the phase relationships between a number of hydrophones distributed at regular intervals in a straight line. It is obvious that in this case sound-waves from a distant source arrive in phase only when it is situated on the beam of the line of hydrophones. By making use of a multiple "compensator" the phases can be corrected for all directions, and the bearing of the source read off from the "compensator" when the observer has determined the setting for maximum intensity.

One gratifying feature of the work on submarine acoustics done during the war is the possibility which it provides of rendering navigation more safe in times of peace. Used in conjunction with suitable sound signalling apparatus fitted to vessels, and submarine bells moored near dangerous shoals and rocks, the improved hydrophones developed for war service should greatly reduce the dangers of collisions and shipwreck, due to fog, etc.

Already hydrographic surveys of the North Sea are being carried out in which the position of danger spots are located for charting purposes by exploding depth charges and recording the resulting disturbances at a number of hydrophones connected to land stations. This method of submarine sound-ranging is by far the most accurate method of locating such spots, and also provides a means of enabling a ship at sea to obtain its correct bearings. By dropping a bomb hundreds of miles at sea, a ship can in a few minutes communicate its position to the nearest shore station and receive this information itself back again by wireless.

F. LLOYD HOPWOOD.

POWER ALCOHOL.

THE annual importation of petrol into this country rose to more than 100,000,000 gallons before the war. Most of this came from the United States. At that time the consumption in the States was about ten times this figure, but in 1919 will probably prove to be not less than thirty times as much. With these values to face it is impossible not to wonder whether the rapid expansion of usage in the States will allow the exportation—at any practicable price—of even the small relative quantity used in the United Kingdom before the war, to say nothing of any additional supply to meet the growth of our own needs for road, sea, and air.

These considerations suffice to render inquiry into the subject a matter of immediate moment, but there is an additional argument available to those who take a longer view. Any fuel product drawn from oil wells or coal mines has the nature of a fortunate dip in a "lucky bag." No one knows how long such supplies will last, nor what untapped stores there yet may be (nor where they are). Moreover, their renewal is a matter of hundreds, if not thousands, of thousands of years. For this reason it is wise for mankind to prepare to supply its future needs by drawing on the current account of the sun's radiant energy and to touch the capital as little as may be.

In most previous discussions on this subject it has been assumed that alcohol obtained from the potato crop is as feasible a source of supply as any that could be named. It now appears from the investigations of the Inter-Departmental Committee on Power Alcohol (Cmd. 218, 1919, price 2*d.* net) that whilst potatoes yield 20 gallons of alcohol per ton, the sun-dried flowers of the Indian mahua tree (costing about 30*s.* per ton delivered at the factory) will yield as much as 90 gallons of alcohol per ton. Here, as in so many other cases, it seems that raw material comes most abundantly and most economically from the tropics, which, indeed, in the present instance is not to be wondered at, seeing that it is the daily solar radiation the energy of which it is desired to tap.

The Government Committee above mentioned, with most praiseworthy energy, has also taken a decided step forward in probing the problems relating to the best use of the alcohol when produced. With this in view it has arranged with the London General Omnibus Co. for a complete fleet of motor omnibuses to be run for six months on both alcohol-benzol and alcohol-benzol-petrol mixtures, and for the results to be compared with running on petrol or other fuel. To use alcohol without any admixture might prove difficult owing to its reluctance to fire in a cold engine; moreover, for good thermal efficiency a high-compression pressure would be needed, and this again makes starting difficult. That, however, is but one of a series of problems which the Committee has arranged to have investigated at Manchester in the laboratory of Prof. H. B. Dixon, whose work on similar lines is well known. Both these investigations—scientific and commercial—should begin to bear fruit very shortly, and by Christmas it may not be too much to hope that the Committee will be able to publish information of such value as to enable the Government to take definite steps towards rendering power alcohol available for all internal-combustion engine users.

THE FORESTRY BILL.

THE Forestry Bill came before the Commons in Committee of the whole House on August 8, when amendments to several of the clauses were suggested. An important amendment increased the number of Commissioners from seven to eight, with the object of having one unpaid Commissioner sitting in the House of Commons, thus enabling the House to keep itself acquainted with the progress of the afforestation work. This amendment was agreed to, as was also another by Major W. Murray that not fewer than two of the Commissioners should have special knowledge and experience of plantation and forestry in Scotland.

Sir Philip Magnus strongly advocated the view put forward by the British Science Guild that at least one of the Commissioners should be a person