available, surmises as to the nature of the poisonous gases and the methods adopted for their use would be premature, but the evidence seems to point clearly to the fumes floated by the wind on to the Allies' lines being chlorine, as at ordinary pressure bromine is a liquid below 59° C., and at ordinary temperatures would not give off its vapour with sufficient rapidity to cause the seven-foot bank of vapour that drifted on to the Allies' trenches, whilst the colour of the cloud would have been a rich brown and not the "green-

ish" or "yellowish-green" colour so frequently described, which undoubtedly points to chlorine.

Chlorine gas is 2·45 times heavier than air, and if discharged "down wind" would only slowly rise, so that at a distance of one hundred yards from its point of disengagement the bank of fume might be expected to be six or seven feet deep, but with bromine vapour, which is more than five times the weight of air, the thickness of the layer of vapour would, under the same conditions, be much less. Liquid chlorine has, for many years, been a commercial article: the gas is liquefied by a pressure of six atmospheres at 0° C., and is stored in lead-lined steel cylinders, being largely exported for use in the extraction of gold in localities where, from difficulties of transport, plant and materials for making the gas *in situ* would be more expensive.

It is said that such cylinders, 4 ft. 6 in. long, were sunk in the German trenches and were connected to pipes six feet long pointing towards the Allies' lines: under these conditions, intense cold would be produced at the point where the cylinders discharged into the delivery pipes by gasification of the liquid and expansion; this would soon check the rapid production of gas, and the white smoke seen behind the greenish cloud of gas may well have been caused by brushwood fires lighted above the delivery pipes to warm them and prevent stoppage.

Although all the evidence and the symptoms found in the unfortunate victims overcome at this particular section of the line point to chlorine as the gas employed, there seems every probability that liquid bromine has also been used in shells or grenades, which, bursting in the air, would scatter the liquid under conditions that would rapidly gasify it, when the weight of the vapour would cause it to descend on the troops below.

Both chlorine gas and bromine vapour, when present to the extent of 5 per cent. in air, rapidly cause death by suffocation, by acting on the mucous linings of the nose, throat, and lungs, so causing acute inflammation; but bromine poisoning is generally distinguishable by the skin of the victim being stained yellow, and the intense action on the eyes, which is much greater than with chlorine.

The Germans have an unfailing source of bromine in the crude carnallite, worked at Stassfurt for the production of potassium chloride, but when full particulars are available it will probably be found that, besides such obvious asphyxiants as chlorine, bromine, and sulphur dioxide, they have also employed compounds of a more complex character.

CHEMICAL STANDARDS FOR WHISKY.

IT may be remembered that the Royal Commission on Whisky, which in 1908–9 gave a lengthy consideration to the matter, did not find a very satisfactory answer to the query "What is whisky?" The Government of Western Australia has also been debating this question, and some years ago it issued regulations under which certain chemical standards for "pure pot-still whisky" were proposed for adoption. The proposals met with some criticism. It was alleged, in fact, that many pot-stills employed in Great Britain could not produce whisky which would comply with the requirements.

In order to investigate the matter further the Government analyst for Western Australia was deputed last summer to visit this country. Here, conjointly with an analyst representing the distillers, he inspected some forty Scotch distilleries and analysed a large number of samples of the whisky produced. In addition, twelve distilleries in Ireland were visited alone by the official analyst. The papers now issued [1] give an account of the investigation. They are prefaced by the statement that the proposals, as now modified, have been approved by the Governor in Executive Council and gazetted accordingly.

Briefly, the stipulations are that, as regards Scotch whisky, it shall have been distilled at a strength not more than 35 degrees above proof and matured in wood for not less than two years; and that "standard pot-still whisky" shall contain at least 45 grams of esters, 3·5 of furfural, and 180 of higher alcohols per 100 litres of absolute alcohol, as estimated by methods prescribed. For Irish whisky no furfural standard is proposed at present, but the proportion of esters is required to be not less than 35 grams, and of higher alcohols 200 grams, per 100 litres of absolute alcohol.

Whisky other than "standard pot-still," whether Scotch or Irish, is required to be sold as "blended" whisky. Of this there are three classes, containing respectively at least 75 per cent., at least 50 per cent., and less than 50 per cent. of standard pot-still whisky. For the first and second classes minimum limits are fixed for the proportions of esters, furfural, and higher alcohols—omitting the furfural, however, in the case of Irish whiskies. The third class includes all whisky which does not comply with the requirements for any of the other classes. The respective kinds are to be labelled with the appropriate designations.

A good deal of the criticism to which the original proposals were subjected has been turned aside by the change of a single word in the regulations. "Pure" has become "standard" pot-still whisky. There was just cause of complaint when specifications for the "pure" pot-still product were drawn up, because in certain cases these requirements could not be satisfied by whisky distilled in an apparatus which had certainly hitherto been regarded as a "pot"-still, even if somewhat modified from the simple form. To stigmatise by inference such products as adulterated because they did not comply with the stipulations for "pure" pot-still whisky was indefensible. But, obviously, a community has the right to say what it will regard as a "standard" whisky, and this has now been done.

[1] "Papers in Connection with the Establishment of Standards for Whisky in Western Australia." (Perth: The Government Printer.)