7. The efficient disinfection of infected articles and infected living spaces.

8. The isolation of tuberculous men.

9. The removal of patients from ships to hospital on the earliest opportunity.

10. Early invaliding.

The discharge to their homes of men invalided for tuberculous diseases is undoubtedly a danger to the health of the civil population. To what extent it has suffered in the past from this cause is unknown.

The building, equipment, and maintenance at Admiralty expense of sanatoria for the treatment of men who are unfit for further service are, however, measures which can scarcely be regarded as practicable.

TUBERCULOSIS IN THE ARMY, 1860-1906: **Its Influence on Invaliding and the Death-Rate.**

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TUBERCULOSIS being, especially in its pulmonary manifestations, a disease of the young adult—and, to a certain extent, of the young male adult rather than of the female—possesses peculiar interest for the Army Medical Officer. Other of the more chronic forms of disease, *e.g.*, syphilis, cause waste by invaliding, while the acute infections deplete the ranks by death; but tuberculosis strikes with both weapons. Thus during the year 1906 tubercle of the lung caused, in the army serving in the United Kingdom, more deaths than any other form of disease except pneumonia, and was responsible for more invaliding than any other single disease, or group of diseases. Taking the entire army, serving both at home and abroad, we find that even the exigencies of foreign service, and exposure to tropical climates, do not serve to oust this disease from its “bad pre-eminence” as a cause of invaliding, and only bring it one step down the list of causes of mortality, enteric now taking its place as second on the list.

In studying the history of tuberculosis in the British army I have relied entirely on the statistics given in the Annual Reports of the Medical Department. These give the most accurate information, though,

when taken in a long series, continuous comparison is hampered by changes in nomenclature and classification. For this reason it has been found impossible to limit the study to that of tubercle of the lung alone, since for many years this was not shown separately from other diseases due to the same cause. Except, therefore, where definitely so stated the reference to tuberculous disease includes tuberculous disease of all kinds.

The accompanying chart shows the yearly fluctuations in the invaliding and death rates for the entire British army, at home and abroad, since 1860 inclusive. Unfortunately, the invaliding rates for the years 1874 to 1878 inclusive cannot be shown, as during these years the Army Medical Department reports class tuberculous disease under enthetic diseases, and do not furnish separate figures. Taking the death-rate first, it will be seen that there has been a steady fall in the ratio of deaths during the period under review, broken by only two important rises. The first occurs in the years 1872 and 1873, and its effect is seen to last till well into the early eighties. The second rise occurs during the years 1900 and 1901, the years of the South African war, to which campaign it is undoubtedly attributable. The cause of the first and most important rise is difficult to estimate. Probably there was more than one cause at work, but the Army Medical Department reports give no information as to what these may be. There were, however, two important changes at work during those years, which may not possibly have had some share in causing this exacerbation of a previously declining cause of mortality. The first of these was the gradual introduction of short service, which was commenced in a tentative way in 1870, and gradually extended in scope throughout the ensuing decade. The immediate result of this was naturally a considerable and increasing influx of young soldiers into the ranks, an increase, that is, of susceptible material. The second change was the alteration in the constitution of the Army Medical Service from a Regimental system to a Departmental system. The dislocation of machinery necessarily consequent on all such administrative changes not impossibly led to a temporarily lessened supervision of sanitation in barracks. The curve representing the variations of the invaliding ratio is much less regular than that representing those of the death-rate. The curve as a whole shows a marked fall, but this began much later than the fall in the death-rate. Owing to the gap in the statistics during the years 1874-1878, already alluded to, it is hard to say whether the fall commenced in 1872 or later. Once the fall began it was, however, very rapid, and lasted till 1893, since when, though with considerable oscillations, the curve has had a slightly upward tendency. This rise is probably due to the recognition of the potentially infective nature of all phthisical cases. The oscillations are less easy to explain. The rise in 1900 and 1901

may be attributed to the war, but those of 1904 and 1906 cannot be accounted for. Invaliding being the result not of an operation of nature,

but of the opinion held by medical officers as to the effect of a disease on a man's fitness for the ranks, naturally fluctuates with the fluctuation of ideas on this point. On the whole, then, we see that in the past

forty-six years there has been an enormous reduction in what we may call the "tuberculous wastage" of the army. In 1860, with an army of under 200,000, we lost by death and invaliding from this cause 1,143 men; in the year 1906, with an army 230,000 strong, we lost only 590, a reduction of nearly 60 per cent.

In addition to this actual diminution in the "tuberculous wastage" of the army, there has been a diminution in this wastage when compared with that due to all other causes. Thus in 1860 the former represented one-fifth, in 1906 only one-seventh, of the latter.

We see, then, that during the past forty-six years there has been a great and practically a continuous fall in the wastage due to tuberculous disease, and it is of importance to ascertain in how far this may be attributed to causes peculiar to the army, and in how far it is due to influences affecting the entire population. In the year 1860 the death-rate from tuberculous diseases in the males of fifteen to thirty-five years of age in the United Kingdom was 3.5 per 1,000. In 1905 it had fallen to 1.5 per 1,000, a decrease of over 50 per cent. During the same time the death-rate of the army from the same cause had fallen from 3.4 to 0.30 per 1,000, or about 90 per cent. The comparison is not, however, strictly fair, since to the death-rate of the army we must add a certain proportion of the loss due to invaliding. What exact amount should be added, it is hard to say, but it is a fair assumption that half the total number of invalids leaving the service on this account die within the period to which their colour service would otherwise have extended. On this assumption we must, therefore, add to the death-rates one half of the invaliding rates for the years under discussion. This raises the total wastage in 1860 to 5.5, and that in 1906 to 1.16 per 1,000. The total decrease in the loss suffered by the army from tubercular diseases during the past forty-six years is thus equivalent to 80 per cent. of the loss suffered in 1860. Taking the improvement in the civil population at 50 per cent., this leaves a balance of about 30 per cent., which may be credited to improvements in the conditions of the soldier's surroundings during the above period.¹

Now, the greatest change that has occurred in the daily life of the soldier since 1860 is undoubtedly in the direction of better housing. What his surroundings were in 1860 may be judged from the report of a Royal Commission appointed, in the year 1857, to inquire into the sanitary condition of all barracks and hospitals in the United Kingdom. This Committee presented its final report in 1860, and the following extracts bear eloquent testimony on this point: "We find that there

¹ This is probably fairly accurate under present conditions. Under the long-service conditions ruling in 1860 the proportion of invalids dying within the period to which their colour service would otherwise have extended was probably much higher: the proportional improvement would in that case be higher than here stated.

are 1,335 men, equal to one and a half regiments, living and sleeping in rooms with less than 250 cubic feet per man; that there are 15,195 men with less than 350 cubic feet per man of sleeping space; that 34,882 men have less than 400 cubic feet each; that 65,271 have less than 500 cubic feet per man; and that out of the whole force for which there is accommodation in these permanent barracks, namely 76,813, there are only 4,656 men with sleeping room exceeding 550 cubic feet each." Not only was the air-space often miserably insufficient, but in addition the construction of the rooms rendered what air there was unavailable. Thus, at St. Mary's Barracks, Chatham, 1,410 men were accommodated in casemates, the most unsuitable form of barrack-room imaginable, with only 250 cubic feet of space per man. In addition ventilation did not exist. To quote again from the report of the Commission: "We learn . . . that in 83 barracks of the United Kingdom, containing 3,130 rooms, and 42,521 men, with from 200 to 400, 500, and in very few rooms only 600 cubic feet per man, no means of ventilation whatever had been provided; that in 78 barracks, containing 2,237 rooms, and 33,601 men, with 230 cubic feet per man and upwards, ventilating arrangements, exhibiting all stages of imperfections and inefficiency, had been introduced. . . . One arrangement which we found at Northampton deserves notice. In this barrack the rooms are over stables, and above the rooms is an attic partially occupied by men. The rooms below this attic were ventilated by an opening through the ceiling into a triangular space, formed by the slope of the roof, the side wall of the attic, and the ceiling of the lower rooms. From this space there was a ventilating opening into the attic close to the heads of the men's beds, who thus would breathe during sleep foul air from the rooms below, unless there were fires in these lower rooms, in which case the men in the lower rooms would be supplied with foul air from the attics, drawn down the ventilators by the action of the fires. Perhaps no more striking illustration could be given of hopeless confusion of ideas on the whole subject of ventilation." The ultimate conclusion to which the Commission came was that there was a deficiency of over 32 per cent. in the barrack accommodation in the United Kingdom, and that "it would therefore be necessary to add about a third part to the permanent barrack accommodation buildings of the United Kingdom." Since Rome was not built in a day, it is hardly necessary to say that the recommendation of the Commission could hardly be carried into effect except through a certain number of years. The Commission was, however, armed with the somewhat unusual power of ordering the immediate execution of such improvements as might seem necessary up to a limit of cost of £100 for each barrack or hospital inspected, and to submit plans and estimates for the carrying out of works beyond this limit. Consequently, even before the submission of the report, a certain

amount of progress had been made, chiefly in the direction of remedying defective ventilation. No advance had, however, been made in the direction of diminishing the overcrowding complained of above up to June, 1860. Since then, however, much has been done, and the basis of all the recommendations of the Committee, namely, that every soldier should have 600 cubic feet of space in barracks, is now, and has for long been the universal rule.

There are still, especially at some of the remoter regimental depôts, buildings of antique structure, whose original design does not readily lend itself to modern ideas of sanitation. But the regimental depôts built in the seventies, though not, perhaps, up to date in all details, are excellent examples of good barracks in all the main essentials. Of the later barracks, built in 1900 and subsequently, nothing but the highest praise can be spoken. In addition to constructing these large new buildings, much has been done to remove the defects of the older ones. This has been done partly by improving the ventilation, partly by providing extra accommodation to relieve previously overcrowded rooms. To this improvement in housing, 99 per cent. of the improvement in the health of the army, *qua* tubercular diseases, must be credited.

There are, it is true, other changes which have helped in this direction. Of these, diminished sentry duty is one of the most important. It used to be the custom in the Army Medical Department reports to give a return showing the incidence of disease, and the various diseases in the various arms of the service. This custom was discontinued in 1876, but up till that time the increased prevalence of tuberculous diseases amongst the Guards, more especially among the Guards' Infantry, was very strongly marked. It is interesting to note that a similar prevalence of diseases of this type is noted by Roth and Lex as occurring amongst the Guard regiments at Berlin and Paris. It is almost certain that this increased liability to tubercle was due to the heavier amount of ceremonial guard duty required of these troops. At the same time Aitken's interesting observation of the increased liability of tall men to phthisis must not be lost sight of in this connexion. To a certain extent there have been improvements in the soldier's clothing, especially in his underclothing, which have no doubt had a beneficial effect. Improved feeding, especially as regards the preparation of the food, increased temperance—all such causes have helped towards the marked improvement which has occurred, but without the great advance which has been made in the housing of the soldier, all these would have been but as scratching on the surface of the evil.