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MILITARY EXPLOSIVES OF TO-DAY.

Cantor Lectures by J. Young, Esq., O.B.E., delivered before the Royal Society of Arts on April 8, 15, and 22, 1918. These Lectures are published by permission of the Royal Society of Arts in anticipation of their appearance in the Society's Journal.

LECTURE III.

High Explosives for Shell Filling.

A high explosive, in order to be suitable for shell filling, must possess special qualities not necessary when it is used for other purposes, even in bombs and torpedoes. *Firstly* it must have great power, that is give much gas and heat. *Secondly* it must be insensitive enough to stand the great shock of firing, and even the impact on an armour plate, without detonating the latter, so that it may penetrate before the fuze acts. *Thirdly* it should have a high density, so that a large weight may be enclosed in the limited space, and a high velocity of detonation, so that it may have a great shattering effect. *Finally* it must detonate completely and with certainty when required, by the action of a detonator which is itself not too sensitive to stand the shock of firing.

These provisos exclude all the nitroglycerine and chlorate explosives, which are too sensitive. Also the ammonium nitrate class, such as ammonal, which are too insensitive, and require a fulminate detonator. Large fulminate detonators in a shell are unsafe, and may lead to prematures, although they have been used. The problem of detonating a shell safely and with certainty is the most difficult of all, although it has been solved fairly satisfactorily now. When a shell merely explodes (*i.e.* the filling burns) the action is so slow that the shell breaks up, a large amount of the filling is blown away unburnt, and very feeble effects are produced. Many of the lyddite shells used in the South African War behaved in this way, and except for emitting poisonous vapours did little harm to the enemy.

None of the shell H.E. possess all the desirable qualities. Those now in use have little more than half the shattering power of blasting gelatine. All are products derived from the distillation of coal.

Formerly gunpowder was the only explosive used in shells. Sprengel pointed out in 1871 that picric acid could be detonated, but no attempt was made to use it. A new epoch in shell filling was commenced in 1885 when M. Turpin showed that picric acid, when brought into a dense and homogeneous state, made a safe filling for shells, and could be detonated with tremendous shattering effect. It was adopted by the French under the name of Melinite. Later by the

British under the name of Lyddite. Other nations also adopted it under various fancy names. Still later tri-nitro-cresol, tri-nitro-toluene, and other aromatic nitro-compounds of a similar nature were introduced, and are now used.

As previously stated the basic substances required for the manufacture of these explosives are obtained from coal. When coal is distilled in the manufacture of coal gas about 16 to 20 gallons of tar are obtained from each ton. The tar is a complex mixture, and contains only about ½ lb. of benzene, toluene, and xylene, required by the explosive manufacturer. The coal gas contains about 1 per cent. by volume of the vapours of these substances, equal to about 19 lbs. per ton of coal. Formerly this was allowed to remain in the gas, and was the cause of the greater part of its luminosity when burnt in a flat burner. But on the advent of War, and the urgent demand for these hydrocarbons, it was necessary to "strip" the gas, or rob it of these constituents, a process already in use in connection with the gas from coke ovens. The result is that the normal luminosity of coal gas has decreased, but this has not much effect on its heating power and use in incandescent burners, while 13 to 20 lbs. of these mixed hydrocarbons in the form called benzol are now extracted from each ton of coal. A writer in *The Times* Engineering Supplement states that 40 millions of gallons of benzol can be obtained from the gas works of Great Britain, in addition to 60 millions already obtained from the coke ovens.

When coal tar is distilled the first portion which comes over at temperatures up to 150°C. is called the "light oil," and is crude benzol, mostly benzene and toluene.

In order to extract the hydrocarbons from coal gas it is submitted to a washing action by a solvent. At first coal tar was used, but the best solvent, and that now generally used, is the "green oil," itself a special high-boiling distillate from the tar. The oil absorbs the benzol, and is afterwards heated and allowed to flow down over a series of superposed cast-iron trays, up through which a jet of steam is passed. The steam vaporizes the hydrocarbons, which are carried away and condensed. The oil is returned to the scrubbing plant and can be used over and over again.

The composition of the benzol varies with the quality of the coal used and the process of stripping. It contains 50 to 70 per cent. of benzene, 10 to 40 per cent. of toluene, 1 to 3 per cent. of xylene, and smaller amounts of naphthalene and acids. These substances are afterwards separated by fractional distillation. At present there is a great demand for toluene, but the benzene is also used as a nitro-compound in explosives, and in a synthetic process for making phenol.

The next fraction from coal tar distillation—the "middle oil"—contains phenol and other bodies, and the later fractions—the "heavy oils"—also contain valuable compounds.

Phenol, C_6H_5OH, commonly called Carbolic Acid, is obtained from the middle oil of tar distillation. The oil is treated with caustic soda, which dissolves the phenol, cresol, and similar bodies. The solution is removed and treated with sulphuric acid, which precipitates the phenol, etc. The phenol is then separated by distillation. Pure phenol forms a mass of crystals somewhat like sugar in appearance and very different from the crude black liquid called carbolic acid used as a disinfectant. Pure phenol melts at 44°C. and boils at 182°C.

Picric Acid, $C_6H_2(NO_2)_3OH$.—When phenol is added to conc. nitric acid a violent reaction takes place, and the tri-nitro compound is formed.

$$C_6H_5(OH) + 3HNO_3 = C_6H_2(NO_2)_3OH + 3H_2O.$$

Phenol. Nitric acid. Picric acid.

Other reactions take place simultaneously, and resinous compounds are formed. In practice the manufacture takes place in two distinct stages. The methods and proportions of acid used vary considerably. The following method works well.

First the phenol is mixed with its own weight of conc. sulphuric acid, and heated to over 100°C. for some time. It combines with the acid to form phenol sulphonate, $C_6H_4OHHSO_3$.

The sulphonate is mixed with water and added, a little at a time, to conc. nitric acid. The mixture is kept cool at first, and a di-nitro is formed. Afterwards it is heated by steam for several hours until all oily matters have disappeared, and a clear yellow liquid is formed. This liquid is next allowed to cool, and crystals of picric acid are deposited. The crystals are thoroughly washed with water until free from acid, and wrung as dry as possible in a centrifugal machine. They are afterwards spread on glass tables and dried in air at about 50°C.

Picric acid forms yellow needle-shaped crystals, melting at 122.5°C. when pure. Any impurity lowers the M.P., so this is the best test for purity. It is slightly soluble in cold water, has an intensely bitter taste, and is poisonous. Its chief use formerly was as a dye for silk and wool.

When heated to about 300°C. it inflames, and burns with a hot flame, and clouds of black smoke containing free carbon. A large mass thus inflamed will burn for a while, but owing to the heat given out will probably end by detonating. A small quantity thrown on a red-hot plate flashes off ; when the plate is white-hot it may detonate. It is not very sensitive, and will only just detonate when hammered on an anvil. ½ gram of mercury fulminate will set up the detonating wave, 1 to 2 grams will detonate any quantity with certainty, even in its densest form. It can also be detonated by picrates and some other compounds less sensitive than fulminate, and these are used in shells.

Use in Shells.—The picric acid is melted in baths heated by oil or hot air and poured into the shell, which is cleaned inside and lined with a non-metallic varnish. A former is placed inside and removed when the acid sets, so as to leave a central cylindrical cavity for the exploder. In this cast form it has a density of 1.62, and is called Lyddite. In this form it is the most powerful and shattering explosive used in shells. When fully detonated it gives a cloud of black smoke, owing to its deficiency in oxygen, and this is useful for observation purposes, and also for indicating to the gunner that his shells are detonating and producing the desired effect. When the detonator fails, and the shell merely explodes, the action is slow, and much picric acid vapour is blown out, so that the smoke is yellow. The effects are very feeble, although the vapours are poisonous.

The rate of detonation is about 7,700 metres per second.

In spite of its great merits picric acid has now been largely replaced as a shell filling by tri-nitro-toluene and amatol, for the following reasons :—

Defects of Picric Acid.—First, the high melting point prevents the use of low pressure steam as a heating agent, and involves methods which constitute a certain danger. *Second,* picric acid is a true acid, and when in contact with metals, or metallic compounds such as rust, lime, plaster, lead paint, etc., forms picrates. All picrates are much more sensitive than the free acid to simple shock ; the heavier the metal the more sensitive the picrate, and lead picrate is very sensitive and powerful. If a small amount of one of these was in the shell it might be detonated by the shock of firing, and the detonation would extend to the filling causing a premature, and the destruction of the gun and detachment.

This may be illustrated by mixing some picric acid with an equal bulk of lead peroxide or red lead, and heating as much as would lie on a sixpence on a tin plate. The mixture detonates with a force only less than that of nitroglycerine and blows a hole in the plate. The mixture also detonates violently by moderate percussion on an anvil.

Hence all operations connected with the preparation of picric acid, the shell filling, and inspection of shells, must be conducted in rooms free from lime or plaster. The shells must be clean and lined with non-metallic varnish. No lead paint is used even on the outside, and no lead alloys in the fuze or anything which would come into contact with the filling.

Given that the picric acid is pure, and proper precautions have been taken, it is quite safe and the most powerful shell filling in use. It is also unaffected by high atmospheric temperatures, unlike T.N.T., and is specially suitable for tropical climates. The problem of detonating a lyddite shell safely and with certainty is now solved,

although this was not the case during the Boer War, or even in the early days of the present War.

Picrates.—When a hot saturated solution of picric acid is mixed with a solution of a metallic salt a picrate is formed, and is easily crystallized out. With potassium carbonate potassium picrate, $C_6H_2(NO_2)_3OK$ is formed. This, mixed with potassium nitrate, has been used for charging torpedo warheads. With ammonia ammonium picrate is formed, $C_6H_2(NO_2)_3ONH_4$. Forty-three parts ammonium picrate and 57 parts of potassium nitrate form picric powder. It is used as a detonator for lyddite shells.

Tri-Nitro-Cresol.—Cresol, $C_6H_4OHCH_3$ is a very similar compound to phenol, and also obtained from coal tar. When nitrated in the same way it forms a tri-nitro-cresol, $C_6H(NO_2)_3OHCH_3$. Its properties are very similar to those of picric acid, and it has been used as a shell filling. In Austria it is called Ecrasite; in France Cresylite. In France it is mixed with picric acid in order to produce a Melinite of a lower melting point.

Tri-Nitro-Toluene, $C_6H_2(NO_2)_3CH_3$.—Usually called T.N.T. This substance, at present the most important of the shell high explosives, is known in the Service as Trotyl, and is used in other countries under various fancy names, such as Tolite (France), Trilite (Spain), Tritolo (Italy), etc.

It is made by nitrating the hydrocarbon toluene, obtained from the distillation of coal as previously described. The toluene for this purpose must be pure, clear, and water white. Boiling point, 110°C. When treated with a mixture of conc. nitric and sulphuric acids it is converted successively into the mono, di, and tri-nitro compounds. The following equations represent the successive steps:—

(1). $C_6H_5CH_3+HNO_3=C_6H_4NO_2CH_3+H_2O$.
(2). $C_6H_4NO_2CH_3+HNO_3=C_6H_3(NO_2)_2CH_3+H_2O$.
(3). $C_6H_3(NO_2)_2CH_3+HNO_3=C_6H_2(NO_2)_3CH_3+H_2O$.

The sulphuric acid combines with the water liberated in the reactions.

The complete conversion into the tri-nitro is a long and difficult process, and different methods are used in different works. In some it is done in one operation by the long continued digestion with the mixed acids. In others there are two stages. First a conversion into the di-nitro, and then by a treatment with fresh acids a conversion into tri-nitro. In others the conversion is done in three stages.

In one method 1 part of toluene is run into 1.7 parts by weight of mixed acids containing 3 parts sulphuric to 2 parts of nitric. The pan is steam jacketed, and the result of the reaction is mono-nitro toluene.

When the reaction is over the acid is run off, and a fresh acid mixture run in and the pan heated. The di-nitro compound

is the result of this reaction. The di-nitro-toluene, which is a liquid at this temperature, is run off and allowed to solidify.

The di-nitro is next heated with conc. sulphuric acid until it dissolves, and then run into a pan containing one and a-half times its weight of conc. nitric acid, the mixture being kept cool by coils of lead pipe in which cold water is circulated. The mixture is next heated to about 100°C. for several hours, until gas is no longer evolved, being kept well stirred. This action converts most of it into the tri-nitro.

The conversion by a continuous process in one operation has been greatly improved recently, and is now much used.

The acids are then run off, and the still liquid substance well washed with hot water and dilute soda. When it cools it is crude, impure, tri-nitro-toluene, and melts at about 70°C.

Purification.—The crude T.N.T. made in this way contains impurities, mostly lower nitro-compounds, and isomers of the true T.N.T. The chief of these are oils at the ordinary temperature, and their presence is indicated by a lowering of the melting point. Pure T.N.T. melts at 81.5°C., but the final purification is so difficult that a product which melts at 80°C. is called "pure."

The chief objection to the presence of these oily impurities is that if the T.N.T. is used as a shell filling, either alone or in one of the higher grades of amatol, the oils have a tendency to separate, and this tendency is increased by a rise in temperature, or pressure in the shell caused by evolution of gas which sometimes occurs. The oils penetrate porous substances sometimes used to contain the exploders, and creep past the threads of screws. When they enter the gaine exploder and wet the contents these become insensitive. If the shell is fired in this condition it will fail to detonate and is a "dud." A new exploder, however, will remedy matters.

Various methods of purification are used. Treatment of the finely-divided substance with hot water in a centrifugal machine has given good results. Washing with cold alcohol is also used, as the impurities are more soluble than the pure T.N.T. For the highest grade of purity the substance is dissolved in hot alcohol and allowed to crystallize out.

Properties.—Pure T.N.T. forms yellow crystals melting at 81.5°C. They are insoluble in water. When heated to about 300°C. T.N.T. ignites and burns with a hot, but very smoky flame. When a large, mass is involved the heat given out will invariably raise the temperature to the detonating point. The disasters in East London and at Halifax are examples of this. When fires of this extent are once properly going it is hopeless to attempt to extinguish them. The most sensible thing to do is to clear the premises and let matters take their inevitable course. It is more insensitive than picric acid and very difficult to detonate by hammering. It is fully detonated by

fulminate, except when in the form of cast slabs untamped, when the addition of a little lead azide to the fulminate is necessary. Fulminate detonators are used in bombs, torpedoes, and grenades. It can also be detonated by less sensitive substances, such as picric powder and tetryl, and these are used in shells. Its density when melted and cast is 1.55—1.6.

T.N.T. is even more deficient in oxygen than picric acid. When fully detonated the gases liberated consist of CO, H_2, and N_2, and the free carbon liberated forms a thick column of black smoke—hence the name "coal boxes" and "Jack Johnstons." The velocity of detonation in its densest form is about 7,000 metres per second. The power is less than that of picric acid about in the proportion of 91:100. Owing to the inferior velocity of detonation the shattering effect (brisance) is proportionately still less, about 87:100.

Advantages of T.N.T.—The special qualities of T.N.T. which has caused it to largely replace picric acid as an explosive are as follows:—

(1). Its lower melting point renders it much safer during the melting and manipulations required in shell filling. (2). It is a neutral substance, and does not form sensitive compounds with metals and their oxides like picric acid, so no particular care is necessary in cleaning and lining the shells, lead-free paint, etc. Alkalies, however, diminish its stability and render it sensitive, so shells should not be cleaned with caustic soda. (3). It can be mixed safely with oxidizing agents, which is not the case with picric acid. As little as 10 per cent. of T.N.T. mixed with ammonium nitrate gives an explosive as powerful as the pure substance itself. The amatols thus made more than double our resources as regards high explosives.

Only the highest grade of purity is used, as crystals and pellets, in the exploders for H.E. shells. A slightly lower grade is used for filling shells and for making shell amatol. The more impure substance, with a melting point 5 or 6 degrees below normal, is used for making amatols with a high percentage of ammonium nitrate, from which the oils are less likely to separate. This is suitable for mining, bombs, grenades, etc. For shells to be used in the tropics only the purest, T.N.T. is suitable.

In shell filling the T.N.T. is melted in steam-heated pans and poured into the shell, where it sets into a yellow crystalline mass. A central cavity is left for the exploder. The detonating arrangements are mentioned later.

Amatol.—Amatol was dealt with in the first lecture. That with the higher proportions of ammonium nitrate, such as 80/20, is more difficult to detonate than when the proportion is lower, and is used in cases where fulminate detonators are used. The mixture most used in shells is 40/60. The mixing and introduction into the shell is done in various ways. Sometimes the T.N.T. is melted and the

powdered nitrate stirred in. The plastic semi-liquid mixture is poured into the shell. Sometimes it is milled cold, the powder introduced into the receptacle and stemmed (compressed), or it is compressed into slabs which are then packed in. The same exploder is used as with pure T.N.T.

When an amatol shell detonates there is only a little grey smoke, and no definite indication as to whether detonation has been complete or not. For observation purposes a packet of smoke producer is put in. The power is a little greater than that of pure T.N.T., but the velocity of detonation much less—4,000 to 4,500 metres per second, so that the local shattering effect is much less. For some purposes this is even an advantage.

Amatol is the most used of all the shell H.E. at present.

Tetra-Nitro-Methyl-Aniline, $C_6H_2(NO_2)_4NCH_3$.—This substance is known in the trade as Tetryl, and in the Service as C.E. (Composition Exploding). It is made by nitrating methyl or di-methyl aniline, substances used on the large scale in the manufacture of aniline dyes. The substance is dissolved in ten times its weight of conc. sulphuric acid, and the solution added slowly to 4½ parts of nitric acid of sp.g. 1.48. The temperature is kept between 44 and 55°C. On cooling crystals of the substance are deposited, and are washed with water. It is completely purified by crystallizing it from its solution in acetone, but inferior grades of purity from nitric acid and boiling water are in use for some purposes.

Properties.—It forms crystals of a fine yellow colour, melting at 129—130°C. It is more sensitive than picric acid, and can be detonated readily by hammering. When ignited it burns with a very hot smokeless flame, and flashes off when thrown on a red-hot plate. It is readily detonated by a very small charge of fulminate, such as that used in shell detonator caps; is very powerful, and has a velocity of detonation of over 7,000 metres per second. It is an excellent initiator of detonation in other less sensitive explosives.

Uses of Tetryl.—As tetryl (or C.E.) is an excellent initiator of detonation, and has a sensitiveness intermediate between that of fulminate and ordinary shell fillings, it is much used as an intermediary. It is used in the form of powder, grains, and compressed pellets or cylinders up to a few ounces in weight. It is sometimes added to fulminate in ordinary detonators. Compressed cylinders are used in the magazines of some fuzes. In powder, pellets, and cylinders it is used in the gaines or detonators for T.N.T. and amatol shells, with which it is very effective.

The Germans also use a compressed cylinder of C.E. as the H.E. charge for some gas shells. The uses of C.E. are extending, although it will probably prove too sensitive, as well as too expensive for use as a complete shell filling.

Tetra-Nitro-Aniline, $C_6H(NO_2)_4NH_2$.—This substance is made by

the nitration of ordinary aniline. It has great possibilities, although not adopted as a Service explosive. It is a yellowish powder which cannot be melted without decomposition. When ignited it flashes off without smoke. Its sensitiveness to blows is about the same as that of C.E. It is easily detonated by fulminate, and is said to be as powerful as pure nitroglycerine if not more so.

It is probably too sensitive to be safe for use as a shell filling, although there seems no reason why it should not be used for other purposes. It is said to have been used in shells during the present War, but not in our Service.

Hexa-Nitro-Diphenylamine $(C_6H_2(NO_2)_3)_2NH$.—This is made by nitrating diphenylamine. It is a yellow powder which does not melt. It is a powerful H.E., but rather too sensitive for a shell filling. A mixture of this with T.N.T. has been used by the Germans in aerial bombs. They also use it as H.E. in some gas grenades.

Tri-Nitro-Anisol, $C_6H_2(NO_2)_3OCH_3$.—This substance is made by the nitration of anisol, a liquid. Chemically it resembles picric acid. It has been used in shells and bombs.

Nitro-Benzenes.—Benzene also gives a series of high explosives. Di-nitro-benzene, readily formed by the action of mixed nitric and sulphuric acids on benzene, is a yellowish solid. It is too deficient in oxygen to be a good explosive in itself, but when mixed with oxidizing agents is a powerful explosive. Thus, Bellite and Roburite are mixtures of di-nitro-benzene and ammonium nitrate, the latter having a little nitro-naphthaline added as well. Bellite is used in grenades.

Tri-Nitro-Benzene, $C_6H_3(NO_2)_3$.—This is also made by the nitration of benzene with mixed nitric and sulphuric acids, but the process is a long one, and full nitration difficult, which has prevented its being used to any great extent. It resembles T.N.T., but is a more powerful explosive.

Methods of Detonation.

Initiators of Detonation.—Detonation can be set up in a H.E. charge by simple shock, and this is used in the case of percussion caps, but with large charges a combined shock and intense heat supplied by some sensitive substance is most effective in initiating detonation. The nature of the shock is important, and what is best for one H.E. is not necessarily best for another, but in all cases it must be very sharp and sudden, so as to produce momentary intense pressure. Fulminate of mercury is the most generally useful and effective substance for initiating detonation. It is also used in percussion caps for igniting powder charges.

Fulminate of Mercury, $C_2N_2O_2Hg$.—It is made by dissolving mercury in nitric acid and acting on the solution with alcohol. Various formulæ are used for its preparation. In one devised by

Chandelon, and which gives good results, 1 part by weight of mercury is dissolved in 10 parts of nitric acid of sp.g. 1.4. When the solution is at 54.5°C. it is poured into 10 parts of alcohol of sp.g. .83. As much as 7 lbs. of mercury can be used at one operation. The preparation should be done in the open air, and involves a certain amount of danger.

For preparation on the small scale for experimental purposes, the following I have never known to fail :—

Dissolve 8 grams of mercury in 70 c.c. of conc. nitric acid of sp.g. 1.45 with the aid of gentle heat. When completely dissolved, and the temperature is not above 40°C. pour into it 90 c.c. of alcohol of sp.g. .87. All flames near should be extinguished. Next heat the beaker containing the mixture in a hot-water bath until bubbles begin to form and a reaction begins. The reaction is violent, and dense white fumes containing various nitro compounds are given off. When the reaction is nearly over fill the beaker with water. The fulminate will fall to the bottom. It should be filtered off and washed free from acid. It can be dried quickly by first washing with alcohol until free from water, and then with ether. In a few minutes it will be ready for use.

Fulminate is a crystalline powder, white when pure, but usually grey owing to some free mercury. It is the most sensitive explosive employed practically. Detonates easily between iron surfaces, can be detonated between lead and iron, but not between surfaces of wood. It is quite safe to keep when wet. It is usually dried by exposure to warm air (104°F.), and when dry, owing to its sensitiveness kept in packets of 120 grains as a maximum. When pure it will stand a high pressure, but with the least admixture of grit of any kind a slight pressure will explode it. It is insoluble in cold water and only slightly so in hot, 1 part in 130 of water.

When ignited in the open it burns with a very sudden flash, and slight report. But when even slightly enclosed, as in a thin copper tube, and ignited, the first few grains which burn produce sufficient pressure to detonate the remainder. It is this property which makes it of such efficacy in detonating other explosives. Its density is 4.4, and when highly compressed its detonation gives, probably, a higher instantaneous pressure than any other substance in use, except, perhaps, the azides.

Whether exploded or detonated the products are carbon monoxide, nitrogen, and mercury. $C_2N_2O_2Hg = 2CO + N_2 + Hg + 114{,}000$ cals. If some fulminate be sprinkled on a clean glass plate, and ignited, the mercury is deposited on the plate and forms a mirror, which makes a pretty experiment.

The flash from fulminate is too sudden to ignite gunpowder, which is simply blown away. When required in percussion caps for the ignition of cartridges it is mixed with potassium chlorate and

antimony sulphide. This composition acts more slowly and gives a long, hot flame. Sometimes ground glass is added to increase the sensitiveness to percussion.

The Azides, derived from hydrazoic acid, N_3H, are even more effective initiators of detonation than fulminate. Where .25 grams of fulminate is the minimum which will detonate T.N.T. .05 grams of lead azide will suffice, and where mercury fulminate alone fails with cast slabs of T.N.T. untamped, an addition of lead azide succeeds perfectly. Lead azide, N_6Pb, is used to some extent at present, either alone or in combination with fulminate. Fulminate, however, is the standard.

The uses of Tetryl, Picric Powder, and some others as initiators of detonation will be referred to later.

Detonators.—Two varieties are in use, electric and non-electric. Non-electric detonators are thin solid-drawn copper tubes containing a charge of fulminate. The fulminate is compressed by about 60 kilos. on each, which gives it a density of about 2.2. The upper half of the tube is left empty for the insertion of the fuze, safety or instantaneous as the case may be, and is closed by a paper cap until required for use. The detonators are made in various sizes numbered from 1 to 10, and the numbers are common to all countries. No. 8, most used for military operations, is 55 mm. in length and 6 mm. diameter, and contains 2 grams of fulminate, No. 5, used for some hand grenades, is 30 mm. long and 6 mm. in diameter, and contains .8 grams.

Electric detonators are constructed so that they can be fired from a distance by aid of an electric current. The construction varies, but the diagram shows the principle. The lower part of the tube (which may be solid drawn, or the end merely sealed with a plug of shellac) contains the fulminate. Copper leads are inserted into the upper end, and these are bridged over by a fine wire of platinum or platinum-iridium alloy. The bridge is wrapped round with fluffy dry gun-cotton, or imbedded in a bead of priming composition, and the leads are sealed in position with sulphur or other insulator. When an electric current is passed through it the bridge fuzes, ignites the guncotton, and this fires the fulminate. That most used in our land Service has a bridge $\frac{1}{4}$-in. long which requires .8 ampere to fuze it, and contains 43 grains of fulminate.

The advantages of the electric detonator are many. It can be connected by cables to a point from which it can be fired with perfect safety. When once connected up it can be tested by a small current, and if necessary be left for months, yet be fired at a moment's notice. Also, a number of detonators in charges can be connected to a single firing point and fired simultaneously. Great use is made of this where a number of land mines have to be fired in one operation. The

current is usually supplied by the Hand Dynamo Exploder, where not more than—say 15—detonators have to be fired at once. For larger numbers a dynamo, or battery of accumulators, is used for certainty.

For hasty demolitions under stress of an enemy advance the ordinary detonator and fuze are used.

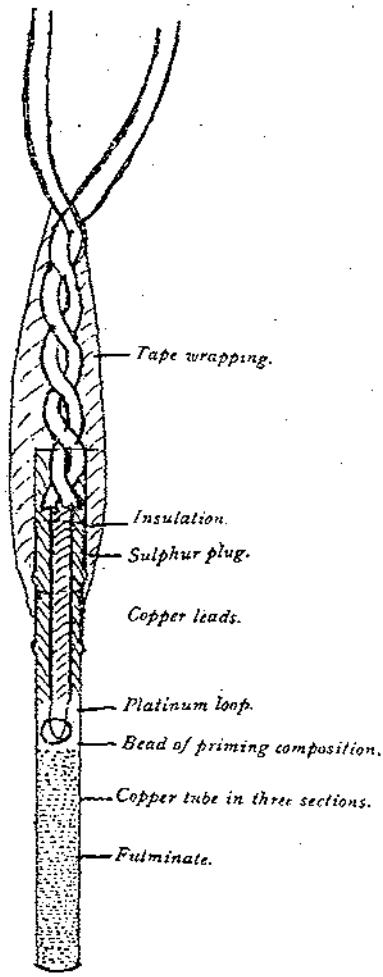


FIG. 1.—*Electric Detonator.*

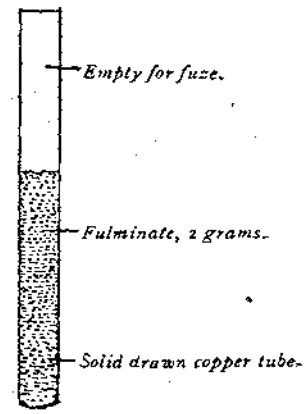


FIG. 2.—*Non-Electric Detonator, No. 8.*

Detonation of Charges of H.E.—When the charge to be detonated is not liable to be submitted to any sudden shock, which is the case with land mines, aeroplane and trench mortar bombs, grenades, and even torpedoes—in fact all except shells to be fired from a gun, the

problem is simple. The charge is built up in position, the cartridges being packed in their original cases in land mines. In the case of grenades, bombs, etc., a detonator is inserted and a piece of safety fuze inserted in the detonator. With torpedoes a specially large detonator to be fired by percussion is used. Aeroplane bombs are also fired by percussion. For land mines with large charges amounting to tons it is advisable to use several detonators distributed throughout the mass, if this is of one of the slower acting ammonium nitrate explosives, and even primers of blasting gelatine or dynamite may assist. The charge is properly tamped, openings being left for the insertion of the detonators. When fulminate detonators are used in this way failures are very rare.

Detonation of H.E. Shells.—The problem of the detonation of a H.E. shell is much more difficult. The shell is subjected to an enormous shock in the act of firing, the detonating charge must be in intimate contact with the filling, and if fulminate were used there would be a great risk of this being detonated by the shock. This would detonate the shell in the gun, the gun would be destroyed and probably the detachment.

On the other hand, when a less sensitive detonating charge is used, which at present means a less efficient one, there is a risk of failure. The shell may merely explode, with very feeble effect. This was frequently the case during the Boer War. The problem seems to have been solved by the introduction of the gaine method.

The Gaine.—The gaine is a metal tube screwed to the fuze which enters a cavity in the filling and makes good contact with it. This is very necessary. It contains a chain of substances, about four, of decreasing order of sensitiveness starting from the fuze, and increasing order of violence of explosion Use is made of the fact that a substance in powder is more easily detonated than when in compressed pellets, and pellets than a cast dense solid. The actual substances vary with the shell and nature of the filling, but always start with gunpowder, which is very certain in action. Thus we may suppose the chain to consist of—(1). Gunpowder. (2). Tetryl powder. (3). Tetryl pellets. (4). T.N.T. pellets.

The action is started by a fulminate cap in the fuze, which fires the gunpowder. This partially explodes and partially detonates No. 2, which detonates No. 3 which in turn detonates No. 4, and this detonates the main filling. With fuze and gaine in good condition there are very few failures now.

The detonation of large shells is a simpler matter, as the walls are thicker and provide more efficient tamping. These are still often detonated by a single exploder charge of picric powder (for lyddite) in a recess in the filling.

The figure shows diagrammatically the arrangement of a shell with a gaine detonator. No details of construction are given.

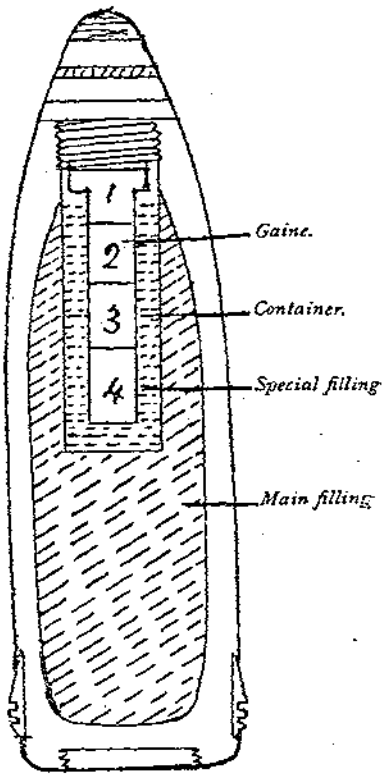


FIG. 3.—*H.E. Shell with Gaine.*

TESTS FOR EXPLOSIVES.

A large number of tests are applied to explosives for commercial use. Only an outline of those most important from the military standpoint can be given here.

(1). *Sensitiveness to Shocks.*—This is important with regard to explosives which have to be handled within reach of enemy bullets. It is usually tested by a *falling-weight apparatus.* About one-tenth of a gram of the explosive is placed on a small anvil, and a hard steel rod placed on top. A weight controlled by guide rods is allowed to fall on the rod, and the minimum height required to explode the charge is a measure of its sensitiveness.

According to this test the chief military explosives can be arranged in the following order of sensitiveness :—

Mercury fulminate.	Tetryl (C.E.).
Nitroglycerine (liquid).	Picric Acid.
Lead, copper, and iron picrates.	Tri-nitro-toluene.
Dynamite No. 1.	Ammonium Picrate.
Blasting gelatine.	Wet Guncotton.
Dry Guncotton.	Gunpowder.
Smokeless Powders (vary).	Ammonium Nitrate Explosives.
Chlorate Explosives (mining).	

(2). *Brisance* (local shattering effect).—For this test a cartridge of the explosive is placed on top of a steel piston, which rests on top of a copper cylinder placed on an anvil. The cartridge is detonated from the top by a standard detonator, and the shortening of the cylinder is a measure of the brisance. The Military Engineer has his own special tests, such as finding what weight of the explosvie will cut a standard steel rail, untamped.

As previously explained the shattering effect is proportional to "Vol. of gas × Heat × Velocity of detonation." The following gives the order for the most important explosives :—

Blasting Gelatine.	Guncotton.
Dynamite No. 1.	Mercury fulminate.
Picric Acid.	Chlorate Explosives.
Tri-nitro-toluene.	Gunpowder.

(3). *Power.*—As previously explained the powers of different explosives can be compared by exploding a weighed charge of each in a modified bomb calorimeter, and measuring the volume of gas produced and quantity of heat evolved. The results are quite reliable. The best practical direct method of comparing powers is the "Trauzl lead-block test."

Trauzl Lead-Block Test.—A cylinder of lead 200 mm. in height and diameter has a hole 25 mm. diameter and 125 mm. deep bored in it. A charge of 10 grams of the explosive to be tested is put in, and a detonator inserted. The charge is tamped by sand and detonated. The increased volume of the hole is afterwards measured, and is proportional to the power of the explosive. The results are in fair agreement with the bomb-calorimeter method. Results are, however, really only comparable with explosives which have approximately the same rate of detonation, and discrepancies are explained in this way.

(4). *Test for Stability.*—This is a very important test. All explosives of the organic nitrate class, such as nitroglycerine, nitrocellulose, and mixtures containing them, which includes all the smokeless powders, are decomposing from the day they are made. The decomposition proceeds at an accelerated rate, and when it has proceeded to a certain point the heat given out may lead to a disastrous explosion where the explosive is stored in large quantities. This has frequently happened.

Several tests have been devised, some very elaborate, but that most generally useful is the original Abel's Heat Test. It is applicable to all explosives of the organic nitrate class, but not to aromatic compounds such as T.N.T., picric acid, etc. It depends on the following established facts :—

(1). During decomposition these organic nitrates give off nitrogen peroxide, NO_2, and a piece of paper treated with potassium iodide

and starch is an extremely delicate test for NO_2, which stains it brown or blue.

(2). An increase of temperature accelerates the rate of decomposition. Roughly, guncotton decomposes as much in one minute at 77°C. as in two years in a store at say 15°C.

A standardized apparatus is used for the test, which must be carried out in a specified manner if results by different operators are to be comparable. Briefly it is done as follows :—

A small quantity of the finely divided explosive (1.6 grams for cordite, 1.3 grams for guncotton) is put into a test tube fitted with a rubber cork through which passes a glass rod ending in a platinum wire with a hook at the end. A piece of the test paper with its lower half moistened with dilute glycerine is suspended from the hook so as to hang a short distance above the explosive. The tube is immersed in a water bath kept at a constant temperature (82.2°C. for cordite, 76.6°C. for guncotton), and the time necessary to produce a brown line on the paper is noted, and is a measure of the stability.

This must be at least 10 minutes for guncotton, and 30 minutes for new cordite. Decomposition is so rapid in hot climates that 5 minutes will pass a cordite in India. The figure shows the appearance of the test tube when ready for the test.

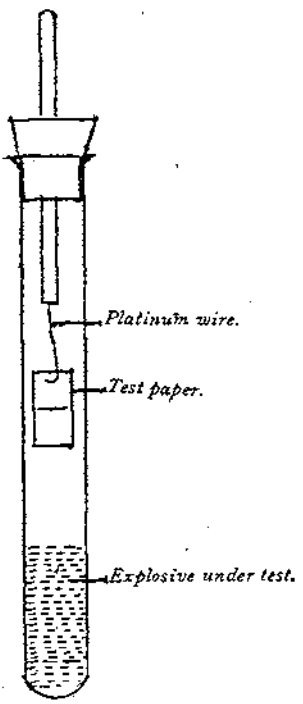


FIG. 4.—*Abel's Heat Test.*

RATE OF DETONATION.—This is very important in the case of high explosives, but the apparatus is too elaborate to be described here. Dautriche's comparison method, in which the rate of detonation of a cartridge of the explosive is compared with that of a measured length of detonating fuze filled with T.N.T. having a rate of 6,000 metres per second is most useful. It will be found described in late standard Text Books, such as Marshall's *Explosives*.

Concluding Remarks.—From the foregoing it will be seen that although enormous work and research is being done, and new mixtures and modifications of old ones are making their appearance every day, there have been no startling discoveries in explosives during recent years. Practically the same explosives are being used by the different nations at war, and none can claim any advantage in that respect.

Also, there does not appear to be much prospect of obtaining more powerful propellants while proceeding on the present lines, as power depends more on heat than on gas, and high temperatures produce excessive erosion of the rifling. With regard to H.E. for shell filling there is still a wide margin, as T.N.T. has only about half the shattering power of blasting gelatine. It should be possible to find some compound equal in power to the latter, and sufficiently insensitive. Possibly a mixture of some substance like tetra-nitro-aniline with a small quantity of another which would reduce its sensitiveness would answer.

DESTRUCTION OF TWO REINFORCED CONCRETE "PILL BOXES" ON MARCH 12th, 1918.

By LIEUT. R. SWIRE, 73rd (Field) Co., R.E.

THE two pill boxes in question were made by the Germans some time before April, 1917. They were in a very dominating position and were no use to us as they were dug into the forward slope of a hill and could not, therefore, be used for firing in the opposite direction. As they would have been most valuable to the enemy in the event of an advance it was determined to destroy them. The explosive used was blastine, fired electrically.

Pill Box No. 1.—For this pill box 400 lbs. of blastine were used, in two charges each of 200 lbs. fired simultaneously. First of all a sandbag wall two headers thick was built inside the pill box close up against the concrete, and stretching from Point A to Point B (see sketch). The top of the wall was about 9 in. below the bottom of the loopholes. On this wall a continuous charge of 200 lbs. of blastine was laid, in contact with the concrete, making a layer of explosive 10 ft. long by 1 ft. wide by 9 in. high. Two cartridges of blastine in this layer were opened, half the explosive poured out, a guncotton primer and electric detonator inserted, the explosive poured back and the cartridges fastened up again. This ensured that the detonators were thoroughly buried in the explosive.

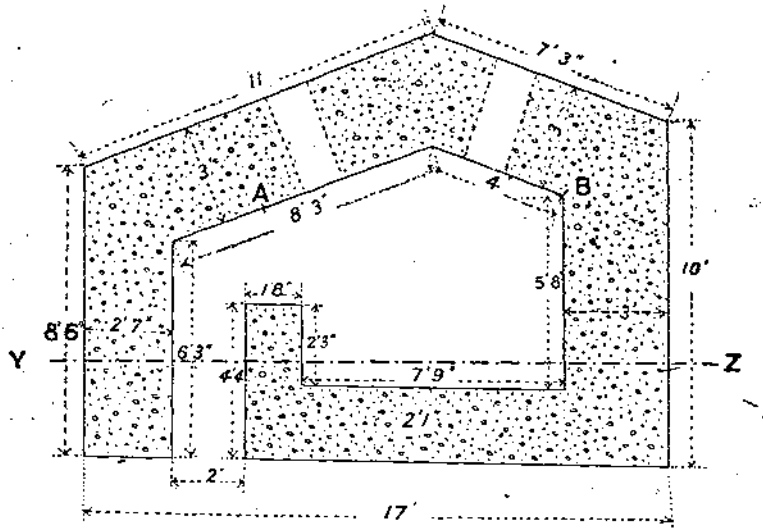
More sandbags were then added on the top of and behind the explosive, carrying the wall up to within 10 in. of the ceiling. The layer of explosive not being so wide as the sandbag wall, it was possible to build it well in, the appearance from inside the pill box being that of a solid sandbag wall with the leads running into it.

The second charge was now laid on the top of the sandbag wall in an exactly similar way to the first, up against the roof, but was not tamped. The idea of this was to produce a great lifting effect on the roof while the front would be blown out by the first charge. The sides were unimportant as they would not be of any assistance to the enemy if left standing. The top charge had also two detonators, and all four detonators were connected in series. Finally the loopholes and doorway were blocked up with sandbags rammed tightly in so that there was no escape for the gases of the explosion.

In each charge five cartridges were opened and the contents poured over the rest. This was to ensure good contact between every

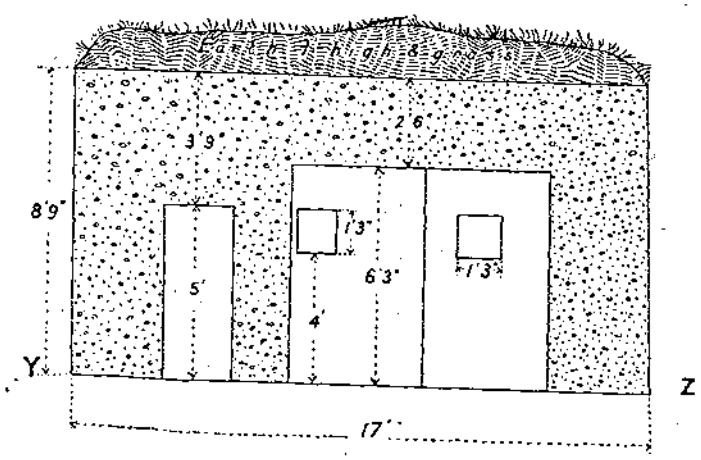
part of the charge as it was difficult to fit in the cylindrical cartridges and make sure of their all touching. In addition several primers and detonators were scattered about in each charge, but were not connected to the leads.

PILL BOX No 1.



PLAN

SECTIONAL ELEVATION THROUGH Y.Z



The charges were fired with an electric exploder from a cellar at a distance of 150 yards. The explosion was very soft, making very little noise but a certain amount of rumble. The result was the complete destruction of the pill box, not a vestige being left except a few pieces (presumably part of the foundations) in the bottom of a large crater. Pieces were scattered to a great distance, but in no

case was a piece observed larger than an ordinary brick. Unfortunately it was not possible to find out the nature of the reinforcing as the demolition had to be done in one day and there was therefore no time to chip away the concrete and expose the reinforcing. I had hoped to be able to see something of it after the explosion, but nothing was left at all. For the same reasons nothing could be found out about the foundations.

Pill Box No. 2.—This was a fairly large work, with three chambers opening off a passage, and two observation posts with narrow slits for observers. In the roof of the observation posts there was a circular hole 1 ft. diameter covered by a movable iron plate. This must have been either for a periscope or for a disappearing machine gun. The observation posts were lined with 1-in. iron or steel plates and covered with concrete 1 ft. thick on the roof and 2 ft. thick round the sides. This raised portion of the roof (see *Fig.* 2) extended from the back edge of the pill box to the shoulder of the observation post, that is from A to B (*Fig.* 1). The whole pill box was underground except the roofs of the observation posts, ground level being about 3 in. below the observing slits.

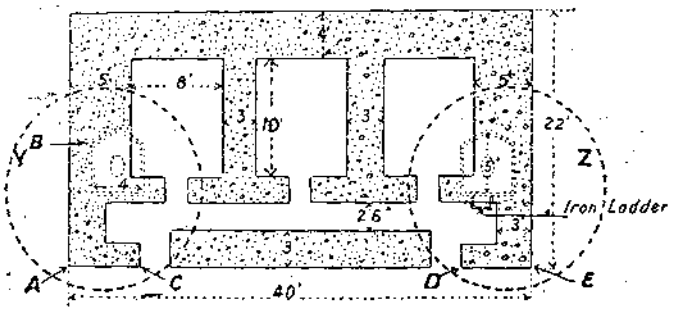
It was decided to destroy the observation posts and to leave the chambers, as it would have taken a very big charge to destroy the whole building and there was not very much point in doing so. Blastine was the explosive employed, 100 lbs. being used in each observation post. First sandbags were built up on the floor of these posts to a height of 2 ft., then the explosive was laid round the walls, making a layer about a foot wide and 9 in. high. The two diagrams below explain the method of laying. Sandbags were afterwards built up behind and on the top of the explosive, completely filling up the observation posts.

As in Pill Box No. 1, some of the cartridges in each charge were opened and their contents poured over the remainder of the charge, to ensure good contact. Detonators and primers were also scattered about in the charge, and two electric detonators in each charge were connected to the leads, all four detonators in series.

The charges were fired from the same cellar as in the case of Pill Box No. 1; the resultant damage is shown approximately by the red dotted circles in *Figs.* 1 and 2. The observation posts were completely demolished, also the portions of wall AC and DE. The roofs of the two end chambers were badly broken in, and there was much more damage done downwards than had been expected. It is possible that the pill box was built not as shown in *Fig.* 2 but with an empty space underneath the observation posts to economize material. This, of course, would not show while the pill box was standing and would account for the large amount of damage done to apparently very thick concrete. Presumably the reason why there was so much damage done backwards, completely demolishing part

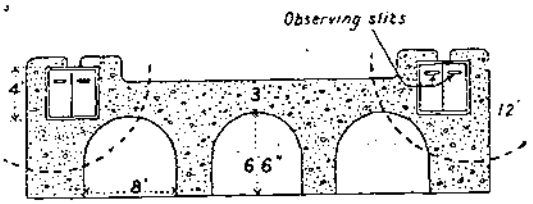
of the back wall was that the whole pill box was underground and therefore the front was immensely strong. The back was not up against any earth at all, a trench having been dug along it to admit of entrance.

PILL BOX No 2.



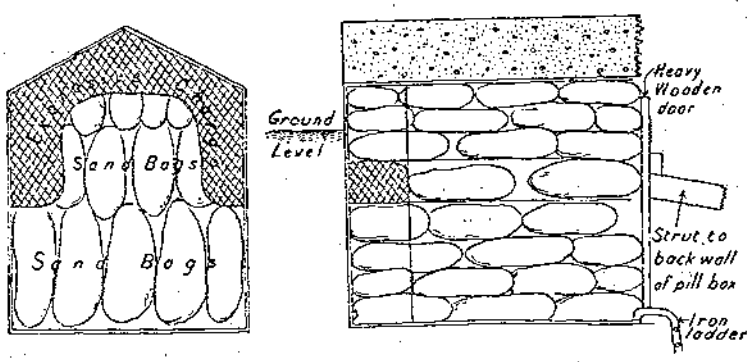
PLAN

FIG. 1.



SECTIONAL ELEVATION THROUGH Y.Z.

FIG. 2.



HORIZONTAL SECTION VERTICAL SECTION (Front to rear)

The work on these two pill boxes took six men about eight hours to complete. There was a great deal of heavy work in filling sandbags, etc., which could have been done quite well by unskilled labour. Apart from the actual laying of the charge the only work at all skilled was the sandbagging and the strutting up of the charges in Pill Box No. 2.

THE DEFENCES OF DARDANELLES.

A REPORT WRITTEN IN 1799.

IN compliance with your Orders, I have in conjunction with Major Holloway, Commanding Royal Engineer, visited and examined the Defences, Batteries, Magazines, etc., at the Dardanelles.

When we consider the important and great national object they have to perform, nothing less than the preventing an Enemy's Fleet, from forcing a Passage, to the Capital of the Ottoman Empire; which would never be attempted, or undertaken, but by a force of great magnitude; we do not think the present works, were calculated upon so extensive a plan, as the momentous object entitles them to; and much fear, would not, under the present improved State of the Art of War, be found adequate to the great purpose for which they were built.

The Castles at the Entrance of the Dardanelles (Cumealli, on the Asia Side; and Setillahar on the Europe) are as well situated as the width of the Channel will admit of, being 4087 yards across, a distance rather too great for Artillery, to act with precision, nevertheless, an Enemy should be met as early as possible, and impeded step by step; we therefore think it was judicious to take up these two points.

The next point taken up, is for a Battery of Nineteen Guns, called Eskisar, on a high Cliff on the Europe side, to the Eastward of the Castle; and although a long and plunging range, will bring on with the Castle of Setillahar, an intersecting fire upon the entrance of the Straits; it should therefore be maintained and armed with Ten or Twelve good Guns, 24 Pounders: The Channel from this widens so much, that no further opposition can be made, until the point de Barbier presents itself, where a Battery for Six heavy Guns, should be made, as well as one of the same number and nature on the opposite Shore; these two Batteries would establish a good and certain intersecting Fire; and being prepared for firing red hot Shot, which all Sea Batteries should be, would impede the progress of an Enemy's Fleet, and make them very cautious how they approached the Upper Castles, Sultania, and Kelerbahar; these Castles are situated upon the narrowest part of the Dardanelles, but the position of the Castle of Kiletbahar, is not so well chosen as it might have been, had it been placed on the point to the westward of it, where it would have had a much better command of the Channel: it

behoves the Turkish Government seriously to exert every effort and means in their power to improve and strengthen these Castles, by all the power of art and science.

For if an Enemy once passes this Grand Barrier, there would remain no obstacle whatever of sufficient importance to check or prevent his accomplishing the Object of his Design, and making his way to Constantinople.

In obedience to your directions, I shall state the various defects at present existing in the four Castles and Batteries, and recommend such alterations and improvements in the Artillery Department, as would be most advisable in my opinion to be adopted for the better security and defence of the Dardanelles.

The Guns, a few excepted, appear to me unserviceable, being flawed, full of cavities, some cracked, and pieces blown out, of others.

The Metal does not appear to be of a good quality, well purified, not properly proportioned, being very brittle, and liable to constant accidents upon firing; an instance of which we were witnesses to, on the Island of Senedoes; the Guns, are most of them at present placed in front of the Great Guns or Pierriers, where in case of an attack, they would be perfectly useless. The Gun Carriages are in general too large for the Guns mounted upon them, very heavy and ill constructed for narrow Ramparts; without Beds, Quoins, Springs, Saddles, etc. The shot lay about in all directions, mixed and unpiled; are old coroded, very rugged and rough. The Magazines, I have seen, require an admission of Air, and Copper doors, otherwise are good. Powder and every description of Ordnance Stores extremely deficient.

The chief opposition, and upon which great dependance seems to be placed at present, to an Enemy's passing the Castles, are the enormous large guns or Pierriers; some of which are nearly thirty Inches in Diameter; they lay upon Skids under Archways, made in the Curtains and Bastions, cannot consequently be haversed, and only fired upon a moving object, when it happens to come opposite to their direction, it must however be allowed, that if One of these large Stone Shot, which they project, was to strike a vessel it would probably be her destruction, but as many of them break into pieces after leaving the Guns, they are of course very uncertain in their effect, and not to be alone depended upon; but as it may be advisiable to make use of them it is proposed to let them remain under the Archways, in the Curtains, next the Channel, with the alterations proposed by Major Holloway, as there may be places for them; but must observe that the principle approved and adopted of late Years, for Sea Batteries, has been to endeavour by every possible means, to move the Guns with facility by Traversing Carriages, or platforms, so as to be enabled to follow the direction of a Vessel as she sails, and to fire upon the same object as often as

possible. A Mixture of a variety of different Natures of Ordnance, being even among the best established Artillery liable to create confusion and occasion mistakes, particularly, at a time when every precaution should be taken to guard against it, that of an attack, to avoid which, I beg leave to recommend to the Turkish Government to arm the Old and New proposed works in the four Castles, with only three kinds of ordnance; viz. 24, 18 and 12 Pounders, on Guns nearly answering to those Calibers, in the number and manner stated in the returns numbered 1, 2, 3, 4; to which I have added a list of the requisite quantity of Ordnance Stores, for each nature of Ordnance, calculating upon 150 Round shot, and 20 Case or Grape per Gun for the 24 and 18 Pounders; and 50 Round Shot, and 20 of Case or Grape for the 12 Pounders Gun.

The Guns should be mounted upon Carriages constructed on the principle of our Garrison Carriage; they will be better adapted to their narrow Ramparts, require fewer Men to serve them, and be easier worked.

Such Howitzers as are in my return proposed for the Castles, should be mounted upon proper Carriages made expressly for them:

The Ammunition proposed for them is at the rate of 200 shells per Howitzer; and the same number of shells, etc., are proposed for the Sea Service Mortar; two of which should be in each Castle.

As it is not to be supposed that these Castles, will at any time be attacked both by sea and Land together; I have regulated the proposed number of Artillery Men, by the number and nature of the heavy Ordnance, which if kept up in time of war, will I should suppose be fully adequate to the Service of the Guns on the Castles at all times.

The Number of Non-Commissioned Officers, and Gunners, required for the different Castles, and Batteries will be as follows, viz. :—

	Non-Commissioned Officers.	Gunners.	Total.
Cumealli	20	203	223
Setillahar	27	270	297
Sultania	30	334	364
Kiletbahar	15	156	171
Point de Barbier and opposite Battery	6	60	66
Equisar Battery	6	60	66
	104	1083	1187

The Number of Artillery Men and quantity of Ammunition, etc., for the Peirriers are not included in this Statement, as their exact number is not yet fixed upon.

The next object of great importance, and strongly to be recommended for the Defence and Security of the Dardanelles, is the Establishment of a Regular Corps of Artillery for the Service of the above mentioned Ordnance, properly Officered, with a sufficient number of Non-Commissioned Officers; This corps should be well trained, in the exercises of the Guns, Howitzers, and Mortars; as well as instructed in every Branch of Artillery, necessary to make them good and expert Gunners; They should be paid and Clothed by the Government, and that regularly; Barracks or Quarters should be provided for them, and their daily rate of subsistence should be sufficient to maintain them; The pay of the Non-Commissioned Officers should be more than that of the Private or Gunner.

The Ordnance Stores should be put under the charge of a Storekeeper, who is to be answerable and accountable to the Government for the Stores; he should have a Clerk, and be allowed a sufficient number of labourers to enable him to keep the Stores in good regular order.

He should keep an exact account of all the Stores he receives, and Issues on account of the Service, and send a monthly state of them to the Government. A second person as a Check upon the Storekeeper should also be appointed, as Clerk of the Cheque, who is to have at all times free access to the Magazines and Stores; is also to keep an account of all Stores received and Issued jointly with the Storekeeper, and to report to the Government any misapplication of them that may come to his knowledge. Thirty rounds of ammunition per Gun should be kept constantly ready and lodged in Expence Magazines near the several Batteries; Kilns or Turmaus for heaving Shot should be erected.

As Iron Ordnance is infinitely preferable to Brass, and generally used in our Garrisons, being more durable and not liable to be injured by firing in the manner that Brass is; particularly if the metal is not sufficiently hard and tenacious; I therefore recommend Iron Guns for the Castles and Batteries; Should the Sublime Porte judge it prefer to adopt any part of the proposed alterations, and improvements.

About a mile and a half to the Westward of the Castle of Setillahar, is a Battery for nine Guns, in which there are at present 5 Light Field Pieces; these should be removed, and the Battery armed with heavy Guns, if it is intended that this Battery should remain; One placed on a point between it and the Castle, would answer the double purpose of forcing an Enemy's Fleet to keep a respectable Offing and be a greater protection to the Castle.

When Major Holloway has completed the plans, and projects, for the intended works in the rear of the Castles of Setillahar and Kiletbahar; I shall have the honour of laying before you some further

Remarks, and Observations, as well as the necessary Returns of the Ordnance and Stores for them, and the Batteries.

M. HOPE.
Commanding British Royal Artillery and Major.

BRIG.-GENERAL KOEHLER.
Comdg. His Brittanic Majesty's Forces.

BOUYOUKELERE, 21st Sept. 1799.

The undermentioned Articles will be required for examining, and removing the different Natures of Ordnance in the Castles, at the Dardanelles, etc. :—

Viz. :—

Guns Complete	4
Sling Carts	2
Truck Carts	2
Sledge Carts	2
Searchers	4
Relievers	4
Prickers	4
Iron Crows	6
Crab Capstans	2
Spars	6
Skids, large	12
do. small	12
Shot Guager sets	4
Men's Harness sets	24
Coils of different sized rope	3
Blocks and Tackle	
3-in. Planks	12
Hand pikes { large / small	24

Such Pickaxes, Shovels, etc., as may be wanted, can be borrowed from the Engineers department. I have the honour to be, Sir

M. HOPE.
Comdg. R. Artillery, and Major.

Return of the number and Nature of Ordnance for the proposed Tower and Battery, on the small Island off Tenedos :—

24 Pounders mounted on Garrison Carriages Complete	15
Stores for Ditto.	
Handspikes	60
Spunges	15
Saddles	8

Wadhooks	8
Linstocks	8
Tampeous	15
Aprons of lead	15
Powder Horns and wires	8
Puncher for Vents	8
Spikes	15
Claw hammers	6
Shot: Round	1500
Shot: Case or Grape	300
Cartridges, Empty	1900
Wads	3800
5½ inch Shells, fixed	100
Tongs and bearers	4
Water Buckets	3
Port-fire, dozens	2
Portfire sticks	4
Powders, Barrels 90th	170
Budge Barrels	1
Powder Measured from 1st to 4th Sept.	1
Slow Match, cwts.	2
Tube	500
Tube boxes	4
Tanned Hides	2
Hair Cloths	2
Wadmill ditto	2
Lanthorns: Muscovy	2
Lanthorns: Dark	2
Sheepskins	6
Spunge Tacks	600
Tarred Marline strains	6
Guns complete	2
Portfire Clippers	4

M. HOPE.

Comdg. Royal B. Artillery, and Major.

REVIEWS.

L'ŒUVRE ET LE PRESTIGE DE LORD KITCHENER.

(Plon-Nourrit et Cie, 8, rue Garancière, Paris).

THE Librairie Plon has recently published a brochure entitled *L'Œuvre et le Prestige de Lord Kitchener*, by M. Henry D. Davray (price 2 francs). M. Paul Cambon, the French Ambassador at the Court of St. James, in a Preface to the little volume, states that he had known the late Field Marshal for many years; since the War, he had naturally been brought into very close contact with this great Public Servant, owing to the multitudinous questions which he had had to discuss with him on behalf of his own Government. M. Cambon tells us that the relationship thus established between the distinguished Soldier-Statesman and himself disclosed to him the fact that Lord Kitchener possessed qualities of the heart which the general public little suspected in the man of cold, and almost austere, exterior, whose figure had become so familiar to them in recent years. In the degree that the dead Field Marshal was reserved and secretive in his relationship with those whose true characters were still a sealed book to him, in that same degree also was he frank and open with those who experience had taught him were worthy of his confidence.

"Lord Kitchener," says M. Cambon, "was also one of the most loyal of France's friends. He had never entertained any doubt that on the day whereon France might be threatened by an act of unjustifiable aggression, on that day she would find Great Britain ranged upon her side."

M. Davray, in the opening pages of the brochure, refers to the dismay caused in England by the sudden and tragic end of the great War Minister, to whom it is that Great Britain really owes the wonderful expansion of her "contemptible little Army" of 1914 into that giant army portions whereof are fighting in Flanders, France, Italy, Greece, Palestine and Mesopotamia to-day.

M. Davray reminds us that Lord Kitchener commenced his active military career in the French Army at a time when that Army was engaged in the defence of "*La Patrie*" against the same enemy that is assailing her to-day. Had the dead Field Marshal found a soldier's grave in one or other of the corners of the world wherein he had commanded troops, the appropriateness of such an end would have been widely recognized. Lord Kitchener, it appears, let it be understood that his own view was that he would die, under conditions of peace, quietly in his bed. Destiny had provided, however, for his exit from the field of his labours under strikingly tragic circumstances; the great soldier met with a sailor's death at a time when he was engaged on national duty of

the highest diplomatic importance. To-day, under conditions which in their similitude resemble an anastrophe, the creator of Great Britain's most powerful Army of all time and its great Chief is at rest with a British man-of-war for his coffin; his grave is the bed of the ocean over whose deep and wide waters Britannia's trident continues to maintain its redoubtable sway.

M. Davray very briefly sketches Lord Kitchener's wonderful career, and incidentally provides an explanation to account for the remarkable confidence placed in him by the public. In examining the circumstances under which the late Field Marshal had reached the very high station which he occupied, the man-in-the-street learnt that his Lordship's success in life lay in the possession by him of that quality which represents the exemplication of efficiency in the highest state of development; he learnt further that his Lordship had always insisted on as high a standard of competence being attained, in their respective spheres, by his subordinates as his Lordship had demonstrated that he himself possessed. It was to an appreciation of the foregoing facts by the British Public that the immense prestige which he enjoyed may be attributed, a prestige which stood the nation in such great stead in the critical days of the autumn of 1914.

M. Davray's short account of the career of one of the most illustrious members of the Corps cannot fail to interest all Royal Engineers.

W. A. J. O'MEARA.

MATHEMATICS FOR ENGINEERS. PART I.

By W. N. ROSE, B.Sc. Eng. (Lond.).—(Pub. by Chapman and Hall, Ltd.).

THE work under review is one of the volumes of "The Directly-Useful Technical Series." In the past technical books have been written either wholly from a theoretical standpoint for the training of college students or wholly from the practical standpoint. Works falling in the first of the foregoing category have devoted attention almost entirely to problems of a purely academic character, whilst those in the second category have been concerned entirely with the presentation of data required by the technical man in his every-day work, the scientific basis upon which all good practice is built being as a rule omitted from the pages thereof. In *Mathematics for Engineers*, we have a work which occupies a midway position between the foregoing categories. The aim of the author of this work has been to provide information, and to set out problems and exercises, which shall be of a directly useful character; the volume has been written as a work of reference for the use of the practical man rather than that of the college student, nevertheless a sufficient amount of scientific explanation has been given to elucidate the formulæ, etc., given in the volume, and the advanced student will find much information therein likely to assist him.

It has been thought convenient to divide the subject-matter into two volumes. Part I. (the volume under review) deals with the fundamental rules and processes of Algebra, Plane Trigonometry, Mensuration and Graphs, whilst Part II. (to be published shortly) is devoted to the Calculus and its applications, Harmonic and Vector Analyses, Spherical Trigonometry, etc.

The contents of Part I. are well arranged and the subject has been developed systematically in twelve chapters, which are headed:—Aids to Calculation; Equations; Mensuration; Introduction to Graphs; Further Algebra; Plane Trigonometry; Areas of Irregular Curved Figures; Calculation of Earthwork Volumes; The Plotting of Difficult Curve Equations; The Determination of Laws; The Construction of Practical Charts; Various Algebraic Processes.

The volume is provided with a number of clear diagrams illustrative of the text. The problems worked out and the exercises set in the various chapters are all of a very practical kind and cover a wide range of engineering practice. Those who experience difficulty in readily solving problems involving factorization or requiring the manipulation of decimal fractions or the use of logarithm tables, etc., will find useful rules affording a ready means for dealing with points that may have proved a stumbling block in the past.

The use of the slide-rule, of the Amsler planimeter, the Coffin averager and other aids to mathematical calculations are fully dealt with in the volume, which concludes with Tables, comprising the following:—Trigonometric ratios; logarithms; antilogarithms; Naperian logarithms; natural sines; natural tangents; logarithmic sines, logarithmic cosines; logarithmic tangents; and exponential and hyperbolic functions.

The volume under review is a useful and valuable addition to the works on mathematics already published for the special use of the engineering profession and covers some new ground.

PAGES D'HISTOIRE, 1914—1918.

(Published by the Librairie Militaire Berger-Levrault, 5—7, Rue des Beaux-Arts, Paris).

(*Continued from R.E. Journal for August*, 1918).

The 148th volume of the above series is entitled *Le Mensonge Autrichien*, sub-title *L'incident Clemenceau-Czernin*, and therein will be found an account of the astute move made by the Central Powers to bring about, *if possible*, a rupture between Great Britain and France. Whilst the German Armies were being concentrated for their mighty effort against the military front of the Allies in Northern France, a simultaneous attempt was made to break through their political front by a peace offensive of a subtle order. The Germanic political strategists failed, however, to assess the *morale* of the French people at its true value in their calculations and suffered an ignominious defeat in consequence.

The contents of the volume are arranged in thirteen short sections and seven appendices. The first of these sections deals with the statement made by Count Czernin, the Austro-Hungarian Foreign Minister, on the 2nd April, 1918, when addressing representatives of the Vienna Municipal Council. He is reported to have said that President Wilson might possibly be of opinion that Vienna was the most favourable soil whereon to sow the seeds of a general peace; the President might possibly think that the Austro-Hungarian monarchy had the good fortune to possess a sovereign who was sincere and honest in his desire to secure a general peace, but one who would never be guilty of committing a felony or negotiating a shameful peace; the President might also have recalled to mind that behind the Emperor and King there stood 55 millions of subjects.

President Wilson no doubt, said Czernin, recognized that this resolute mass of human beings represented a force the value whereof should not be underestimated by him. The Count next stated that there had been a misunderstanding with regard to a remark which he had made in a previous speech to the Delegation; he had then said that Mr. Wilson was already in possession of his views, but this the American President denied. Mr. Wilson had stated that no communications had passed directly between himself and the Austro-Hungarian Foreign Minister, and in this respect Czernin agreed that the American President was quite right.

Czernin proceeded to tell the City Fathers that before he delivered the speech in question proper arrangements had been made for the transmission, from a neutral country to Washington, of the correct text of what he was about to say, in order that there might be no possibility of a misunderstanding or of his speech being misreported; in order also that, at the moment when he would be speaking in Vienna, a copy of his speech should already be in Washington.

Czernin then informed his audience that, as a matter of fact, the text of his speech did not reach America till some days later; however, according to him this was of no consequence. The object he had in view, namely, that President Wilson should become cognizant with the exact text of his speech, was attained; in his opinion, the fact that a delay occurred in this copy of the speech reaching the President's hands was a matter of secondary importance.

Czernin expressed himself as satisfied with President Wilson's speech of the 11th February last and stated that the four principles laid down therein constitute an admirable basis whereon to open the discussion on the subject of a general peace. He declared that the Central Empires had done all in their power to avoid a new offensive. The Entente Powers, however, were unwilling to take advantage of this considerate attitude of the Central Empires.

"M. CLEMENCEAU, SOMETIME BEFORE THE COMMENCEMENT OF THE OFFENSIVE ON THE WESTERN FRONT, CAUSED ME TO BE SOUNDED," said Czernin, "FOR THE PURPOSE OF ASCERTAINING WHETHER I WAS PREPARED TO OPEN NEGOTIATIONS FOR PEACE AND ON WHAT BASIS. I REPLIED IMMEDIATELY, BERLIN BEING IN AGREEMENT ON THE SUBJECT, THAT I

WAS READY TO OPEN SUCH NEGOTIATIONS, AND THE ONLY OBSTACLE TO A PEACE WITH FRANCE THAT I COULD SEE TO BE STANDING IN THE WAY WAS HER ASPIRATIONS REGARDING ALSACE-LORRAINE. A REPLY REACHED ME FROM PARIS THAT UNDER THESE CIRCUMSTANCES IT WOULD BE USELESS TO OPEN UP NEGOTIATIONS. SINCE THEN WE HAVE HAD NO CHOICE IN THE MATTER."

The formidable struggle in the West had already, said Czernin, recommenced. Austro-Hungarian and German troops were fighting side by side, as they had done in Russia, Serbia, Roumania and Italy. The armies of the Central Empires would prove to the Entente, according to the Count, that French and Italian aspirations with regard to the territories of those Empires were Utopias calling down a terrible vengeance.

The explanation of the attitude of the Entente was traceable, thought Czernin, to certain internal events in Austro-Hungary. However, come what may, the Dual Monarchy would not abandon Germany, nor was the latter likely to abandon her Ally.

Loyalty on the banks of the Danube was in no way inferior to loyalty on the banks of the Spree. Austro-Hungary had no imperialistic or annexationist aims either on her own behalf or of that of Germany; however, they both intended to march arm in arm to the bitter end for the purposes of defence, of safeguarding their national existence and of securing their future.

The peace negotiations with Russia had made the first breach in the Will to War of their enemies; this was the chink which let in the light of peace.

"Placing firm confidence in our strength in the justice of our cause," continued Czernin, "I have thus far concluded three *moderate*, nevertheless honourable, treaties of peace."

The Count further informed his audience that the enemies of the Central Empires were beginning to see that the latter wished alone to make secure the future of the Monarchy and of its Allies—and that by force of arms—this the Central Empires felt confident of being able to do and this they would do. He expressed the opinion that the annexationists were responsible for prolonging the War and that there was not much to choose between them and the defeatists.

It was necessary, said Czernin, that the enemies of the Dual Monarchy should be defeated militarily as well as from the moral point of view. After victory had been won by the contest of arms, diplomacy would have to step in to complete the work of the Army.

In the second section is recorded M. Clemenceau's first rejoinder to Czernin. On reading the Havas telegram relating to the Austria-Hungarian Foreign Minister's speech referred to above, he made the brief remark:—

COUNT CZERNIN HAS LIED!

The third section contains the text (in French) of the official note published in Vienna on the 6th April, and constitutes Czernin's first reply to M. Clemenceau.

The note stated that, under instructions from the Austrian Foreign Minister, Count Nicholas Revertera had had several interviews in Switzerland with Commandant Armand, of the French War Office, *an intimate friend* of M. Clemenceau. At one of these interviews, held at Friburg, the question had been raised as to whether it was possible to arrive at any understanding on the subject of a basis on which the question of a general peace might be discussed between the French and Austrian Foreign Ministers or their official representatives.

Count Revertera had been instructed to mention to Commandant Armand, for M. Clemenceau's information, that Count Czernin was ready to discuss the question of peace with an accredited representative of France, the moment that the latter renounced her intentions regarding Alsace-Lorraine.

Count Revertera was furnished, according to Czernin, with a reply in M. Clemenceau's name, wherein he was informed that the latter could not accept the proposal regarding the renunciation of France's claim to the lost Provinces, and therefore it was found useless to arrange an interview for the discussion of peace proposals.

The fourth section contains the second rejoinder of the French Premier to the Austrian Foreign Minister. M. Clemenceau sent a communication to the Press on the 8th April, wherein he explained that when he succeeded to the Premiership he found that CONVERSATIONS between Revertera and Commandant Armand, *started on the initiative of Austria*, were in progress in Switzerland. He felt that he could not abruptly terminate these conversations; on the other hand, by their continuance useful information might be obtained. It was Revertera who had wished to continue the discussions; in consequence, Commandant Armand was instructed, in the presence of the Chief of his Bureau, by M. Clemenceau: "To listen, but to say nothing."

When Revertera realized that his attempts to put the halter of a German peace round France's neck were not likely to succeed he placed a note in Commandant Armand's hands on the 25th February for the purpose of making clear the character of his mission. The introductory paragraph of this note indicated that Revertera had been endeavouring TO SECURE FROM THE FRENCH GOVERNMENT peace proposals not for consideration at the Ballplatz but really at the Wilhelmstrasse. And this is the fact, the proof whereof is contained in an authentic document, the terms whereof Count Czernin dares to transpose when he says: "M. Clemenceau, sometime before the commencement of the offensive on the Western Front, caused me to be sounded for the purpose of ascertaining whether I was prepared to open negotiations for peace and on what basis."

In speaking thus, says M. Clemenceau, he has not only not told the truth, but he has also said something contrary to the truth. In France, this goes by the name of *lying*.

The note proceeds to recall how Austria had tired out the Foreign offices at Rome, Washington and in London by her solicitations in respect of a so-called separate peace, solicitations which it can now be seen had no other aim than to transfer to other necks the yoke which has been pressing so heavily on her own shoulders.

In the fifth section is set out Count Czernin's second official note dealing with this controversy. Satisfaction is expressed therein that the *conversations* between the Austro-Hungarian and French Governments were admitted by M. Clemenceau; however, it is suggested that the statements in M. Clemenceau's note and in M. Painlevé's contribution on the subject to the *Humanité* are not, in several essential respects, in accord with the actual facts; indeed, the departure from the true facts is so great, it is said, as to render a detailed correction of the French *communiqué* necessary.

It is alleged that Count Revertera was invited, in July, 1917, by a neutral intermediary, *acting on behalf of the French Government*, to say whether he was in a position to pay attention to any overtures which France might make to Austria-Hungary. Count Revertera, being duly authorized, replied in the affirmative a few days later; in consequence, Commandant Armand, a distant relative, called on him *at his home* in Friburg on the 7th August, 1917.

Commandant Armand enquired on behalf of M. Ribot, the then Premier, whether conversations between France and Austria-Hungary could usefully take place.

The initiative in the matter, it is stated, was taken by France. Count Revertera was thereupon officially instructed to ascertain whether any proposals could be formulated on the basis of which the discussion of the question of general peace could proceed.

Count Revertera entered into *pourparlers* with Commandant Armand on the 22nd and 23rd August, 1917; and it is admitted that the result was as M. Clemenceau has stated; the negotiations at once terminated.

In his note Czernin says that M. Clemenceau is incorrect when he states that the Revertera-Armand negotiations had already begun at the time when he assumed the Premiership. It was only in January, 1918, that Commandant Armand renewed, on the direct instructions of M. Clemenceau, his official relations with Count Revertera.

It was this resumption of official intercourse between the Austrian and French representatives that gave birth to the negotiations mentioned in the official *communiqué* of the 4th April, 1918. It is admitted that Count Revertera on this occasion handed a note to Commandant Armand, the first paragraph whereof, however, alone has been quoted by M. Clemenceau.

It is claimed therefore that the statement made by Count Czernin in his speech of the 2nd April, with regard to M. Clemenceau having made the attempt, before the commencement of the offensive in the West, to ascertain whether he was ready to open up peace negotiations, and the proposed basis for the same, is strictly true. Therefore, the charge made by M. Clemenceau that Count Czernin was lying, cannot, it is said, be supported, even after making allowance for the explanations contained in the *communiqué* of the French Government.

The Austro-Hungarian Government, it is stated, has no knowledge of the solicitations as to proposals for a "separate peace"; that is to say, concerning the solicitations which are alleged to have tired out the Foreign Offices at Rome, Paris, Washington and in London.

On the other hand, there did take place in Switzerland, it is pointed out, interviews between Count Mensdorf and General Smuts; these interviews took place on several occasions and lasted many hours. It is also suggested that a twelve month earlier than the abortive Revertera-Armand conversations an attempt of the same kind was made by a person of much higher rank than Count Revertera; Count Czernin was accommodating on that occasion too, but in this case also the negotiations failed to mature.

It is added that there would be no point in Count Czernin denying that he took the initiative, in this or that case, had he actually done so; for contrary to M. Clemenceau's views on the subject (as alleged in the note), the Count does not consider that it should be a reproach to any Government to have made an attempt to bring about an honourable peace, one that would deliver the peoples of the world from the horrors of the present conflict.

In conclusion it is stated that the important question in this controversy is not: who took the initiative? But who is it that is responsible for the failure of these conversations? The fact which stands out is that M. Clemenceau has not denied, up to the present, that he refused to enter upon the negotiations on the proposed basis that France should definitely renounce her claim to Alsace-Lorraine.

In the sixth section matters connected with M. Clemenceau's third rejoinder to Count Czernin are dealt with. It is pointed out that a "diluted" lie remains a lie for all that. The lie that Count Czernin told consisted in the statement that, some time before the German offensive, M. Clemenceau had approached him with a view to ascertaining whether he "was prepared to open negotiations for peace and on what basis."

To refute Czernin's statement M. Clemenceau quotes a passage from Count Revertera's Note to Commandant Armand; this passage shows that it was Austria that was endeavouring *to obtain from France* proposals to form a basis for peace negotiations. Count Czernin has not contested the authenticity of the Note in question.

To mask his discomfiture Czernin has attempted to saddle M. Clemenceau with the responsibility for having taken the initiative. However, he is faced with the fact that it was not till the 18th November, 1917, that M. Clemenceau was apprised of the negotiations (that is to say, the day after becoming War Minister), whereas the letter containing the information as to these negotiations is dated 10th November, 1917, and must, in consequence, have been addressed to his predecessor.

Count Armand is represented as an intimate friend of M. Clemenceau, whereas the latter had only met this officer once previously, some 15 or 20 years ago, and then only for about five minutes.

If Count Czernin really considers the matter relating to the responsibility for the initiation of the conversations of trifling importance, as he indeed states to be the case, why, it is asked, is he making so much fuss about it all? Is it to proclaim that the views of every French Government, as indeed France herself, are fixed and immutable on the question of Alsace-Lorraine? Who would have thought it necessary for Count Revertera to throw illumination on Count Czernin's mind in

relation to a question on which the Emperor of Austria had himself said the last word?

IT WAS THE EMPEROR CHARLES WHO, IN A LETTER DATED MARCH, 1917, BY HIS OWN HAND SIGNIFIED HIS ADHESION TO THE "JUST CLAIMS OF FRANCE CONCERNING ALSACE-LORRAINE." AND IN A SECOND IMPERIAL LETTER THE EMPEROR ANNOUNCED THAT HE WAS "IN AGREEMENT WITH HIS MINISTER" ON THE SUBJECT.

No alternative to the acceptance of M. Clemenceau's denial was ever open to Count Czernin.

In the seventh section is set out the text of the telegram sent by Charles I. to William II. This text was published in Vienna in an official *communiqué* on the 11th April, 1918.

The Austrian Emperor alleges in his communication to his august cousin that the French Premier, "driven into a corner," was seeking to escape from the tissues of lies into which he had himself, says H.I.M., packed more and more misstatements and had not hesitated to put forward an absolutely false and incorrect allegation to the effect that His Imperial Majesty had recognized as just the claims which France was making with regard to the restitution of Alsace-Lorraine.

"I repudiate this assertion with indignation," telegraphs Charles I. "At a time when Austro-Hungarian artillery is in action with German artillery on the Western Front against a common target, it is scarcely necessary for me to provide proof that I am fighting for Your Provinces and that I am ready to fight on just the same as if it were necessary for me to defend my own Country."

The Austrian Emperor considers that his conduct in supporting the German Arms affords a sufficient testimony of his loyalty to the German Emperor's cause, and he holds that it would be "*useless waste of time to devote even a single word to the lying statements of M. Clemenceau.*" (sic.). He once more assures William II. of the perfect solidarity which exists between them and between their Empires; no intrigue can put in danger their *fraternity in arms*. He concludes: "Together, we shall force an honourable peace on our adversaries."

In the eighth section is set out the text of an official *communiqué* dated 11th April, being the third of the Notes on the subject issued by Count Czernin. Therein it is alleged that M. Clemenceau was continuing to distort facts in order to extricate himself from the painful position in which he had placed himself.

Count Czernin, in his Note, held it to be useless to prove each particular misstatement alleged to have been made by M. Clemenceau. He charged M. Clemenceau with an attempt to divert attention from the real issues of the controversy; the issues being, firstly, that M. Clemenceau had, before the German offensive on the Western Front, sought a *rapprochement* with Austria-Hungary, and, secondly, that he had made it known that France could not, as a condition precedent to the discussion of peace terms, abandon her claim to Alsace-Lorraine.

To this end, says Czernin, M. Clemenceau had tried to divert attention to political proposals alleged to have been made by the Austrian Emperor in a certain letter on the subject of the restitution of Alsace-Lorraine to

France, and he had even asserted that the Austro-Hungarian Foreign Minister held the same opinions as his Sovereign on this question.

"The absurdity of such a statement," continues Czernin, "is self-evident. It is in flat contradiction to everything that the responsible Foreign Minister (*i.e.* Czernin) has at all times stated in public, views which are well-known in France."

The Count asserts that M. Clemenceau's version of the proposals contained in the letter of the Emperor Charles consists of lies from beginning to end. What is made clear, says Czernin, is that the War on the Western Front is continuing because France desires to *conquer* Alsace-Lorraine; M. Clemenceau, therefore, could not have provided, he continues, a better proof of the fact that the Central Empires are fighting to defend their possessions.

The ninth section contains the evidence in the hands of the French Government upon which M. Clemenceau founded his statement as to the views of the Austrian Emperor on the subject of Alsace-Lorraine; it consists of an autograph letter which Prince Sixte de Bourbon received from his brother-in-law, Charles I. The Prince communicated the contents of the letter in question, on the 31st March, 1917, to President Poincaré who, with the Prince's consent, immediately made the same known to the French Premier.

The Austrian Emperor begins his letter by deploring all the misery brought into the world by the War, which, at the time of writing, was approaching the completion of its third year. He states that his subjects were united on the question of maintaining the integrity of the Dual Monarchy at all costs, and he also referred to the successes of the Austro-Hungarian Army in the Balkan theatre of operations.

He proceeded to compliment France on the powerful "resistance and the magnificent spirit" shown by her in the struggle, and gave expression to the sentiments of admiration felt by his people towards the French Army in acknowledgment of the traditional and conspicuous bravery shown by it, and towards the French people in acknowledgment of the spirit of self-sacrifice exhibited by it.

Charles I. continued: "It is also particularly agreeable to me to observe that, although temporarily foes, no real divergence in views or in aims separate my Empire from France; my sincere sympathy for France, together with the knowledge that the feelings throughout the Dual Monarchy are similar to my own, lead me to hope that it will be possible in the future altogether to avoid a return to such a state of affairs as that brought about by the present War, a situation for which I am in no way responsible. For this purpose and in order to demonstrate, in some precise manner, my sincerity in giving expression to the foregoing sentiments, *I ask you to inform M. Poincaré, the President of the French Republic, secretly and unofficially, that I will support by every means in my power, and by using all my personal influence with my Allies, the just claims of France to the restoration of Alsace-Lorraine.*"

Dealing with Belgium, the Austrian Emperor declared that "her sovereignty must be entirely restored to her, and that she must be allowed to retain her African possessions, without prejudice to the compensation she must receive in respect of all the injuries suffered by her."

Serbia also, he stated, will have her sovereign rights restored to her; and, as earnest of Austria's good intentions towards this country, "we are disposed," he continued, "to secure for her suitable and proper access to the Adriatic Sea as well as wide economic concessions." In return Serbia will be required, as a condition precedent, to guarantee that all societies or groups, and in particular the Narodna Obrana, whose political aims are antagonistic to the Unity of the Dual Monarchy shall be suppressed and kept in effective check.

Charles I. excused himself from discussing questions affecting Russia, owing to the state of affairs in that country at the time of writing; Russia was then without any definite or legal form of Government.

The Austrian Emperor requested his brother-in-law in his turn, as a *quid pro quo*, to furnish him with his views on the subject of the relations between Great Britain and France, in order that some common ground might be found for opening official *pourparlers* likely to lead to a permanent peace; thus could be put an end to the sufferings of many millions of men and to the anxieties of innumerable families, who had already experienced much sadness.

The text of the Austrian Emperor's letter is accompanied by a Note from the French Premier, wherein the latter states that *Count Czernin having referred in his Note of the 8th April to the negotiations due to a person "of much higher rank than his own,"* the Austrian Government had now materials placed at its disposal which might permit it to give its explanation in relation to the *attempted* negotiations, the existence of which had been admitted, and to make known the details of the interviews in which its delegate took part.

This constituted M. Clemenceau's fourth rejoinder to Count Czernin.

In the tenth section appears the text (in French) of the fourth Note from the Ballplatz; it reached France *viâ* Basle on the 13th April. Therein, it is stated, that the Austrian Emperor's letter published by the French Premier on the 12th April was spurious.

The Austrian Note stated that the allusion made in the *French communiqué of the 7th April* to "a person occupying a much higher rank than the Foreign Minister" (*i.e.* Count Czernin), did not refer to the Emperor, but to Prince Sixte of Bourbon. "The Prince was occupied," the Note continued, "in the Spring of 1917, in bringing about a *rapprochement* between the belligerents."

It is definitely asserted that the Austrian Emperor's letter to Prince Sixte of Bourbon was "a purely personal and private letter, which contained *no order* to the Prince to open up negotiations with the President of the French Republic, or otherwise to transmit the information therein contained to him or to provoke or to receive any counter-statements."

The Emperor's letter, it is stated, made no mention of Belgium; further, the reference to Alsace-Lorraine therein was as follows:—"*I would have used all my personal influence to further French views, and would have supported the French claims to Alsace-Lorraine had the same been just, but they are not.*"

"It is significant," said the Note, "that the French *communiqué* passes over in silence another letter from the Emperor, mentioned in the

French Premier's *communiqué*, and in which H.I.M. is said to have made the statement that he was 'in agreement with his minister' on the subject."

The eleventh section contains the text of the second telegram sent by Charles I. to William II.; it was received in France *viâ* Basle on the 15th April.

"The accusations of M. Clemenceau against me," telegraphed the Austrian Emperor, "are so mean that I do not propose to continue the discussion on the subject with France any longer."

"Our guns, in the West, constitute our ultimate reply."

The twelfth section is devoted to M. Clemenceau's reply (the fifth of the series). "There are some rotten consciences," he said. "Finding it impossible to save face, the Emperor Charles is stammering away in the style of the man who has been found out."

"He has been driven into accusing his brother-in-law of forgery, in having fabricated with his own hand a lying document."

M. Clemenceau explained that the original document, whereof the French Government had published the text, was communicated in the presence of M. Jules Cambon, the Secretary-General in the Ministry of Foreign Affairs, to the President of the French Republic.

It is pertinently asked whether it can be conceived as possible that the President of the French Republic would have received Prince Sixte de Bourbon a second time, on the initiative of Austria, had he been the bearer of a document contesting rather than affirming the claims of France?

The Prince, it is stated, himself showed the Emperor's letter to the members of the French Government. Moreover, two friends of the Prince are prepared to attest to the authenticity of the letter; it was given to one of them to copy out.

In the thirteenth section are set out the concluding incidents of this strange episode:—

(*a*). On the 15th April information reached France *viâ* Geneva that Count Czernin had tendered his resignation, which the Emperor had notified his willingness to receive.

(*b*). On the 18th *idem* the text of the letter from the Emperor Charles to Count Czernin (published in the *Wiener Zeitung*) reached France *viâ* Basle.

In this letter the Emperor notified Count Czernin that he was appointing Baron Burian, Minister for Foreign Affairs.

Count Czernin received fulsome thanks for his services to the Hapsburg House and to the Empire during one of the most important epochs of history. The Emperor at the same time conferred upon him the Grand Cross of the St. Stephen set in brilliants and assured him of the cordial feelings which he continued to entertain towards him.

(*c*). In spite of the apparent serenity with which Berlin and Vienna accepted M. Clemenceau's exposure of the Vienna manœuvres, and in spite of the categorical denials of the Ballplatz, the resignation of Count Czernin was accepted by everyone as an admission of the truth and accuracy of the revelations.

The Ballplatz was evidently embarrassed on discovering that the

effect of its repudiations in connection with the now famous letter of Charles I. was to cast a stigma on Prince Sixte de Bourbon; the repudiations amounted to a charge of forgery directed against him at the instance of the Austrian Court.

In consequence, it was felt necessary to issue a fifth Note on the subject. Therein it is stated that the latest explanations of M. Clemenceau in no way altered the truth contained in the official statements of the Austro-Hungarian Foreign Minister. The character of Prince Sixte de Bourbon was too well-known to the Emperor, it was said, to admit of any possibility of the idea being entertained that he had tampered with or falsified the Emperor's letter to him. Indeed neither the Prince, nor any one else had been accused of such an act. Since it was not possible to trace the circumstances under which a *spurious letter had been substituted for the one actually sent by the Emperor, the incident was to be considered as closed.*

The special correspondent of the *Berliner Tageblatt* in Vienna, in a communication to his paper, gave some information as to the steps taken by the Austrian Foreign Minister to disseminate his official explanation relating to the Emperor's letters.

On the 12th April, Count Czernin sent out a circular to his subordinates informing them that the allegations of M. Clemenceau concerning the Emperor's letter were "pure invention," and they were directed to give as wide a currency as possible to this statement. He added that, in diplomatic circles, a view prevailed that M. Clemenceau might meet the repudiations of Vienna by publishing the facsimile of the *alleged* letter; in anticipation of the adoption of this course, it was given out, at the same time, that *the facsimile would be a forgery!*

The first appendix contains the statement made by M. Painlevé on the 8th April, 1918, wherein he made it known that during 1917, Austria had made several attempts to enter into official *conversations* with representatives of the Entente.

The second appendix contains the text of the telegram sent by William II. to Charles I., wherein the former acknowledged the telegram from the latter containing the repudiation of the views attributed to him on the subject of Alsace-Lorraine by the French Premier.

The third appendix contains the text of the telegram sent by William II. to Czernin. Therein, H.I.M. thanked the Count for the assistance which he had given to Germany's cause and notified Czernin that he had conferred the Iron Cross, 1st Class, on him.

The fourth appendix contains the text of a letter addressed by Charles I. to the Hungarian Parliament, wherein the Emperor's letter to Prince Sixte of Bourbon and Count Czernin's resignation are dealt with. It was stated in the letter in question that recent events did not in any way imply a change in foreign policy.

The fifth appendix deals with the decision arrived at by the French Government on the 11th April, 1918, to appoint a Commission to investigate the documents composing the *dossier* Prince Sixte and the *dossier* Armand-Revertera.

The sixth appendix deals with the Resolution passed on the 8th May, 1918, by the Commission appointed to investigate the *dossiers* mentioned

in the preceding appendix. The Resolution was drawn up in the following terms :—" The Commission in Foreign Affairs, having examined the documents submitted to it and having taken evidence on the subject of the conversations instituted and proceeded with at the instance of Austria-Hungary in 1917 and 1918, records its opinion that these conversations have at no time afforded an opportunity for proceeding to the discussion of peace terms likely to be acceptable to France and her Allies."

The seventh appendix contains a number of extracts from the Neutral and Enemy Press on the subject of the Clemenceau-Czernin controversy.

The 149th number contains the Official Communiqué issued by the Central Government to the Provincial Authorities of France during the period October—December, 1917; it is the XXXV. Volume of the series dealing with this subject. It is provided with Appendices, which deal with the visit of the President of the French Republic to Lorient in October, 1917; the meeting of the Presidents of the French and Portuguese Republics at Verdun in October, 1917; the visit of these two Presidents to Rheims on their return journey from Verdun to Paris; the telegrams exchanged between the two Presidents, on the termination of M. Bernardino Machado's official visit to the M. Poincaré; the reception by the President of the French Republic of the Mission from Roumanian Universities; the address presented by the women of Oherville-en-Caux to M. Clemenceau and the latter's reply thereto.

On the occasion of his visit to Lorient, M. Poincaré presented the Legion of Honour and the *médaille militaire* to many of France's naval heroes. Addressing those present, the President of the French Republic expressed the pleasure which he felt in conveying the thanks of the country to its gallant defenders. He regretted that his official duties had not permitted him to spend as much time with France's naval forces as he would have wished. He recalled that he was in the Baltic, on a French man-of-war, at the time Austria launched her exacting ultimatum to Serbia; and spoke of the splendid spirit which animated the officers and men of the French Navy.

M. Poincaré briefly passed in review the great work done by the French Navy and Mercantile Marine, by Dreadnoughts, by cruisers, by torpedo-boats, by patrol-boats, by submarines, by military transport vessels and by cargo-boats. He spoke of the magnificent courage shown by all grades and classes of seamen; the contempt for danger; the devotion and spirit of self-sacrifice exhibited by French sailors in their daily and nightly contests, in the Mediterranean and on the wide oceans, with the German U boats, the modern pirates.

Specific reference was made to the conduct of the Captain, the officers and crew of the *Kléber* of Cancale, when attacked on the 7th September, 1917, by a German submarine. The Captain and the second officer were killed on this occasion, and the command of the vessel devolved on Quartermaster Monier, who so distinguished himself as to win the Legion of Honour, presented him that day by M. Poincaré.

The address of the women of Oherville-en-Caux to the French Premier was a personal tribute to a Great Patriot, who is justly admired by the

fair sex of his native land as being the personification of the "Emblem of Energy." The signatories to the address express their unbounded faith in the Leader of France's political forces, who was, at the same time, the Head of her Army. They call for the punishment of the violators of France's fair territories and of those responsible for spilling the blood of so many of her innocent people. They express their readiness to make every personal sacrifice, in order that the work in hand for securing a complete victory may result in a successful issue, and may bring about a permanent and durable peace; they desire to ensure that France shall emerge from her present trials greater, more prosperous and more glorious than ever so that their own offspring shall be spared the horrors which they themselves had been experiencing.

M. Clemenceau, in reply, stated that he had been much touched by the pathetic appeal received by him from the small village of the Caux region. He thanked the women of Oherville-en-Caux for the honour done him; it would be an incentive to him to remain steadfast in his duty to France, "the soldier of Humanity."

France would give heed, he said, to the women of France who were voicing their stern resolution in the days of their dire distress; they had displayed marked heroism. The more cruel the sacrifices which they had been called upon to endure, the more inexorable had become their determination not to yield to the will of their aggressors.

W. A. J. O'MEARA.

NOTICE OF MAGAZINE.

REVUE MILITAIRE SUISSE.

No. 6.—June, 1918.

THE BELGIAN FIELD ARTILLERY AND THE GREAT WAR.

The original article, which is illustrated with photographic reproductions of views from the Belgian front, is contributed by Lieut. E. van Erde. The censor has eliminated a part of the original article, owing to the technical information therein being of a character which it was inadvisable to publish at the present time.

Lieut. van Erde disclaims any intention of providing a technical study of the artillery arm, his aim has rather been to tell of his experiences in the field. Two important problems had to be faced by the Belgian General Staff, at the beginning of the War, in relation to the field artillery of the Belgian Army; namely, (*a*) how to improve the *matériel* and to provide for the very considerable increase thereof found to be necessary, and (*b*) how to replace the wastage of War in the *personnel* and to provide for the manning of the new units and formations which had to be brought into existence. The energy and tenacity of purpose of the officers to whom the duty was assigned to deal with these problems resulted, as Lieut. van Erde tells us, in all difficulties being surmounted.

Before the War, the people of Belgium were decidedly antimilitarist. However, the repudiation by Germany of her Treaty obligations with regard to the preservation of the Neutrality of Belgium raised the indignation of the whole nation to fever heat. It was a shock to the Belgians to find that a *High Contracting Power* could, in a matter of this kind, act so unscrupulously as to ignore its own signature affixed to a document of the most solemn kind.

The bribe offered to Belgium as a reward should she be willing to allow German troops to pass through her neutral territory for the purpose of invading France stung the pride of her people to the quick. "Rather will we have War than that," said they, and within five days 50,000 young men voluntarily came forward to enrol in the Belgian Army. Lack of equipment and of arms made it impossible for the Authorities to accept their services. Within five days the mobilization of the Belgian Army was completed.

Well knowing the strength and the efficiency of the German Army and what it was up against in attempting to oppose it, the Belgian Nation nevertheless voluntarily and freely sacrificed itself rather than betray a friendly neighbour.

The stubbornness of their defence stupefied the German High Command; the military pride of the Germans was humbled by the success of the Belgians in achieving what appeared to be the impossible. The check of their advance so enraged the German soldiers that in their fury they have acted as wild beasts and have committed crimes which will be for ever indelibly associated with the names Louvain, Andenne, Aerschot, Termonde and Dinant.

It remains to this day a mystery how it was that the formidable artillery, which the Germans brought against the Meuse forts, did not more quickly crush the Belgian defence on the frontier, especially in view of the disparity in the armament of the contending forces in 1914.

Since the early days of the War the Belgians have picked up a great deal of lee-way and now, in 1918, are well provided with every kind of appliance, tools, armament and equipment necessary for defence. The year last mentioned is that in which the New Military Law of 1913 would, it was expected, have provided Belgium with the full establishment of 350,000 men sanctioned by her Parliament; an army of the size which, she hoped, would enable her to fulfill all her duties as a Neutral.

Official documents published by the Belgian Government show that the strength of the Belgian Field Army was, on the 4th August, 1914, as follows:—

Formation.	No. of Rifles.	No. of Sabres.	Cyclists.	No of M.G.'s.	No. of Guns.
1st Division ...	14,000	500		18	48
2nd Division ...	14,000	500		18	48
3rd Division ...	18,500	500		24	60
4th Division ...	18,500	500		24	60
5th Division ...	14,000	500		18	48
6th Division ...	14,000	500		18	60
Cavalry Division ...		2,500	450		12
Totals ...	93,000	5,500	450	120	336

The Belgian Army was disposed on the evening of the 3rd August, 1914, to meet the eventuality of Belgium remaining neutral during the then coming conflict.

The 1st Division was concentrated at Ghent, *i.e.*, facing Great Britain.

The 4th Division at Namur and the 5th Division at Mons, *i.e.*, facing France.

The 3rd Division at Liège, *i.e.*, facing Germany.

The 6th Division and the Cavalry Division at Brussels, forming a General Reserve ready to move forward rapidly to reinforce any of the other Divisions.

Matériel.—The only type of field gun which was in possession of the Belgian Army at the outbreak of the War was that known as the 7.5 (T.R.).

A description of this gun, its sighting, its carriage and its ammunition are given in the original article.

The design of the gun and carriage were simple and both gun and carriage were constructed with an ample margin of strength. The piece was easy to bring into position, and to handle when in action. It was, of course, outmatched by the Krupp artillery brought against it by the Germans.

The artillery in the hands of Belgian gunners of to-day is something quite different to that concerning which details are published in the original article; it is not only greater in quantity, but it is also heavier, of larger calibres, and possesses a greater range. Belgian officers and men often say that had their Army been in possession of artillery, similar

in numbers, calibre and range, to that which it is provided with to-day, the Germans could never have crossed the Meuse.

It is much to the credit of the artillery experts of the Belgian Army that, in spite of the extreme difficulties with which they have had to contend, they have nevertheless accomplished what they have in furnishing their army with weapons in every way capable of meeting the requirements of the situation.

The author of the original article calls attention to Major Willy Breton's *Etablissements d'artillerie belges pendant la guerre* wherein is described the part played by the Belgian Artillery in the early phases of the War.

The Belgians have always aimed at being a self-contained nation and, in consequence, they had provided themselves with factories and workshops, wherein they made their own guns, ammunition, etc. In December, 1915, a terrible catastrophe occurred at Graville, which was literally flattened out; not a wall was left standing, not a human creature remained alive. This was enough to discourage the stoutest-hearted of men, nevertheless the Belgians set to work to make good the deficiency thus caused.

The Belgians have since then set up munition works in the British Isles, and are now supplying not only themselves but also the British Army therefrom. In their factories the Belgians are making many kinds of precision appliances: gun sights, optical instruments, binoculars, physical apparatus, surveying instruments, altitude apparatus, alidades, goniometers, periscopes, compasses, etc., etc.

Personnel.—Officers.—In normal times, the officers of the Belgian Artillery were all educated at the *École Militaire*, admission to which was regulated by examinations in literary and scientific subjects.

After two years, at the above institution (where the discipline was very strict) the future artillery officers passed on to the *École d'application militaire* at Brussels, for a further two and a-half years. At the *École d'application* they received instruction in specialized subjects. Young men educated at the latter School were not bound to adopt a military career; those who wished to do so were allowed to adopt a Civil career, some of them, as a matter of fact, choose the profession of a Civil Engineer. The students of the *École d'application* were accorded privileges similar to those enjoyed by young men who had gained an Engineering diploma at a Belgian University. General de Tilly, the author of the well-known work on Geometry; General Brialmont, the designer of the original fortifications of Antwerp and of the Meuse defences; and General Leman, the gallant defender of Liège in 1914, are numbered among the distinguished alumni of the *École d'application.*

It was customary for a certain number of the artillery officers, after leaving the *École d'application*, to spend some time at the Cavalry School; but just before the outbreak of the present War the *École d'équitation* for the artillery had been removed to Brasschaet.

A few artillery officers, destined for employment on the General Staff, passed in due course to the *École de guerre*; it is said, that many artillery officers declined the invitation to qualify for the Staff, a marked preference being shown for a regimental career by officers of this arm.

Every year artillery officers spent a short time at the *Polygone* de

Brasschaet for range practice, annual training, etc. Triennially, sometimes at shorter intervals, the artillery took part in the Great Manœuvres carried out by the Belgian Army.

The necessities of War have compelled the old order to give way to a new in Belgium as in this country. A special school was organized, known as the "*Centre d'instruction de sous-lieutenants auxiliaires d'artillerie*," early in the War, and placed under the direction of a competent chief, who was assisted by a few specially selected officers. The task was assigned them of training officers for the artillery as rapidly as possible. More recently a "*Centre préparatoire à la sous-lieutenance auxiliaire d'artillerie*" has been formed where young men of superior education receive preliminary instruction before being drafted to the first-mentioned Centre. The training given at the "*Centre d'instruction de sous-lieutenants auxiliaires d'artillerie*" is essentially practical in nature and lasts about four months. On completion of the course at this Centre, the young fellows are sent on to the front with the title of "*adjutant candidat-officier*" to complete their training and are attached for some months to a Section Commander.

Two "*Écoles de perfectionnement*" have also been brought into existence; one for the instruction of Section Commanders and the other for that of Battery Commanders. The latest technical developments (theoretical and practical), are studied at these schools, as well as new methods of handling artillery, etc.; lectures are also given in relation to events in progress, so far as they concern ballistics, new artillery appliances, etc., and work involving invention is also carried out at these schools.

The training of the young Belgian artillery officer is such as to continue the high scientific standard of education aimed at in the artillery arm prior to the outbreak of War and to ensure that he shall be acquainted with the latest developments of his branch of the Service.

N.C.O.'s and Men.—Prior to the War, the Belgian artillery was recruited, to some extent, from the men who volunteered for this branch of the service; but they had to come up to the physical standard required. The normal period of service with the Colours was, in those days, 26 months.

The most intelligent of the militiamen, on passing an examination, became eligible to attend the courses of instruction at the "*École de brigadiers.*" After a six months' course in interior economy, artillery material, etc., at this School the best of the students were selected for further instruction at the "*École de sous-officiers.*" The duration of the course at the "*École de sous-officiers*" was six months, on the completion of which the students were promoted to the rank of quartermaster; those adopting a military career proceeded by regular steps to the position of "adjutant chef de Section."

The War has necessarily brought about the abandonment of the foregoing elaborate scheme for the training of N.C.O.'s. When the formation of new units of field artillery was taken in hand, the authorities resorted to three sources for filling up the *cadres*.

(*a*) The men of the Garrison Artillery who had been manning the forts were incorporated into the field artillery, *i.e.*, after the capture of these works by the Germans; (*b*) the older men and the married men, recruited under the Law passed after the outbreak of War, were posted to

the field artillery and (c) so were wounded infantrymen, who, owing to the nature of their injuries though not capable of doing infantry work were yet fit to man guns, etc.

In the beginning of 1915 a "*Centre d'instruction d'artillerie*" was formed, and artillery recruits were posted thereto for a two months' course.

Horses.—Before the War the Belgian field artillery was provided with a sufficient number of horses of a good stamp; they were obtained mostly from Ireland and the Ardennes.

The riding horses generally and the draught horses of the Field Artillery were Irish, but the country-breds of the Ardennes were preferred for draught purposes in the Horse Artillery.

At the time that the retreat from Antwerp began, the waste of War began to be felt and there was a considerable shortage of animals, so much so indeed as to make it necessary for the military authorities to requisition the magnificent cart-horses, which were one of the prides of Antwerp.

In the early days of the War, the horses were overworked and passed a precarious existence, being often without protection from the rain and wind. Much has been done since then in connection with the care of horses. Veterinary hospitals have been formed for the treatment of slightly wounded animals; new types of harness have been designed and manufactured, etc., etc.

The wastage has to a great extent been made good by importation of animals from the New World. A "*Centre d'instruction*" has been established for breaking in and training these animals and for giving them a rest after their sea-voyage and also to admit of their becoming acclimatized.

Uniform.—The peace-time uniforms continued to be worn by the Belgian artillery till 1915, when, with considerable regret, this arm of the service had to take into wear the now almost universal khaki-coloured garments worn by the belligerents. The artillery khaki-uniform is distinguishable from that of the infantry by the blue piping and blue tabs worn on the collar of the jacket; the Belgian infantry garments have a red piping and red tabs on the collar.—(*To be continued*).

Notes and News.

Switzerland.—The announcement is made of the death of Colonel F. de Tscharner, which occurred in June last. The deceased officer was at one time Commandant of Artillery at St. Gothard and also served on the Staff.

Colonel Schmid, Commanding the 4th (Swiss) Division, has resigned his appointment; he is succeeded by Colonel Sonderegger, who has been recently serving on the General Staff.

A new spirit is showing itself in the Swiss Army. Officers on the Active List are expressing their opinions on the War in the Swiss Press openly, and are also showing the direction in which their sympathies lie, without suffering ostracism in consequence. This is contributing indirectly, it is said, to the re-establishment of contact between the army and the people.

A better understanding between these two sections of the Swiss people is also being directly promoted owing to journalists being permitted to

communicate to the Press military information, which they have now been authorized to obtain.

Divisional camps of instruction have been formed at various centres; the detailed information concerning military life in these camps published in the Press have caused considerable interest to be taken by the civilian population in the doings of the Army.

The question of the neutrality of Switzerland is revived. Two facts are responsible for the subject being reopened, viz.:—(*a*) The initial successes of the German offensive in France, and (*b*) the attitude of the German negotiators who recently discussed the terms of a Germano-Swiss Convention at Berne.

It is said that, even in the most Germanophil of Helvetic Centres, there was not a single Swiss, who, during these negotiations, did not feel that his country was menaced by a Teuton domination. The German proposals have apparently caused considerable uneasiness among high placed Swiss politicians; it is not so much what is contained in these propositions as the attitude shown by Germany that is responsible for the greatest alarm. Dangers lurk, it is pointed out, in neutrality; the initial adoption of such an attitude often leads to a Neutral Power subsequently intervening in a War at a time when it is too late for it to defend itself effectively.

Russia, it is suggested, has gained nothing by accepting the principle of neutrality; indeed, it has lost everything, for to-day it is completely dominated by Germany. If Russia should wish to emancipate herself now from the octopus-like grip of her Western neighbour, she could only do so by resuming the War; she is, as a matter of fact, in too enfeebled a state to resume hostilities, and any effort of hers just now would only be in the nature of a "*stratégie des petits paquets.*"

Italy, on the other hand, recognized that continued neutrality on her part might indirectly tend to promote the triumph of the Central Empires and thereby her own sovereignty might be compromised. She decided, in consequence, to abandon her attitude of neutrality before the Austro-Germans had acquired too great strength by their victories. In this she showed her prescience and her wisdom.

The question is asked: Ought Switzerland to have decided likewise? It is felt that, in view of the opinions to which Pan-Germanists have given expression in the public Press, there is little doubt what will be the fate of Switzerland should the Central Empires emerge victorious from the present struggle; these Empires have declared War on small States as well as on the great States. The answer given indirectly to the question amounts to "Yes."

Portugal.—A special correspondent furnishes a few notes on the experiences of the Portuguese troops in Flanders. The Germans made an attempt, during the early part of March last, to pierce the portion of front held by the Portuguese, but their attacks were repulsed; the Portuguese not only held on to their trenches, but also succeeded in taking quite a number of prisoners. This fact has naturally caused some elation in Portugal.

This number of the *Revue* concludes with a *Bulletin Bibliographique.*

W. A. J. O'MEARA.