TYPHOID BACILLI AND THE SOIL.

THE Medical Officer of the Local Government Board in England draws attention in his last report (1900-01) to an investigation undertaken for the Board by Dr. Sidney Martin, with the object of ascertaining the precise conditions which in a surface soil elsewhere favourable to the multiplication of typhoid bacillus determine its prompt extinction when placed therein in competition with the bacteria natural to the soil. Dr. Martin's report, which is entitled *On the Nature of the Antagonism of the Soil to the Typhoid Bacillus*, is published as an appendix to the medical officer's report, and, in view of the paper by Professor Firth and Major Horrocks published in another column, it seems well to reproduce here Dr. Martin's own general summary of the results of his investigations:

"This investigation has been concerned essentially with the extracorporeal life of the typhoid bacillus. This bacillus is well known to be disseminated by water and by milk, and as infecting persons through this media. In water it can live, however, only a short while. Milk, on the other hand, forms a good culture medium for the bacillus.

"Demand for determining whether soil may serve as a medium in which the bacillus lives and flourishes has arisen in the fact that the occurrence of cases of enteric fever in certain localities is not, in some instances, explained by the dissemination of infection by means of water or milk, or by ascertainable infection from pre-existing causes.

"These three modes of infection being eliminated in a particular instance, it was important to determine whether the surroundings of invaded houses might foster in some way the growth of a bacillus; whether, if the earth about a house be contaminated by typhoid dejecta, and if the bacillus can live for any length of time in the earth, the soil of the particular locality might not serve as a constant, or recurrent, source of infection.

"Many different forms of bacteria are found in soil, and they are much more numerous in soils that have been cultivated than in other soil. Some of these bacteria are spore-bearing, and their continued existence in the soil is aided by their spores, since spores can resist dryness and heat, and can germinate when the soil becomes again moist. The typhoid bacillus does not bear spores; and, when it disappears from the culture medium it dies, having no resting stage. Non-spore bearing pathogenic bacteria, as a rule, require the medium of the animal body for their continued existence, their extracorporeal life being commonly of short duration. On the other hand, the typhoid bacillus is a micro-organism that multiplies in suitable media with enormous rapidity; it is also motile, and, like the bacillus coli, it is more resistant to the action of certain germicidal substances (for example, phenol and free hydrochloric acid) than many non-pathogenic bacteria such as occur in water.

"The typhoid bacillus requires, for its growth and life, nitrogenous substances, usually in the form of proteids. In the presence of these substances, which it very slowly exhausts, it will live for very considerable periods. Some of the typhoid bacilli, in a liquid culture medium, sink to the bottom, partially clump, and to a great extent lose their motility; but there is a constant formation of new bacilli in the upper part of the medium.

"The investigations upon which I have been engaged early showed that certain soils, such as sandy, peaty, and uncultivated soils generally, were inimical to the typhoid bacillus, which not only did not grow in them, but became rapidly motionless and died. In sterilized cultivated soils, on the other hand, the bacillus was found not only to live, but to multiply also, and, finally, to pervade all the soil. It was obtained in pure culture therefrom at the end of over twelve months from its first insemination. Such a soil, impregnated with the typhoid bacillus, could be dried till it was capable of being pulverized, and the bacillus nevertheless obtained from it. The bacillus did not, however, live long in this dried soil.

"Cultivated soil is distinguished from uncultivated soil by containing on the one hand more nitrogenous organic matter

in the form of nitrates and ammonia, and on the other more partially-changed proteid substances, with the nitrogenous products of the putrefactive decomposition of proteids. When, however, the typhoid bacillus is added to a well-moistened (but not sloppy) cultivated soil, it rapidly dies, and is usually not obtainable in two days after being sown in it; and its disappearance appears to be more rapid the higher the temperature. In such a moistened soil, at a temperature of 30° to 40° C., there is a rapid growth of the bacteria proper to the soil, and it was found that it is to the antagonism of these soil bacteria that the disappearance of the typhoid bacillus is due. If the cultivated soil is not made very moist when the bacillus is added, this micro-organism can be recovered from the soil up to twelve days after it has been added to it, this being the longest time in the experiments in which the typhoid bacillus has been regained from any unsterilized cultivated soil.

"By numerous experiments I have shown that individual soil bacteria possess the power of causing the disappearance of the typhoid bacillus, not only in liquid media containing peptone broth, but in sterilized soil media. In a liquid medium, for instance, it has been shown that, after the typhoid bacillus had been growing for some time, the addition of one or other soil bacterium eventually caused its disappearance. Again, in the liquid medium in which a single soil bacterium had been growing for some time, it was found that the typhoid bacillus would not grow; or, if it had a short period of growth, that it eventually died. The medium which was found most hostile to the typhoid bacillus was a peptone broth which had undergone putrefaction on the addition of a small quantity of cultivated soil. After seven days' growth, and after the removal of soil bacteria, the addition of the particular medium of the typhoid bacillus, even in large quantities, resulted in the death of the micro organism.

"It must not be inferred that the putrefactive bacteria proved hostile to the typhoid bacillus by destroying the nitrogenous matter, and so exhausting the nutrient medium. This cannot be the sole or even chief explanation, for experiments have shown very definitely that the products of putrefaction soluble in alcohol are very powerful agents in inhibiting the growth and in destroying the vitality of the typhoid bacillus.

"As a general result of my investigations, it is to be concluded that the typhoid bacillus has commonly only a short existence in the soil; that it is destroyed by the products of the putrefactive bacteria which exist in most cultivated soils."

MOTOR CARS FOR MEDICAL MEN.

By EDWARD PHILLIPS, M.B.Durh.,
Coventry.

ABOUT twelve months ago you were good enough to publish some remarks of mine on the above subject in which I advocated a light petrol car which seemed to answer the requirements of a doctor. This car ended in disaster. I was probably too sanguine about its attainments, and I am glad the one I ordered was never delivered, although I paid a deposit on it—but this by the way. The inventor could drive it, but apparently no one else, and it was not out of its experimental stage. Then, again, its price was prohibitive for the size of the car. I shall, however, say nothing more about it until it be perfected and made more reliable.

During the past year great improvements have taken place in motor cars; the light voiturette with its single cylinder 3 h.p. engine is rapidly giving place to a heavier car, with two or more cylinder 8 or 10 h.p. motor, and other improvements too numerous to mention, with the result that although much more reliability has been attained the price has advanced accordingly, and, as far as I can see £350 or £400 is too much for the average doctor to lay out in the purchase of a motor carriage to take the place of his horse and trap.

The American steam cars seem to hold their own and have been much improved, the price is not high, and they have many points to recommend them. When I have had extended trials and found the few inconveniences complained of are not of consequence I shall feel inclined to advocate their use, on account of their freedom from noise and vibration.

Another point to be considered is the upkeep of a car. This

may be considerable, unless the owner has a mechanical mind or time to spend in acquiring the details of car construction and ascertaining what parts require adjusting or what faults should be remedied. It should be understood that every owner of a car should make himself conversant with its mechanism, so that he can either remedy the fault himself or direct others to do it for him. If he is able to do this, a well-made car can be kept in thorough working order without the necessity of sending it to the makers for trivial repairs.

I am well aware that many doctors have had motor cars, and many of these have wished they had not. Others seem to have got on fairly well, but they are in the minority. The experiences of a doctor, recorded a few weeks ago in the *Lancet*, who had had a Benz car were entertaining. It appears that he had ridden it in all weathers and roads, he had paid no attention to adjusting it, and finally it rattled like an old worn-out farm cart, probably from no other cause than the want of attention. A vehicle of this kind would hardly lend dignity to the doctor's visit, at the same time it speaks well for the type of car which ran so long without attention. It must be aggravating for a man to possess a car and find that it will not mount the hills in his district, or possibly only at a snail's pace; and yet this is the experience of not a few. The larger cars, as I have mentioned before, would face these difficulties, but they would have to be high-priced ones and of the best make.

The motor bicycle has much improved of late and can now be considered a reliable machine. At something under £50, too, it is well within the range of a doctor's purse, and I am inclined to think any one contemplating the purchase of a car in the future would do well to set up a motor bicycle in the first instance, and thus make himself conversant with the details of the petrol engine. For a long time the motor bicycle did not appeal to me, it seemed to be cumbersome and overweighted. The frame seemed to be filled up with boxes and tanks, and there was a want of simplicity in the construction, and certainly no room to carry anything else besides its mechanism. The engine was not properly silenced, and its $1\frac{1}{4}$ h.p. was insufficient for hill climbing, consequently the rider had to pedal a much heavier machine than his ordinary bicycle, and undertake an athletic performance which he would have been glad to avoid. The weight of the machine was enormous, 120 to 130 lbs. or more. This made it difficult to wheel, and if by accident it should fall the engine from its exposed position would be ruined. Then I noticed that the everyday bicycle was often converted to the motor bicycle by the engine being fixed to the frame. This did not appear to me right, for with the increase of weight and its unusual distribution, difficulty of steering would come in. A longer wheel base, however, gets over this difficulty, and the engine should be placed vertically either over or behind the bottom bracket. I mention these points to show that a motor bicycle should be constructed differently from the pedalling machine, as I consider more than half the vibration is produced in the handle-bar by attaching the engine to the front tube out of the perpendicular.

I have recently set up a motor bicycle, and can speak from experience. I have had it constructed on my own lines, so that the inside of the frame is open, like an ordinary bicycle, the engine is placed behind the bottom bracket, and the petrol tank in front of the handle-bar, so as to allow the carrying of bags or other paraphernalia required by the doctor. The wheel-base is some 6 in. longer than the safety bicycle, which makes it easier to steer. The power of the engine is $2\frac{1}{4}$ horse, thoroughly silenced, and the total weight with everything on is between 70 lb. and 80 lb.

I had no difficulty in learning to ride; the first time I mounted it I rode straight away, all my previous fears vanished, and the charm of ascending a steep hill on a bicycle at a good speed without pedalling is only appreciated by the man who is seated on the saddle.

In my opinion a motor bicycle in a practice could well take the place of two horses, and should give little or no trouble providing ordinary details were regularly attended to. The vibration and discomfort is not felt with the engine placed in the lowest possible position, and sixty or seventy miles can be accomplished with the greatest ease, the only discomfort of such a run being a dusted appearance and a healthy appetite.

MEDICAL OFFICERS DISMISSED IN HIGHLAND COUNTIES.

A PARLIAMENTARY return has recently been issued "showing the number of medical officers dismissed by parish councils in eachcrofting county during each of the seven years 1895 to 1901, name of the parish council, and the cases in which a cause of dismissal was assigned." The following details are given:—

County and Parish.	No. of Medical Officers Dismissed.	Date.	Whether Cause for Dismissal was Assigned.
Argyll—			
Kilfinichen	1	1897	No.
Caithness—			
Balkirk	1	1896	No.
Inverness—			
Ardersier	1	1902	Yes.
Barra	1	1898	No.
Croy	1	1902	Yes.
Petty	1	1902	Yes.
South Uist	1	1898	Yes.
Orkney and Shetland—			
Eday	1	1899	Yes.
Evie	1	1898	No.
Ronsay	1	1900	No.
Stronsay	1	1898	Yes.
Ross-shire—			
Kincardine	1	1896	No.
Uig	1	1899	No.
Sutherland—			
Durness	1	1898	No.
Kildonan	1	1899	No.
Loth	1	1899	No.

It is to be observed that in some instances the cause for dismissal was given; it would be interesting to know whether the cause assigned was a sufficient one and whether the medical officer was given an opportunity of defending himself. These dismissals have all taken place since the advent of parish councils. The members of these bodies in the Highlands of Scotland often consist of crofters who are by no means highly educated, and who are easily led or misled by interfering agitators. Members of the profession proposing to apply for similar appointments should hesitate before doing so, especially if in the Highlands generally or in these parishes in particular. We doubt if this list is complete, as we are under the impression that the medical officer of South Harris was dismissed from office without any cause being assigned for his dismissal.

A NEW PLAN OF CAMPAIGN AGAINST MOSQUITOS.—The sanitary authorities in New Orleans have been working to reduce the number of mosquitos and succeeded in having introduced into the City Council an ordinance requiring householders to sprinkle their cisterns with oil or cover them with wire netting so as to keep out the mosquitos in the breeding season. This, however, has been so vigorously opposed by the householders on the ground that it would cost them some 400,000 dollars and prove a great hardship for the poorer people that the Council has had to hold the ordinance in abeyance. Recently a member of the Council came forward with a plan for exterminating the mosquitos in the city by introducing among them a fatal fungus disease. He argues that the infection of mosquitos with a disease that will kill them off will cost much less and that the city can provide for the experiments instead of unloading the burden on the property holders. We agree with the *New York Medical Record*, however, in thinking that it would be well to know whether the germ of the disease which it is proposed to introduce is really fatal to mosquitos and to them only, or, like those of malaria and yellow fever, uses the insects as intermediate hosts as a preparation for attacking human beings. The plan of extermination proposed by the New Orleans health authorities is simple and efficacious, as Major Gorgas has shown in Havana, and it would be safer and in the long run more economical to trust to it than to experimentalize with methods the possible results of which are not definitely and fully known.