

Chemical Warfare.

DR. HERBERT LEVINSTEIN, in a lecture delivered on Feb. 3 before the London section of the Society of Chemical Industry, courageously examined the position of chemical disarmament and chemical warfare in relation to the ideals and foundations of future peace and to the stern realities of the dangers of conflict. Whilst it is probably true that man is by nature a peaceable creature, and hence amenable to the settlement of domestic disputes peaceably under compulsion of law, the extension of the same principle to international disputes, however devoutly to be sought, is not so simple as may appear. The necessities of life are provided for the individual who falls in the social struggle but not for the nation which succumbs in society organised on competitive principles, and the possibility of defensive resort to arms remains in the background of international agreements. Hence with the present organisation of society the possibility of fighting is never remote, and Dr. Levinstein's first plea was for the strengthening of the efforts of the League of Nations in making wars on a large scale less probable.

In international disputes, arms are the last resort; other means of persuasion are equally available, and not the least powerful is the possession of a powerful chemical industry. Restriction of naval armaments, largely an economic measure, by making war cheaper tends in a sense to make it easier, and in Dr. Levinstein's opinion increases the importance of the chemical arm. Examination of the text of the agreements relating to the prohibition of chemical warfare leads to the conclusion that the prohibition is largely ineffective. He finds, for example, no prohibition of the use of screening smokes; yet it may be argued that such smokes as that of chlorosulphonic acid are in concentrated form deleterious to the human organism and are therefore forbidden. Justification of the use of a smoke can be based on the grounds that its toxic properties are accidental, as indeed are those of the fumes from high explosive shells. Tear gases, used in the United States for the protection of banks and safe deposits and for dealing with riots and civil disturbances, may be classed as non-asphyxiating and non-poisonous, since in low concentration they affect the eyes alone.

Chemical warfare has not, said Dr. Levinstein, been justly condemned by the general opinion of the world; condemnation lies against its use by the Germans in

1915 in violation of the spirit, if not of the letter, of the Hague Convention, and because it was used against unprotected troops. He asked why preference should be shown for the use of high explosives with their ghastly effects; there is, unfortunately, no prohibition against the dropping of high explosive shells or incendiary bombs from hostile aircraft at dead of night on crowded cities.

The object of war is not to destroy human life, but to break down the opponent's will to resist. Gas, Dr. Levinstein claimed, maims or kills a far smaller proportion of those whom it puts out of action than does any other weapon used in the recent War; thus in proportion to the military results it causes far less human suffering, and, in addition, less of the wasteful destruction of the work of man. Dr. Levinstein quoted statistics showing that of the casualties caused by gas only 2.3 per cent died and few—about 0.5 per cent—were permanently injured, whilst of casualties resulting from all other forms of warfare 25.33 per cent died, and of the survivors 2.5 per cent were maimed, blinded, or disfigured for life. He did not suggest that gas warfare is anything but dreadful, but he argued that it is both less dreadful and of greater military value than the older forms of warfare. It causes inconvenience, holds the element of surprise, permits economy of force, and is equally serviceable in attack and defence.

In Dr. Levinstein's opinion it is an elementary act of prudence for a nation situated as is Britain to see that research for chemical warfare purposes should continue to be a subject for special study, and that funds for that purpose should not be reduced below the safety point. Guns and shells can be restricted, and in any case take long to prepare, but gas can be projected from quickly improvised containers; limitation of armaments as proposed may therefore greatly increase the military importance of the chemical weapon, and prudence dictates contact in peace time between military authorities and the chemical industries.

If a purely general observation supplementing Dr. Levinstein's remarks may be offered, it is simply that modern warfare in all its forms is increasingly based on chemical knowledge, and that if chemical research can make warfare even a little less probable and less hideous, its potentialities in that direction deserve the attentive interest and unbiassed support of all right-minded men and women.

Variations in the Skeletal Structure of the Pig.

HAVING observed marked variations in the lengths of exhibition carcasses of swine used for bacon curing, Prof. A. M. Shaw, of the University of Saskatchewan, suspected that the difference might be due to variations in the numbers of ribs. He accordingly counted them and found that, of nine carcasses exhibited, two possessed 16 pairs of fully developed ribs, four possessed 15 pairs, while the remaining three carcasses possessed 14 pairs of fully developed ribs each.

Reference to standard works on veterinary anatomy was made. Sisson states: "The ribs number fourteen or fifteen pairs. The fifteenth rib when present may be fully developed and its cartilage enter into the formation of the costal arch; but in most cases it is only about an inch (2.3 cm.) in length." The vertebral formula given by Sisson is: *C* 7, *T* 14-15, *L* 6-7, *S* 4, *Cy* 20-23. He also states that "the occurrence of fifteen thoracic vertebræ is quite common and the existence of sixteen or even seventeen has been re-

corded. Reduction to thirteen is very rare." Various model pig skeletons examined by Shaw all possessed what was apparently considered to be the normal number, namely, 14 pairs.

Prof. Shaw has had careful counts made in Canada, the United States, Great Britain, and Denmark, and has now published the figures for 3957 animals, representing several breeds, grades, and crosses (*Scient. Agric.*, 10, 1; September 1929). When summarised they show the following results: 13 pairs of ribs, 20 pigs; 14 pairs, 1574 pigs; 15 pairs, 1829 pigs; 16 pairs, 310 pigs; 17 pairs, 7 pigs. The remainder showed uneven pairs or floaters. More than 400 vertebral columns were scraped and cleaned for identification, varying in number of ribs from 13 to 17. The counts showed that cervical (7) and sacral (4) remained constant, thoracic varied according to the number of ribs, while the lumbar variation is from 6 to 7, except in two cases, where there were only 5 present. The true ribs were always attached to