

evaporation, which in the case already considered is 88 per cent. of the total heat absorbed along *BCD*, would clearly result in considerable improvement of the efficiency of the thermodynamic cycle. Thus not only high temperatures, as in the case of the adoption of high superheat, but also high boiler pressures, lead to a substantial increase in over-all thermal efficiency.

The question of the improvement of the thermal efficiency of the steam engine by such means is one of prominent interest in the engineering world at the present time. Advances in this direction have already been made for land installations, and recently we have

witnessed an application of the same principles to marine work, which had been awaited with keen interest, and was not without an historic setting. It is just a quarter of a century since the first commercial application of the steam turbine to marine work was made in the Clyde river steamer the *King Edward*, which, built in 1901, has continued in successful service season by season up to the present time. A new vessel, which has a high-pressure steam installation of geared turbines on the lines indicated above, has been built for the same owners and for the same service. This vessel, which has been named *King George V*, becomes in its turn the pioneer of the new system.

Malaria and the Mosquito.

THE enthusiast who is 'eradicating' malaria by any or all of the well known methods, should cease for a while from his labours and study the short report recently issued by the League of Nations and referred to below.¹ In Col. James's words, "He will at least realise what a great waste of effort is involved in measures directed against the breeding-places of mosquitoes as a whole and even in similar measures directed against one species. He will begin to appreciate how the secret of a successful control of malaria lies not in the general knowledge that the disease is spread by mosquitoes of a certain kind, but in the particular exact knowledge of the life history of the few individual mosquitoes which succeed in becoming transmitters of the disease."

This is a refreshingly new aspect of the problem. The enthusiast eradicates all mosquitoes. He does not stop to distinguish a Culicine (non-malaria) from an Anopheline (malaria) mosquito; he is out to destroy them all. Now he is advised to study not only the species of Anopheles which are concerned in transmission, for all are not, but also actually to concern himself about infected individuals! Why should he do this? It is because "Malaria is essentially a household disease and particularly a disease of certain kinds of houses . . . Malaria should be dealt with in the houses of the people rather than in the environment." We have called this a new aspect of the problem, but the author points out that some twenty-five years ago Stephens and Christophers in their reports to the Royal Society directed attention to "fever houses." They state: "We may look upon such a house and its accessory hovels as one infected with malaria or as 'a fever house.' Such is the universal condition of European houses indeed in the remote stations situated in the African bush. It is in such houses that the malarial cachectic is living, exposed to frequent or even constant re-infection and in which every traveller staying the night is liable to infection. From such fever houses the majority of our cases of blackwater have come."

It has always been somewhat disconcerting that while, for example, in a native African village more than 75 per cent. of the children may be infected with malaria, yet the infection rate of sporozoites (infective stage of the malaria parasite) among the anophelines may be low, less than 5 per cent. Once infected, however, a single mosquito becomes

exceedingly dangerous; how much so is shown by the fact that a mosquito which has lived (in captivity) 1-3 months and has bitten nearly half a hundred people in that time may still have numerous sporozoites in its salivary glands and is consequently still potent for mischief. But, on the other hand, if not bitten oneself, one may draw comfort from the fact that a mosquito is gradually purging itself of infection by biting other people, so that while 85 per cent. of mosquitoes showed a salivary glands infection on the 50th day, on the 70th day this was reduced to 20 per cent. (the glands, moreover, containing but few sporozoites), the mosquitoes having bitten about a dozen people in the interval. This at first sight appears inconsistent with the previous statement, but the difference lies in the fact that in the first case the mosquitoes' stock of sporozoites in the glands was being replenished by the oocyst stage present in the stomach, as shown by dissection, while they were absent in the second case.

Col. James's observations lead him to formulate some very important conclusions, namely, that "in Nature the only mosquitoes which succeed in transmitting malaria are those rare individuals who happen to pass their lives in conditions which resemble very closely those which we have found to be essential for the successful transmission of the disease in experimental work" and of these "not many will ultimately become infective." Let the sanitarian then pause and study the individual infective mosquito in the fever house. Here is the real centre of gravity.

Among interesting data with regard to the life of the malaria parasite in the mosquito are those concerning the persistence of oocysts and sporozoites, the young and the mature stages of the malaria parasite in the stomach and salivary glands respectively of captive hibernating mosquitoes, a persistence which is held to explain primary attacks of simple tertian malaria in Nature in the early spring in northern latitudes.

The report concludes with a study of the infected cases from the clinical and microscopical sides. They suggest that we shall have to revise somewhat our idea of the Golgi cycle in relation to the temperature chart, but in blood work we must never forget that the peripheral blood is almost certainly not the same thing as that of the spleen or marrows. Very prudently, we consider, the author refuses to sail on the troubled sea of immunity where shipwrecks are inevitable. The report is written in an agreeably clear fashion with an absence of assumption of authority quite charming.

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¹ League of Nations: Health Organisation—Malaria Commission. Report on the First Results of Laboratory Work on Malaria in England. By Lieut.-Colonel S. P. James and P. G. Shute. (C.H./Malaria/57) (r.) Pp. 30. Geneva: League of Nations; London: Constable and Co., Ltd., 1926.