that they may do so the waterways must be kept clear of weeds and vegetation of all sorts.

In Africa during the recent campaign larvivorous fish were introduced from Zanzibar and placed in a lake with swampy surrounding ground, but it was soon found that until the latter was well drained by a system of shallow waterways, and these waterways kept clear of vegetation constantly, so that the fish could ascend and descend, there was no marked reduction of the anopheline larvae. In other words, "no result until conditions had been made quite unnatural."

The most striking application of the use of fish as natural enemies with beneficial results is the introduction of larvivorous fish into water tanks where anophelines are breeding and where the water cannot be treated with oil or other larvicides, as, for instance, drinking water reservoirs. But this success is due in the main to the fact that the anophelines are living in conditions not provided by Nature and wholly artificial.

One finds all this is true for the whole subject of control of insects by natural enemies, and is not merely confined to the control of mosquitoes. It was once thought in America that by the introduction of a certain foreign species of Coccinellidae ("lady-birds") that is predaceous on a woolly aphid which caused great economic loss to fruit farmers in California, a splendid means of extermination of the aphid had been hit upon. By the introduction of the "lady-birds" an unnatural condition had been set up, and all went well for a time, to the great delight of everyone concerned. All might have continued well if it had not rested with Nature to have the first and last say in the matter. Her universal demand that a balance be struck in the operation of her affairs prevailed, and in a short time the introduction of the "lady-birds" for the purpose they were to have achieved failed miserably, and the insects were ultimately, I believe, more of a curse than a blessing.

Natural enemies alone will never be a solution to the control of any animal, and it is time that we recognized that the credit given to them is a credit largely due to the advantage that is sometimes gained by man in his ingenious ability to upset the balance of Nature temporarily.

I have no faith in natural enemies as a means of control. Far greater certainty in anti-mosquito measures is always attained by the employment of purely mechanical and chemical agents with the aim at rendering conditions unsuitable to the larval development.

THE DANGER OF THE CONCRETE PILL-BOX.

By BREVET-MAJOR J. F. MAYNE,
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In the Struma Valley in 1918, a Royal Army Medical Corps officer was asked by the Assistant Director of Medical Services, 27th Division, to be present at a test in a concrete machine-gun emplacement, or "pill-box," in order to take samples of the air as soon as the firing ceased.

When in action in the open type of emplacement on former occasions, some of the gunners complained of a feeling of giddiness and faintness. It was suggested that this was due to the escape of carbon monoxide from the breach along with
the disused cartridges, and it was thought that in an unventilated pill-box which was made proof against enemy poison gas carbon monoxide would be present in such a high concentration as to be dangerous to the gunners.

The experiment was almost too successful, the Royal Army Medical Corps officer and one man being badly gassed, the three others not suffering so severely.

The emplacement was built of concrete and was shaped like a rectangle with two of its corners cut off; it was in these corner walls that the embrasures were situated.

The interior was 11 feet by 6 feet by 5 feet in height, and had a cubic capacity of less than 300 feet without allowing for the tables, guns, ammunition, etc. There was one air outlet in the roof of about five inches in diameter.

The only air inlet was through the concrete passage which was completely roofed over and had a right-angled bend near the outer door. This passage was about six feet in length.

The inner and outer doorways had blankets stretched across them and a sand bag had been stuffed into the roof ventilator. This was intentionally done to keep out enemy gas. Even the embrasures were so arranged that the guns could fire through but that enemy poison gas could not enter. In short, the pill-box was supposed to act as a gas helmet for the five men inside it.

Under ordinary conditions the personnel consisted of two men to each machine gun and one machine-gun officer; in all, five.

The following account is taken from the report of the Royal Army Medical Corps officer who was in the pill-box during the test:

"Immediately firing started a Staff officer and myself entered. The number of occupants was seven when the first belt was being fired. After a few minutes firing the machine-gun officer went out. He was followed a little later by the
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Staff officer. There was no artificial light and at first it was difficult to make things out. I seated myself between the two guns and busied myself in getting ready to take the samples of air. These were to be taken by emptying the sample bottles which had been previously filled with water.

"Suddenly No. 1 of the left-hand gun dropped back to a sitting position on his heels. I shouted, 'Are you all right?' and getting no reply, I dragged him into the passage and along to the outer door where someone took him from me.

"By this time the outer blanket had been removed and light was admitted into the corridor. I saw another man on his knees in the inner doorway in a devotional attitude. I thought at first he was praying, but I soon noticed that his hands were fixed in the position he would take up were he No. 1 of the gun crew. I seized him and dragged him along to the outer door. While I was doing this a third man rushed out of the pill-box, clambered over both of us, and made his escape.

"I can't remember much of what happened after this. My mind was centred on getting the sample bottles and fortunately I went back to seek for them. It was then that I tripped over the fourth man lying in a corner; he had been forgotten in the confusion and darkness. I hauled him out by the feet into the passage and returned for my samples. I got three out of the four bottles, stumbled into the passage and became unconscious."

The case is interesting because Dr. —— is able to describe how he felt during a convulsion caused by carbon monoxide poisoning. Convulsions are apparently rare in this type of poisoning, and there is no very full description in any of the works I have since consulted. It is also interesting because of the simplicity of the test by means of which we established the presence of carbon monoxide in the air sample, a test which could be readily used in the bedside diagnosis of cases of suspected CO poisoning, such as we got abroad during the last three or four winters when charcoal braziers were so much used in dug-outs.

"The Assistant Director Medical Services told me I had been unconscious about ten minutes. When I came round, except for a feeling of fulness in the head, I felt I had got over the worst, but about ten minutes later I began to feel a sensation of tingling and numbness creeping up my arms and legs. This was accompanied by severe muscular spasm and tremor. The adductor and opponens muscles of the thumbs were first affected, the thumbs becoming fixed across the front of the palms.

"The muscles of the forearm were next affected and in such a manner that the whole hand was flexed and inverted. The spasm gradually spread to the muscles in front of the upper arm, the arms becoming so flexed and so painful that I asked some men to pull on my hands and keep my arms stretched out at right angles to my body. This gave me great relief especially when the pectoral muscles became affected. At this time the most marked spasm was that of the muscles around the mouth. My mouth became so fixed that I could not pronounce words although I could make a noise with my voice. To those around me it must have appeared like what is described as "risus sardonicus." The muscles of the lower extremities were by this time so much contracted that my knees were flexed to the fullest extent. Curiously enough, I am unable to state whether my thighs were flexed on my abdomen. Tremor developed in my arms and legs and I was unable to keep them still. The abdominal muscles and the pectorals were the last to be affected.
and so severe was the spasm that I experienced a feeling of suffocation and I began
to think I should not recover. My respirations became very rapid and, according
to Colonel ——, my pulse, which was good at first, became weak and rapid and
almost disappeared. In a few minutes the spasm went off, and, excepting for a
feeling of fulness in the head, I felt almost normal.

"In about ten minutes I had a much milder spasm which only affected the
hands; and, finally, a third which was scarcely noticeable.

"During these spasms I was under the impression that my mind was quite clear,
but Colonel —— told me afterwards that I was certainly talking nonsense when
the convulsion was at its height; I had no nausea, and headache was never marked,
although I felt afterwards as if I had been ‘sand-bagged.’ There was a great
tendency to sleep and a feeling of weariness. I heard that two of the other victims
vomited and that some complained of headache.

"The guns were in action about fifteen minutes. The first man collapsed after
ten minutes had elapsed, and the last when he had started firing his fifth belt.

"The delay in the onset of symptoms in my case is easily explained. I entered
the pill-box a little later than the others and I was seated near the floor and
between the two guns. The others were standing and bending over the breach,
thus getting a greater concentration of the products of combustion.

"On the other hand the greater severity of my symptoms must have been due
to my getting a larger dose of gas as the result of the exertion required to remove
three unconscious men.”

This is an interesting description of an experiment which undoubtedly saved
many lives. Had an attack been made by the enemy in the Struma Valley, and
had we been using these pill-boxes, there is no doubt that within twenty minutes a
whole line of machine-guns would have been out of action, with perhaps serious
consequences.

I remember reading that after one of our successful offensives on the Western
Front, pill-boxes were found full of dead Germans untouched by shell fire. It is
likely that these were cases of carbonic oxide poisoning and were not due to shell
concussion as was said at that time.

The samples were taken to No. 25 Mobile Laboratory to be tested for the
presence of carbon monoxide. A veterinary officer kindly supplied me with a
quantity of mule’s blood. I defibrinated this and shook it up with the air sample
in order to absorb the CO as Carboxyhemoglobin. I then tested for this
substance, at the same time doing a control with normal blood, as follows:—

A five per cent watery solution of mules’ blood which had been previously
defibrinated was made up and ten cubic centimetres were introduced into the
sample bottle. The bottle was protected from light and was well shaken for some
minutes. It was then emptied into a test tube and to it were added fifteen cubic
centimetres of a twenty per cent solution of potassium ferrocyanide and two cubic
centimetres of a thirty-three per cent solution of acetic acid. On mixing a
characteristic reddish-brown precipitate was thrown down; the control gave a
distinct greyish-brown precipitate. The difference in colour between the two
precipitates disappeared very slowly.

This test definitely established the presence of carbon monoxide in the air
sample.

I took one of the remaining samples to the Central Laboratory at Salonica. Being
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told that suitable apparatus was not available I purchased some carmine in the city and attempted a colorimetric estimation in my own laboratory. I concluded that the sample was saturated to the extent of between sixty per cent and seventy per cent. This would be equivalent to about 0.3 per cent of carbon monoxide gas in the atmosphere of the "pill-box," but being so short of chemical equipment and having to improvise apparatus, I can't vouch for the accuracy of the quantitative analysis.

The qualitative test described above could easily be done at the bedside in cases of suspected CO poisoning. A cubic centimetre of the patient's blood should be taken and diluted to make a five per cent solution. The reagents, already mixed in a test tube, could be quickly added and the test completed in a few minutes. A control would not be necessary if one were familiar with the characteristic reddish-brown colour.

I desire to express my gratitude to Major-General Sir M. P. Holt, K.C.M.G., for permission to publish this article; and also to Lieutenant-Colonel Henderson, D.S.O., R.A.M.C., for his kindness and assistance when working under extremely adverse circumstances.

A SUSPENDED STRETCHER DESIGNED FOR THE CARRIAGE OF BADLY WOUNDED AND FRACTURE CASES BY MOTOR AMBULANCE.

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AND

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The evacuation of cases of fractures and gunshot wounds of the lower limbs and pelvis, and gunshot wounds of the chest and abdomen by motor ambulance is a serious problem. Some cases of this type were tried by mule litter, but at best this is a slow and tedious method, and could not be used for the removal of large numbers of cases.

The condition of the patient after a journey by motor ambulance has not been as good as desired. Even when motor ambulances are driven very slowly and over good roads there is a certain amount of vibration which cannot be avoided, and the patient rolls about in all directions and independently of the stretcher.

This new arrangement has been designed to clasp the patient to the stretcher so that he moves with the stretcher and to reduce the vibration to a minimum.

DESCRIPTION.

The apparatus consists of four broad clamps to fix the patient to the stretcher, four strong straps to suspend the stretcher in the middle of the ambulance and four straps to fasten the stretcher to the floor of the ambulance. Two strong springs are let into each strap to absorb the vibrations.

Clamps (see Diagram 1).—Each clamp consists of a plate (six inches by five inches (A) curved to the shape of the lower limb and well padded. To the plate is attached a square adjusting arm (B), six inches long, with countersunk