

most of the districts where the larch saw-fly was making itself felt, and as none of the other parasitic hymenoptera or diptera recovered from the cocoons from year to year showed signs of attaining to anything like its efficiency as a parasite, it was felt that the eventual control of the pest possibly depended largely upon the future activities of this one species. Hence the following observations made during the present season may be of interest in so far as they indicate the probability of other of the parasites attaining to a like importance.

Shouldwaite plantation at Thirlmere, the first in that area to suffer from attack, endured during several summers the severest defoliation, until in 1910, owing to the good offices of *M. tenthredinis*, the ravages of the pest abruptly and almost entirely ceased. In 1911 it was impossible to obtain from there any further cocoons for the purposes of the investigation owing to the scarcity of the saw-fly. In 1912, however, this plantation was invaded by a vast swarm of adult saw-flies, which there was reason to believe came from a badly infested plantation some three miles away. Owing to a period of very unfavourable weather, and perhaps to other causes, the defoliation that ensued was not at all so extensive as it was feared it would be; however it was distinctly noticeable, and the consequences of this re-infection of the area were looked forward to with some anxiety. Would the trees, weakened by the old outbreak, have to submit to renewed defoliations, until such time as *M. tenthredinis*, re-emerged Cincinnatus-like from its obscurity, regained sufficient strength to overcome the progeny of the invaders? An examination of the parasites that have emerged this year from cocoons collected in this area revealed a quite unexpected state of affairs. Scarcely 2 per cent. of the cocoons proved to be parasitised by *M. tenthredinis*, but some 25 per cent. yielded specimens of an ichneumon which had hitherto played quite an insignificant part as a parasite of the large larch saw-fly (a species of *Mesoleius*, as yet undetermined). From approximately 24 per cent. emerged tachinids belonging to the species *Zenillia pexops*, B. and B. (Mr. C. J. Wainwright, who kindly identified it for me, informs me that he knows of but one other record of its having been taken in Britain.) It seems highly probable that both these parasites have followed in the wake of the invading saw-fly, particularly as observation of material from the locality from which it was suspected that the latter had flown has shown that the tachinid at all events is exceedingly abundant there.

It is impossible as yet to have direct proof of the efficacy of these two parasites in warding off defoliation in the areas in which they have so opportunely appeared, but it is very reasonable to suppose that, here and elsewhere, they will prove to be important enemies of the large larch saw-fly.

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Mackerel and Calanus.

REFERRING to Prof. Herdman's interesting observations upon the above (NATURE, July 17), I may perhaps mention that the mackerel-drifters, when fishing upon the usual grounds around Scilly and in the Bristol Channel, are largely influenced in their selection of a suitable position by the finding of so-called "yellow water." This condition of the sea in the area under consideration arises from the presence of vast shoals of Calanoids—e.g. *Calanus finmarchicus*, *Pseudocalanus elongatus*, &c.—which impart a yellowish tint to the surface of the water. The

sporadic distribution of such copepods, moreover, is often somewhat remarkable; the fishermen state that it is possible at times to observe the entire extent of a "splat" of "yellow water."

The presence of mackerel is generally to be expected in water of this character, but heavy catches are not invariably made in it. G. E. BULLEN.

The Hertfordshire Museum, St. Albans.

THE FUTURE OF OIL FUEL.

THE position of liquid fuel has increased in importance far beyond any expectations its most enthusiastic advocates of but little more than a decade ago ever dreamed, due to the rapid advances made in its use in internal combustion engines. The success of engines of the Diesel type, which can employ crude oil or heavier residues after the lighter fractions of the crude oil have been removed for other applications, has furnished the completing link in the use of oil in such engines. With the petrol engine, slow-speed oil engines working on ordinary burning oil (kerosene), and the Diesel and semi-Diesel engines, high efficiency is now assured with any fraction of the natural oil.

The importance of liquid fuel and the certainty of its more extensive use in the Navy rendered it imperative that the whole question, especially that of supply, should receive consideration, and led to the appointment of the Committee now sitting. The advantages of oil fuel for steam raising were dealt with fully in these columns so far back as 1902 (vol. lxvi., p. 186), when oil fuel was in its early trial in the Navy.

The present general position and future policy of the Admiralty were outlined by Mr. Churchill in a reassuring speech before the House of Commons on Thursday last. Whilst the crude oil output for last year was nearly 50,000,000 tons, Naval requirements were met by fewer than 200,000 tons, and the Admiralty have assured themselves of obtaining all requirements in time of war, so long as British command of the sea is maintained.

This necessarily involves obtaining supplies by suitable contracts, and drawing specially upon supplies under British control, which is now possible from the Mexican fields. A far-reaching step in national policy is the further proposal to establish an oil refinery, so that crude oils may be dealt with as they come cheaply into the market. It is not only essential to have some measure of control of the supply at its source; it is equally essential to provide ample storage and transport facilities. The former has been arranged for on a large scale in this country and throughout the Empire, and by the end of 1914 the Admiralty will possess thirteen transport steamers, the five largest of which have a carrying capacity considerably greater than the quantity of oil fuel consumed throughout the fleet last year.

In connection with the subject of oil fuel, three Cantor lectures recently delivered by Prof. Vivian B. Lewes before the Royal Society of Arts¹ are of especial interest. The first lecture was

¹ Journal of the Royal Society of Arts, May 23, 30, and June 6, 1913.

devoted principally to theories on the formation of petroleum, and to the composition of natural crude oils. In the second lecture methods of combustion for steam raising, and, briefly, its use in internal combustion engines, were considered. Particular interest attaches to the possible high efficiency attainable when utilised for steam raising by Prof. Bone's surface combustion system. It is, however, in the third lecture that we find the all-important questions of supply discussed. Euthusiastic advocates of the advantages of oil fuel—advantages which are admitted—often forget that, with small exception, liquid fuel must always be an imported fuel in this country, and that the questions of supply and price must depend on a variety of factors, not the least important being that of transport. Prof. Lewes rightly emphasises the fact that trusts and rings are by no means wholly responsible for the recent high price of petrol; there is the big question of enormous increase in consumption with nothing like a corresponding increase in production. Referring to this high price, Prof. Lewes says:—

The way to keep the price of petrol within reasonable bounds is not by letting the imagination run riot on the subject of trusts and rings, but to develop steadily all processes that will increase the supply, not only of petrol, but petrol substitutes, always bearing in mind that with the present consumption ever increasing, petrol itself cannot supply the market for even another ten years, and will probably be a rarity as a motor fuel before the end of the century.

This naturally leads to a reference to processes for "cracking" heavier oils to produce lighter fractions by the breaking down of the heavier hydrocarbons, and a description is given of one of these processes in which oil mixed with water is sprayed through heated iron retorts filled with iron turnings.

Referring to sources of supply other than petroleum oils, it is shown that shale distillation in this country can yield only an infinitesimal fraction of the petrol consumed. Benzene (benzol), obtained from coal-gas and coke-oven tars, being a native product of proved value as a motor fuel, is discussed. Prof. Lewes says that if the whole of the benzol from the 32 million tons of coal annually coked in coal-gas and coke-oven practice were recovered, a very considerable supply would be assured, but under existing conditions less than half the coke is obtained in recovery plant (it may be noted that the use of recovery ovens is extending rapidly), and most of the benzol goes abroad. Prof. Lewes appears to advocate removing the tax on petrol and the imposition of a tax on export benzol as a means of obtaining an important addition to our supplies of motor fuel.

Heavy fuel oils, suitable for steam raising and for internal combustion engines, constitute 50 per cent., or even more, of the crude oil. Prof. Lewes anticipates no such shortage in supplies of these oils in the future as has existed for some time past, for "the distillation of every available supply to yield petrol must result in enormous volumes being thrown on the market." The

present shortage is ascribed to the better price of petrol giving it preference for shipment during a period when there is great lack of transport facilities. With the increase in the number of tank steamers (many yards are busy with such vessels) he anticipates that the enormous stocks held in many fields will become available.

IS CANCER INFECTIVE?

NOTWITHSTANDING that no analogy has been shown to exist between cancer and any known form of infective disease, the contrary is often asserted without proof, as a kind of creed, by well-meaning and enthusiastic students of the disease. A recent lecture illustrates the importance of the influence the latter view may come to have upon the public in general. Whether it is wise to put forward such views before a non-critical lay audience is open to doubt, even if they are told "there is no risk of direct infection, although it is better to avoid direct contact by kissing, by using in common table porcelain, clothing, or beds."

In a popular lecture¹ delivered at the Urania, in Berlin, Dr. V. Czerny, the famous surgeon, gives a clear account of the reasons why, after forty years' experience in surgical practice, he still holds that cancer is an infective disease. According to him it is communicable, not directly, but through an intermediate host. Once the infection is conveyed, the normal cells become changed, they destroy the organism not only by disturbing functions vital to life, but also because, like real parasites, the cancer-cells withdraw necessary foodstuffs, as well as secrete abnormal products of metabolism, viz. toxins which poison the organism. Czerny supports his view by arguments as to the varying frequency of the disease in different countries and in different districts of the same country, the alleged occurrence of epidemics of cancer, of the eyelid in cattle, of the thyroid in trout, and of cage epidemics in mice; but he neither points out the statistical and pathological fallacies that underlie the assertions of the authors whom he quotes, nor takes cognisance of the explanations more cautious authors have given of the apparent differences and "epidemics" upon which he depends. Every precaution necessary for the statistical study of cancer in man applies with even greater necessity to animals, since the data obtainable from an animal population can be controlled at will by the investigator. Unless these precautions are taken, weight may not be attached to reasoning from such imperfect data without important reservations.

Bugs, mucors, mites, worms, cockroaches, bilharzia, filaria, acid-fast bacilli, &c., are alleged as possible intermediate hosts of "the ubiquitous cancer parasite," which may be a protist, but more likely is an ultramicroscopic organism "which constantly secretes a chemical irritant. If one

¹ "Ueber die neuen Bestrebungen, das Los der Krebskranken zu verbessern." By Dr. Czerny. *Himmel und Erde*, Heft 7, April, 1913. Also published separately by B. G. Teubner, Leipzig and Berlin.