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Authors alone are responsible for the statements made and the opinions expressed in their papers.—(G. 5281).

THE DESIGN OF TIMBER COLUMNS FOR USE IN THE FIELD.

By Capt. J. W. Landon, *Asst. Instr. in Fortification, S.M.E., Chatham.*

In the volumes of *Military Engineering* there is no information with regard to the design of composite columns which are built up of spars or cut timbers. It has been suggested that the following few notes might be useful to some readers :—

The working load for each of the separate members of a composite wooden column is assumed to be that found from Gordon's formula with the empirical coefficients given in *M.E.*, Part IIIA., p. 39.

The formula is :—

$$P = \frac{rA}{1 + a\left(\frac{l}{d}\right)^2}$$

where P = the safe working load, axially applied.

r = the allowable compressive stress for very short columns, in which failure occurs by direct compression, and is not due to buckling.

A = the area of cross-section.

d = the length of the axis on the cross-section, perpendicular to the assumed axis of buckling. In solid columns of rectangular cross-section d = the least dimension, if the strut is free to buckle about any axis.

l = the unsupported length of the column, measured in the same units as d.

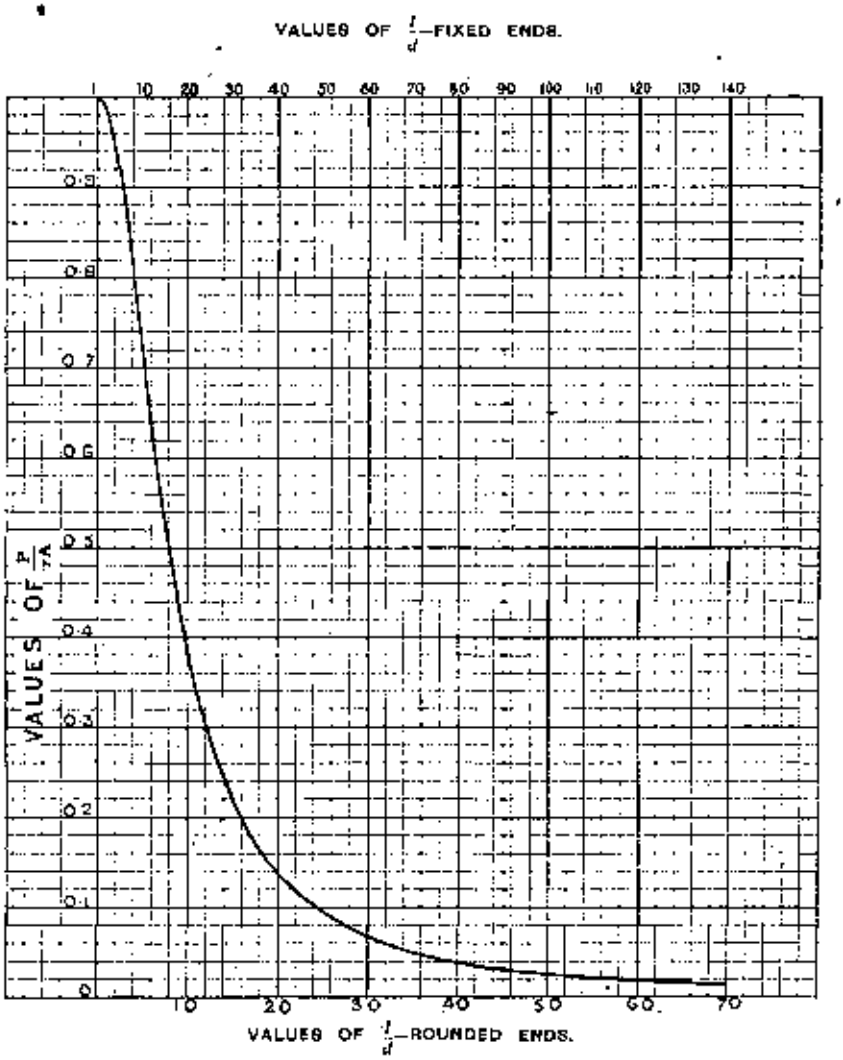
a is an empirical coefficient which varies with the end conditions and with the shape of the cross-section.

Assuming the ends rounded, for a solid strut of circular cross-section $a = \frac{1}{4s}$, and for a solid strut of rectangular cross-section $a = \frac{1}{6s}$.

It is not proposed here to discuss the accuracy of this formula, or its agreement with practical tests. Different authorities differ by considerably more than 100 per cent. in their estimate of the safe working load on wooden struts. The formula above, for moderately long struts, gives loads which are considerably less than those used by some authorities, but for field purposes this is probably desirable.

SOLID TIMBER COLUMNS OF RECTANGULAR CROSS-SECTION.

GRAPH FOR GORDON'S FORMULA.



NOTE.—For solid members of circular cross-section multiply the true value of $\frac{l}{d}$ by 1·14 before reading off on the graph.

FIG. 1.

In *M.E.*, Part IIIA., for $\frac{l}{d}=48$ the rough rule for designing struts gives a safe load for solid members of rectangular cross-section more than six times the safe load given by Gordon's formula. In this rule there seems no doubt that the ends are supposed fixed, and not rounded as stated.

Some useful graphs which have been plotted from Gordon's formula are given on *Plates* XII., XIII. and XIV. in *M.E.*, IIIA. For many purposes the graph given in *Fig.* 1, which is also based on Gordon's formula, is rather more useful and general for solid members of rectangular cross-section. In this graph the ordinate gives the load per unit area of cross-section assuming unit value of r, *i.e.* the value of $\frac{P}{rA}$. The abscissa gives the values of the ratio $\frac{l}{d}$, the top scale referring to fixed ends, the bottom scale to rounded ends.

The same graph may also be used for solid spars of circular cross-section if the ratio $\frac{l}{d}$ is multiplied by $\sqrt{\frac{16}{12}}$ or 1·14 before being read off on the graph.

Some examples of the use of this graph are given later.

With regard to end connections for struts which fail by buckling, the term "rounded ends" seems quite definite, and such a strut normally buckles as shown in *Fig.* 2 (*a*).

It seems desirable to distinguish between "flat ends" and "fixed ends." In the case of a strut with flat ends buckling may occur as shown in *Fig.* 2 (*b*). In the case of a strut with fixed ends buckling will occur as shown in *Fig.* 2 (*c*). The strength of a strut with fixed ends may be taken as the same as a strut with rounded ends of one half the length.

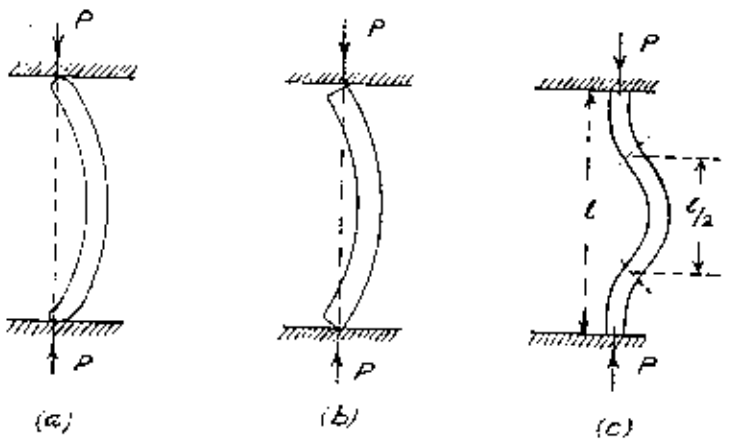


FIG. 2.

With long struts, before an end can be considered fixed the fixing must be very thorough and no yielding must be possible. In the ordinary methods of connection employed in the field the fixing will be far from perfect, and the ends should generally be considered rounded. Any additional strength which the column may have, due to a partial fixing of the ends, is of an indeterminate amount, and should be left to increase the factor of safety.

In columns used in field structures, such as trestle legs, derrick spars, etc., the load is rarely axially applied, and the eccentricity of loading is such as to cause a bending moment, usually of unknown amount, tending to buckle the column in a particular plane. This can be allowed for in most cases by using a low value of r, as is done in *M.E.*, IIIA.

For trestles made of cut timbers such as are shown in *Figs.* 5 and 6, if care is taken to ensure that the transom load is shared evenly between the different transom members, the resultant thrust on the legs will cause a bending moment in the plane of the trestle tending to buckle the legs outwards. This is due to the bending of the loaded transom which causes the intensity of pressure to be greater on the inside face of each leg than on the outside face.

In a spar trestle, when a single transom member is lashed to the legs, the tendency will be to buckle the legs out of the plane of the trestle. Here the eccentricity of loading will be comparatively large and of a definite amount. If the leg is strong enough to safely carry the load, the deflection due to bending will be quite small compared with the eccentricity of the loading, and we may in such a case calculate the maximum compressive stress set up in the leg.

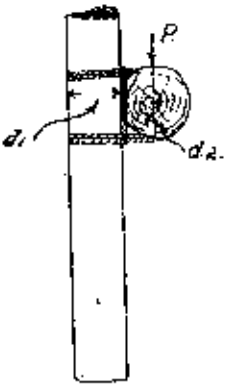


FIG. 3.

From *Fig.* 3 it is seen that the stress at any point in the cross-section of the leg may be considered of two parts.

(1). The uniform compressive stress $\frac{P}{A}$, where A is the area of cross-section.

(2). The compressive stress due to a bending moment of magnitude

$$P\frac{(d_1+d_2)}{2},$$

where d_1 is the diameter of the leg, and d_2 is the diameter of the transom.

The maximum value of this stress

$$=P\frac{(d_1+d_2)}{2}\times\frac{32}{\pi d_1^3}$$

$$=\frac{P}{A}\left\{\frac{4(d_1+d_2)}{d_1}\right\}.$$

The total maximum compressive stress

$$=\frac{P}{A}\left\{1+4\frac{(d_1+d_2)}{d_1}\right\}.$$

Let $d_1=6"$ and $d_2=10"$, sizes common in trestles for bridges to carry infantry in fours.

The maximum compressive stress

$$=\frac{P}{A}\left(1+\frac{64}{6}\right)$$

$$=11{\cdot}7\frac{P}{A}$$

$=11{\cdot}7$ times the mean compressive stress.

It should be noted that this maximum stress will occur whatever be the length of the leg.

Take the allowable compressive stress along the grain equal to 1 ton per square inch. This gives a factor of safety of about 3 for seasoned Baltic fir.

The safe working load for the leg is given by—

$$P=\frac{fA}{11{\cdot}7}$$

$$=\frac{1\times\pi\times36}{11{\cdot}7\times4}\text{ tons}$$

$=2{\cdot}42$ tons (dead load).

Let the leg have an unsupported length of 12 ft., and a mean diameter 7 ins. (6-in. diameter at the point where the transom is attached).

$$\frac{l}{d}=\frac{144}{7}=20{\cdot}6.$$

From the graph (*Fig.* 1)

$$\frac{P}{rA}=0{\cdot}1,$$

$$\therefore \quad P=0{\cdot}1r\frac{\pi\times 49}{4}$$

$$=3{\cdot}85r.$$

This should be equal to 2·42 tons if the two methods of design are to give the same result.

$$\therefore \quad 3{\cdot}85r=2{\cdot}42,$$

or $$r=0{\cdot}63 \text{ tons per square inch}$$

$$=1410 \text{ lbs. per square inch.}$$

Hence, if we use the strut formula (*Fig.* 1), in order to allow for the eccentricity of loading for this value of $\frac{l}{d}$, the value of r should be reduced from 2,240 lbs. per square inch to 1,410 lbs. per square inch.

If we take the same value of r equal to 1,410 lbs. per square inch, and use it for calculating the working load for a length less than 12 ft. we shall get a greater working load and our factor of safety will be less than 3. If the length is greater than 12 ft. we shall get a less working load and our factor of safety will be increased.

This example serves to emphasize the serious effect, so far as strength is concerned, of non-axial loading when the eccentricity is large.

It would be much more satisfactory, in a case such as that just discussed, to estimate the strength by the first method where the factor of safety is more or less definite. This unfortunately means more work on the part of the designer.

If two spars are used, one lashed on either side of the legs, then assuming they each carry half the load, the resultant thrust on each leg should be approximately along the axis. For a given load the size of the leg may be considerably less than in the case where a single transom member is used. The equalizing of the load carried by each transom member may be effected by the arrangement shown in plan in *Fig.* 4.

PLAN.

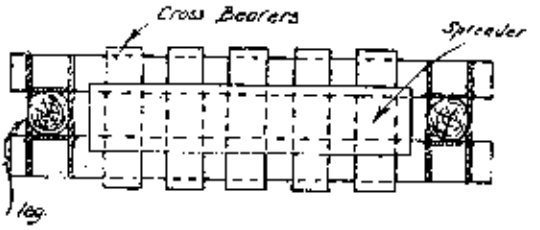


FIG. 4.

In columns which are built up of several timber members, bolted or keyed together, experiments have shown that, when failure occurs, each member practically fails as an independent unit, and the ultimate strength of such a column is not substantially greater than the sum of the strengths of the separate members. Connecting the members by bolts, nails, lashings, etc., or by any method likely to be used in the field, is not sufficient to prevent the small amount of relative sliding which occurs when each member starts to fail as a separate unit.

This simplifies the calculations for composite members. The method of connection may be such that particular members of a composite column must buckle in a particular way, but in every case the strength of the column as a whole must be estimated by considering the strength of each member separately.

A few worked examples are given below :—

EXAMPLE (1).—Required the working load, axially applied, for a strut of $9'' \times 3''$ seasoned Baltic fir, 12 ft. long, with rounded ends. The value of r may be taken as 1 ton per square inch.

$$\frac{l}{d} = \frac{144}{3} = 48.$$

From the graph, *Fig.* 1—

$$\frac{P}{rA} = 0{\cdot}025.$$

$\therefore$ working load $= 0{\cdot}025 \times 2240 \times 9 \times 3$

$= 1510$ lbs.

If the ends are fixed

$$\frac{P}{rA} = 0{\cdot}1.$$

$\therefore$ working load $= 0{\cdot}1 \times 2240 \times 9 \times 3$

$= 6050$ lbs.

EXAMPLE (2).—Suppose the member in Example (1) is prevented from buckling about the longer axis of cross-section and can only buckle about the 3-in. axis—

$$\frac{l}{d} = \frac{144}{9} = 16.$$

From the graph $\frac{P}{rA} = 0{\cdot}19.$

$\therefore$ working load $= 0{\cdot}19 \times 2240 \times 27$

$= 11500$ lbs.

EXAMPLE (3).—A derrick of 20 ft. unsupported length is made of three recently-felled spruce spars of mean diameter 5 in., lashed together at intervals. What is the maximum dead load such a composite spar can carry?

The ultimate compressive stress of seasoned spruce may be taken as 6,000 lbs. per square inch. For green spruce we may take 3,000 lbs. per square inch. Allowing for the fact that the load will probably be somewhat eccentrically applied, we will take $r = \frac{3000}{5} = 600$ lbs. per square inch.

The value of $\frac{l}{d} = \frac{240}{5} = 48$.

Taking a value $\frac{l}{d} = 48 \times 1{\cdot}14 = 54{\cdot}7$ on the graph, and reading the value of $\frac{P}{rA}$ for rounded ends we get—

$$\frac{P}{rA} = 0{\cdot}02.$$

The safe load for the 3 spars

$$= 3 \times 0{\cdot}02 \times r \times A$$

$$= \frac{3 \times {\cdot}02 \times 600 \times \pi \times 25}{4} \text{ lbs.}$$

$$= 706 \text{ lbs.}$$

EXAMPLE (4).—Two 6-in. × 3-in. Baltic fir members are to be used for the leg of a trestle which has to carry a dead load of 3 tons. The leg can be braced so as to prevent buckling in the plane of the trestle, but not so as to prevent buckling perpendicular to the plane of the trestle. What is the maximum length the leg can have and at what intervals must it be braced? (See *Fig.* 5).

Ends must be considered rounded.

Load to be carried by each 6 in. × 3 in. member equals 1·5 tons.

Consider buckling in the plane of the trestle.

Take $r = 1{,}800$ lbs. per square inch to allow for eccentricity of loading

$$\frac{P}{rA} = \frac{1{\cdot}5 \times 2240}{1800 \times 18}$$

$$= 0{\cdot}104.$$

From the graph $\frac{l}{d} = 23\frac{1}{2}$.

$$\therefore \quad l = 23{\cdot}5 \times 3 = 70{\cdot}5 \text{ in.}$$

Greatest unsupported length = 5 ft. 10½ in.

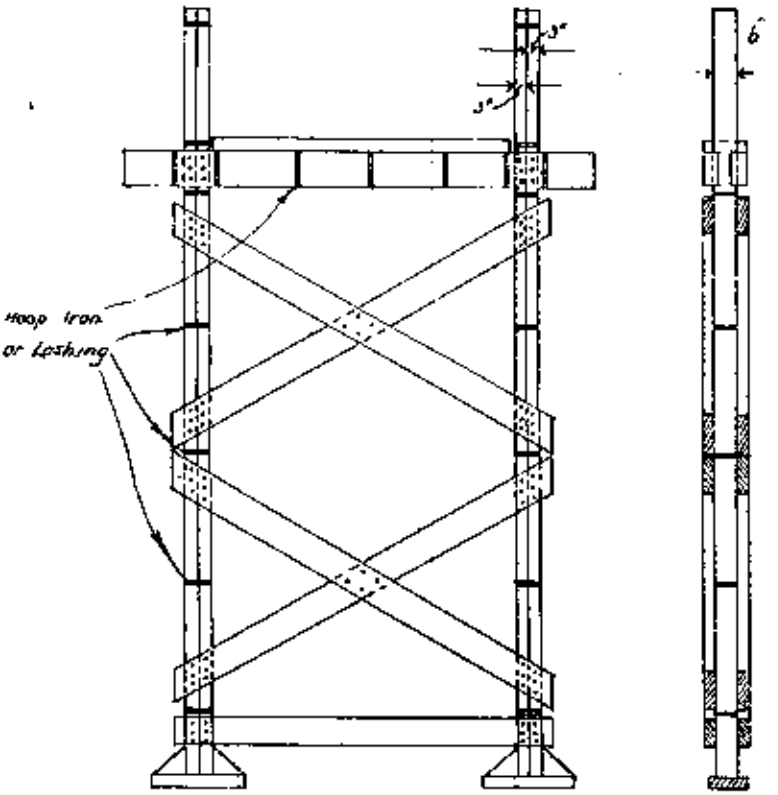


FIG. 5.

Considering buckling perpendicular to the plane of the trestle,

$$\frac{P}{fA}=0{\cdot}104.$$

From graph $$\frac{l}{d}=23\tfrac{1}{2}.$$

Greatest unsupported length $=6\times 23\frac{1}{2}''$

$$=11'\ 9''.$$

The two members of the legs may with advantage be nailed together, and bound at intervals with hoop iron. The bracing must be well fastened, and should be the same on both sides of the sides of the trestle to prevent a twisting action on the legs. It must be so arranged that it actually does prevent a movement in the plane of the trestle of the middle point of the leg in this case.

EXAMPLE (5).—The leg of a trestle is made of four Baltic fir 11-in. × 2-in. planks nailed together to form a box as shown in *Fig.* 6. It is 10 ft. long. What dead load can be safely carried by it ?

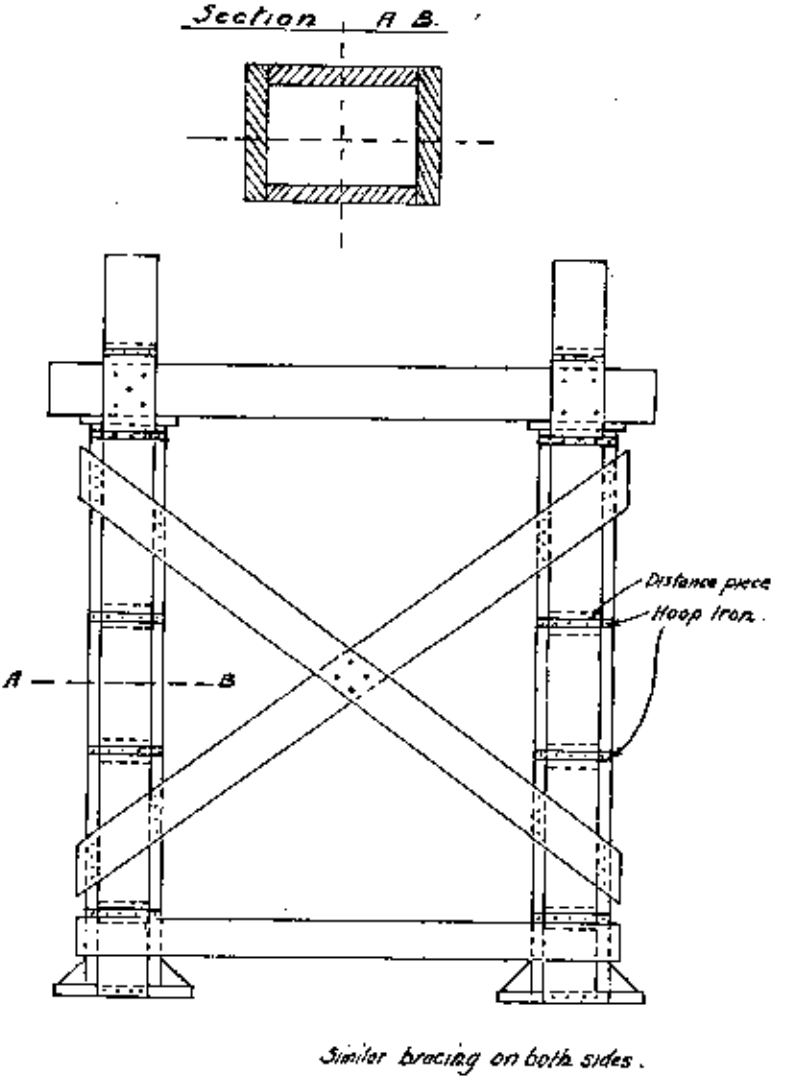


FIG. 6.

If this is made as shown in the sketch with the planks well nailed together, and with distance pieces and hoop-iron bindings at intervals, we may estimate the load as follows :—

Considering buckling either in the plane of the trestle, or perpendicular to the plane, we may assume that two members buckle about

their longer axis of cross-section and two members buckle about the shorter axis of cross-section.

This assumes that some relative sliding can take place between the individual members. In so far as the nails will partially prevent this the leg will be stronger than estimated.

For two planks buckling about the 11-in. axis

$$\frac{l}{d}=\frac{120}{2}=60.$$

From graph $\quad \frac{P}{rA}=0{\cdot}019.$

$\therefore$ load $\quad =2\times 0{\cdot}019\times 1800\times 22$

$=1500$ lbs.

For two planks buckling about the 2-in. axis

$$\frac{l}{d}=\frac{120}{11}=10{\cdot}9.$$

From graph $\quad \frac{P}{rA}=0{\cdot}345.$

$\therefore$ load $\quad =2\times 0{\cdot}345\times 1800\times 22$

$=27320$ lbs.

$\therefore$ total load per leg $\quad =28820$ lbs.

$=12{\cdot}9$ tons.

Trestles similar to those shown in *Figs.* 5 and 6 have been designed and tested for bridges to carry infantry in fours, and also for bridges to carry the 3-ton A.S.C. lorries. They have shown no sign of failure when the bridges have been tested. In both types, the transom can be temporarily lashed in a position higher than required, and its correct height can easily be adjusted after the trestle has been launched and loaded. This is a great advantage when bridging a river with a muddy bottom.

WILSON MONO-RAIL.

By LIEUT.-COLONEL ARTHUR A. CROOKSHANK, R.E

THIS mono-rail was designed by Major Wilson, R.E. (and the design on Figure shows latest improvements).

The rail is of flat or ribbon iron of about 2¾-in. by ¼-in. section. Wooden beams are placed across a communication trench overhead —about 6 ft. apart. A strap of square iron goes round the beam and has suspended from it, a hook with a split end; the rail (of flat iron on edge) rests in the split ends. The car, which is designed light, consists of a wooden tray just big enough to carry a stretcher case; it will take a load of 200 lbs. as an alternative. The tray is suspended by continuous wire from two pairs of small grooved (or pulley) wheels, by means of round iron hooks.

As far as I know the Wilson mono-rail only exists in one portion of the line in France; the majority of divisions, when they go into this part of the line, make very little if any use of the mono-rail, probably because they have never seen one before, and are frightened of it, and because their experience is confined to the 60-cm. Decauville or 2-ft. gauge light railway

It seems to be a pity that the Wilson mono-rail has not been developed and used more extensively, as it has many advantages (see Specification and Notes, below) over other types of trench railways.

SPECIFICATION AND NOTES.

The objections to the existing type of Wilson mono-rail are :—

1. The overhead beam is of freak scantling.
2. The iron strap (round the beam), from which the rail is hung is liable to get displaced, and requires frequent attention.
3. It is difficult to get the rails flush at the joint; if not flush, an offset is left, which jars and retards the car, and also makes a noise.
4. Noise is caused by the flange of the wheel striking the bolt-heads of the joint fastenings. Metallic sounds are very objectionable, especially at night.

In this design, the following changes are introduced :—

1. The overhead beam is of common scantling, and the method of supporting the ends of the beam is improved.
2. The method of carrying the rail is improved and simplified—the strap round the beam is replaced by a hook through the beam.
3. The rail joint is improved—offsets at the rail junction and the brushing of the wheels against the bolt-heads are eliminated.

Specification for this Joint.—The rail is sheared longitudinally for slightly more than the length of overlap intended. An overlap of 4 in. is suggested, in which case the strip should be sheared about 5 in. The upper tongue is to be sheared off at a distance of 4 in. from its end. The lower tongue is to be joggled with a displacement equal to the thickness of the strip, at a point slightly over 4 in. from its end. Two holes of ½-in. diameter should be drilled in the centre line of the lower tongue, 1 in. and 7 in. respectively from the end. The two ends of the rail should be precisely similarly treated. Each will then joint correctly with the next. The whole operation of shearing, joggling and marking centres for holes can be done in one operation, and will then give uniformity. This joint can be shortened considerably by reducing the overlay. Theoretically, the strength of the joint should be thereby increased. In practice, however, the shearing cannot be relied upon to give a perfect fit, and in consequence there must be a slight gap in the butt joint of the upper tongues. The stiffness of the joint must therefore depend largely upon the accuracy of the fit of the two bolts, and the further apart these are placed, the less yield in a vertical plane will be permitted by a slight slackness in the fit of the bolts.

This type of mono-rail has very great advantages over other kinds of trench railways :—

1. It is invisible.
2. It can be run all day.
3. It makes very little noise, and that noise cannot be located, and in those parts of the line in which it has been used, it has never attracted enemy fire.
4. The ordinary traffic of the communication trench is not interfered with—both traffics (mono-rail and foot passengers) can go on at the same time.
5. It is economical in power—one man per car is ample. The car carries one stretcher case or 200 lbs.

6. The rail can be carried round practically any curve—*e.g.* it goes round traverses with 90° corners.
7. Both the line and the rolling stock are very light, also cheap in initial cost and in maintenance—damage and wear and tear are slight.
8. Being in a trench, it is difficult for the enemy to observe artillery fire directed at it.

The usual type of trench railway, viz., 60-cm. Decauville, has none of the above advantages.

Outside the trench area and in other places the Wilson mono-rail can be run overground to connect underground mono-rail base with lorry-head or broad-gauge railhead. (See design entitled Wilson Mono-Rail Overground Type).

Overground type is explained in the Specification and Notes.

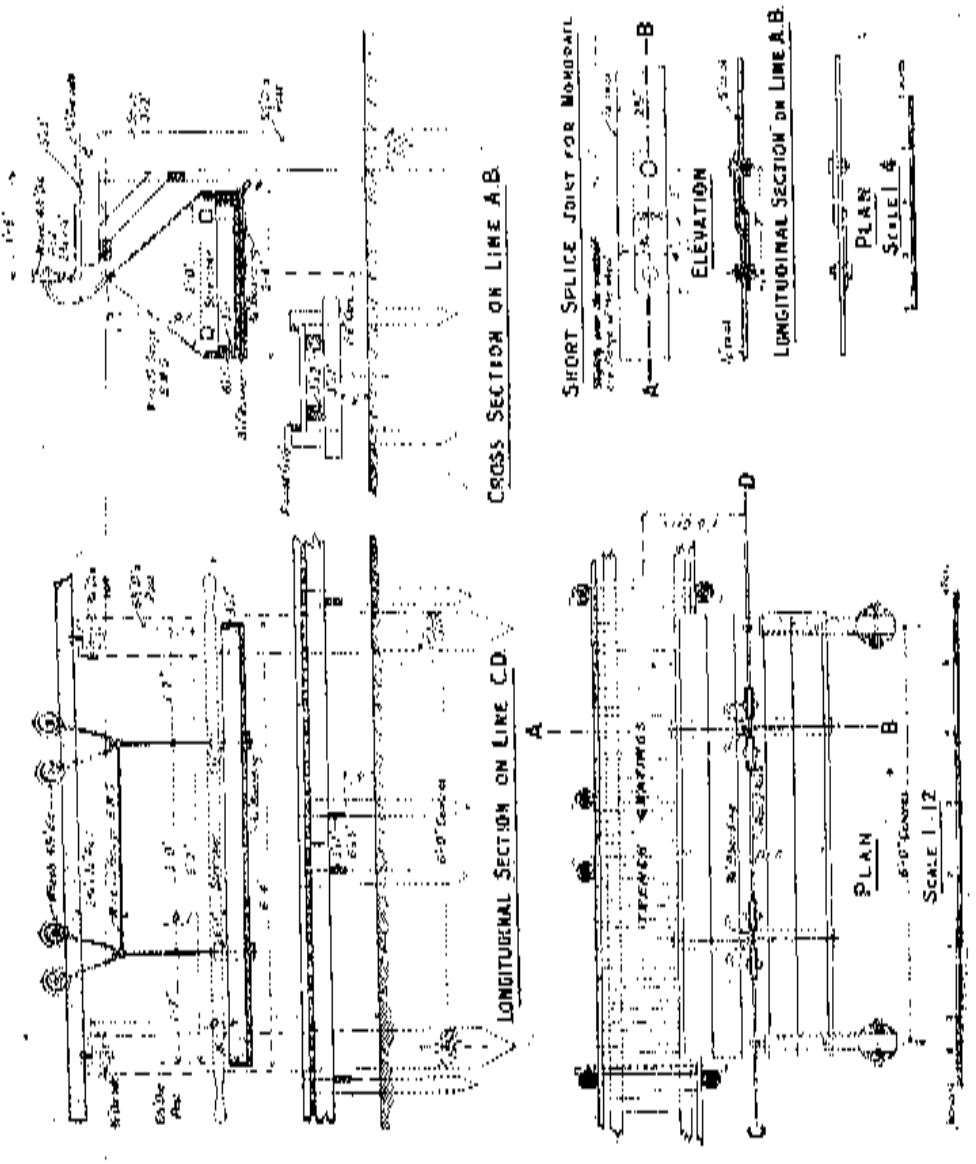
The designs are almost entirely by Major A. C. Finnimore, R.E.

WILSON MONO-RAIL.

Improvements designed by Major A. C. Finnimore, R.E.

WILSON MONO-RAIL, OVERGROUND TYPE.

Designed by Major A. C. Finnimore, R.E.



THE BATTLE OF JUTLAND.

H.M.S. "REVENGE," *29th November*, 1916.

I THINK we saw as much of the Jutland action as anyone in the Grand Fleet. Our squadron was closest to them and we undoubtedly got the best view that the weather conditions allowed, though, of course, we didn't see as much actual fighting as the battle cruisers. Such a lot has been written of the show that I don't suppose I can improve upon it, but perhaps my own impressions might be interesting. We were steaming furiously towards the scene of action and gun-fire could be plainly heard when suddenly a line of ships appeared out of the mist on the starboard bow, which turned out to be our battle cruisers. We could see splashes 100 to 200 ft. high falling alongside them and they themselves were banging off pretty hard. Of the enemy we could see nothing although the B.C.'s were only about 4,000 yards away. They passed across our bow pretty rapidly as they were going 25 knots. Almost immediately we deployed to port and proceeded to look round for the enemy, but could see nothing but a line of heavy flashes that rippled down their line, the leading ship appearing to be just abaft our beam.

The 1st C.S., led by *Defence* and *Warrior*, were now chasing a German light cruiser back towards the line of flashes, but when about 3,000 yards inside our line they suddenly came under a most devastating fire and turned and began to close our line evidently with the intention of passing under the stern of the last ship of the line. At times they were literally obscured by a solid wall of water reaching above their mastheads, out of which would emerge a bow and then a bridge and so on. When she reached a position about abreast of and 1,000 yards from us the *Defence* was sunk. When the smoke cleared away there was absolutely *nothing* left. The same happened to the *Queen Mary*, for 30 seconds after she sank the *Tiger* steamed through the cloud of smoke and steam without touching or seeing a thing.

For 10 minutes or so more we saw nothing but the flashes from their guns and then a few shadowy forms emerged out of the fog for short intervals during which we opened a slow fire, but I don't think with much result.

Being at the rear of the line we could not of course tell much of what manœuvring was going on, but I believe that we were at this time endeavouring to turn their van. When this sort of pot-shotting had been going on for about 20 minutes they disappeared completely and we seized the opportunity to turn in divisions towards them. As

we did so the *Marlborough*, our next ahead, was torpedoed. I happened to be watching her at the moment. I thought she was going for a moment, but she recovered herself and remained with about 7° of list on.

Six minutes afterwards nine Huns suddenly came into full view. I know it was nine because I counted them, but where the remainder were I don't know. Anyway we got to work on them at a range of about 10,000 and were soon rewarded by heavy bursts of flame which accompanied the hits. The fire appeared to be chiefly concentrated on their leading four or five ships and these must have had a nasty time as for the next half-hour they were continually surrounded by a cloud of smoke from fires, etc. The leading ship, whom we could naturally see best, was, at the end of 20 minutes, only firing her fore turret while the rest of the ship was continually bursting out in flames. It was a most gorgeous sight.

Personally I thought that one of the others blew up, but the visibility was not good enough to tell for certain. They had a few smacks at us during this time, but bar a few chunks of iron from short bursts, which came on board, we were not touched.

They stuck it out for half an hour and then under cover of destroyer attacks and smoke screens bolted. Even then, being the faster fleet, I don't quite see why we should have lost them, but although I have heard a lot of argument about it I have never really discovered the reason.

Anyhow, lose them we did and night was quickly on to us. All through the night we steamed south with the fleet, but, as the damaged *Marlborough* was leading our sub, we slowly dropped astern of the rest. This we didn't know at the time. Three during-the-night attacks took place on big ships quite close to us and some very pretty fireworks there were too—searchlights, guns and cordite fires on board the attacking destroyers, and on one occasion the whole sky was lighted up as a big ship blew up some way astern. These we imagined to be the Hun destroyers attacking one of our other squadrons. Little did we realize that it was the High Sea Fleet being attacked by ours. However, nothing came near us and when daylight came there was a thick fog. Early in the morning the *Marlborough* was sent off home and the Admiral transferred his flag to us. Shortly after he arrived we sighted a Zepp and had a shot at it. As a matter of fact we fired two salvoes, but unfortunately without getting a hit. Still, it scared her a bit as she didn't wait for a third, but pushed off at full speed. Funnily enough, however, the aforesaid salvoes went careering off into the fog and fell about 300 yards off one of our own battleships 15 miles away. That was the last shot we fired and it really ended our warlike adventures as there was nothing left to do but return, the Huns being undiscoverable, and we sadly wended our way back North.

REVIEW.

PAGES D'HISTOIRE, 1914—1917.

(Librairie Militaire Berger-Levrault, Paris: 5, Rue des Beaux-Arts).

Continued from R.E. Journal for July, 1917.

The 129th number of this series is entitled *La Manœuvre Allemande* and deals with the peace-kite sent up by the German Government in the winter of 1916. The contents of the volume are grouped in seven sections and consist of the texts of certain official documents and of the speeches delivered in connection with the attempt of the German Kaiser to secure a German peace. The volume is provided with appendices (under five heads), containing extracts from Press articles published contemporaneously with the initiation and failure of the German Government's efforts to secure its ends. These contents are preceded by a Preface written by Monsieur Georges Reynald, Senator for the Ariège and Secretary to the Commission for Foreign Affairs. In this Preface Monsieur Reynald summarizes the situation in the light of the documents, etc., connected with the German Kaiser's peace manœuvre. He points out that the concluding weeks of 1916 and the opening ones of 1917 were accompanied by the outpouring of an enormous volume of diplomatic correspondence, *e.g.*, the German Note, containing the offer of an illusory peace; the intervention of President Wilson, calling on the belligerents to declare their war aims; the reply of the Central Powers to President Wilson, amounting to a refusal to discuss the situation; the reply of the Entente Powers, which, whilst maintaining a firm and courteous attitude towards the President of the great American Republic, provided a dignified and spirited answer to the peace manœuvre of their enemies; the irate rejoinders of the disappointed Germanic States, ending in the announcements from the Wilhelmstrasse and the Ballplatz of their intention to prosecute unrestricted submarine warfare, acts resulting eventually in the rupture of friendly relations between the United States of America and Germany.

The correspondence referred to may, Monsieur Reynald points out, be studied with profit; it represents, so to speak, the heavy artillery of the several Chancelleries in action, an action of such intensity as to have exhausted the supply of ammunition in its parks. Public opinion was, at first, much disturbed by the opening shots; it was shaken by the shock and explosive wave arising from the comments in the Press that followed; later, the public regained their composure, and the texts of the documents published were examined with a view to ascertaining the nature of the arguments, in support of their respective propositions, used by the several parties concerned.

Monsieur Reynald justly claims that in this respect France and her Allies were certain to win. The Entente's case rested on logical reasoning and was presented in unambiguous phraseology. The confident calmness and frankness shown in the Entente's reply is in marked contrast with the equivocation and reticence apparent in the German documents, etc.; the latter seem to have been designed solely for the purpose of creating a favourable impression.

In order to render the study of the diplomatic correspondence in question profitable to the fullest extent, it is necessary to place the texts of the several documents in their proper sequence, and this is what the editors of the volume under review have endeavoured to do; they have collected between two covers all the depositions in the case. This collection unfolds the elements of a veritable drama, such a one as not even the most ancient of theatres has seen staged. The scene is one of the vastest that can be conceived, it extends across the Old World even unto the New; the plot concerns itself with the answer to the question whether the War, which is engulfing Europe and claiming thousands of victims daily, shall be prolonged or shall be brought to an immediate termination; the *dramatis personæ* are none other than whole nations, who like the heroes of the tragedies in the ancient classics, are resorting, in giving expression to their sentiments, to the similar practice of taking the whole world into their confidence. In the first act in this game, says Monsieur Reynald, Germany plays the leading part. She struts on to the stage encased in armour, wearing a visored helmet and with a drawn sword in her hand. It is Germania, the warrior, whose stalwart figure the Teuton loves to parade, that appears behind the footlights. She stands erect, the point of her drawn sword resting on the ground, her hands on its hilt; she endeavours to provoke her adversaries to make peace, much in the same way as she provoked them to make war.

In her declamation can be traced a mixture of hypocrisy, haughtiness and violence. Her words make mention of humanity being struck a deadly blow in the most precious part of its heritage, of the material and moral progress of Europe lying heaped up in ruins. Then casting a satisfied glance on her own form and figure, she lauds her own vigour and power exultingly. The phrases ring out; indestructible force, military successes, unbreakable lines. To Germania the victory, to others the responsibility for the War. 'Twas not she who was the instigator of the Great Conflict; the necessity of securing her national existence against the ambitious designs of her neighbours compelled her to fly to arms; she has now, and always has had, the deepest respect for the rights of other nations.

To show the intense amicability of her disposition Germania is willing to exhibit extreme moderation in utilizing the fruits of her Great Victory. She could utterly crush her enemies and completely annihilate them; but she prefers to invite them to formulate peace proposals, making the reservation alone, that the honour and free development of Germany shall be duly provided for. Lest her adversaries may not make haste promptly to accept this magnanimous offer, it is intimated that a refusal on their part will arouse the very depths of the anger of

the Germanic nations, and this will result in bathing the recalcitrant Entente Powers in a higher tide of blood than that of previous springs.

Very different is the manner of President Wilson's entry on to the stage; there is no blustering either in his speech or in his manner; he no longer wears the picturesque garb of Uncle Sam, so familiar in ages past. Mr. Woodrow Wilson, says Monsieur Reynald, is a modern American; he comports himself with dignity and correctness. His character is composed of the two contradictory elements, for which his compatriots are noted: practical sense and spiritualistic tendencies. This combination of realism and idealism is a result of the conditions under which the American nation has grown up. Immigration has played a very considerable part in building up the American nation. The immigrants were men possessing the spirit either of adventure or of enterprise; they were animated with the desire of obtaining material prosperity and of seeking in an enlarged outlook some compensation for their exile. They took with them to their country of adoption the qualities of goodwill, energy and initiative; to these qualities is it due that the United States of America has reached a very high level in the sphere of economic power.

Emigration, Monsieur Reynald points out, is rarely a spontaneous movement; it has frequently its origin in political unrest or social upheavals. Fugitives and the outlawed labour under a sense of violated rights and of injustice suffered and, on leaving their native soil for distant lands, resolve to establish in the latter a more equitable code of justice and a wider range of liberty than that prevailing in their own homeland. The New World was impregnated by the colonists, who first settled on its Atlantic seaboard, with the virtues of Puritanism. In this environment the business life and commercial activities of the American people have descended from one generation to the next as a patrimony, in which ideals have ranked high.

The President of the United States, who is a professor and a jurist, naturally gives due weight to the theoretical considerations governing a problem, and he expresses himself accordingly with the serenity of a philosopher accustomed to act on first principles. His language is that of a magistrate, nay even that of a judge. It is palpable that he has exercised scrupulous care in maintaining absolute impartiality, that he has rigidly avoided giving expression to his own personal views on the situation.

No one can be unmindful of the part America has played as the Universal Provider of the Armies of Entente Powers during the War; a part whereby her people have been enormously enriched. Maybe, says Monsieur Reynald, President Wilson may have thought that his countrymen were becoming too prosperous just now and that it was necessary, in consequence, to put on the brake on the too rapid growth of wealth, lest this should give rise to a situation likely artificially to modify, and thus upset, the economic equilibrium of the State. The President may further have anticipated that some danger existed also of the financial resources of the Powers that had become debtors of his country becoming exhausted. The fact stands out that Mr. Woodrow Wilson is a statesman of great capacity.

There remains to be considered the part played by that other group in the Cast: the Entente. She also is wearing the harness of war, and blood is flowing from her wounds. But she stands upright and faces her audience with a proper pride; her robust appearance indicates that she is not inferior in vigour to massive Germania, and the opening words with which she introduces herself to her audience strikingly exhibit her moral superiority over that of the first actress that appeared on the stage. Having to make a twofold reply, the modulations of her voice vary according as she is addressing the first or the second of her interrogators, but one and the same idea continues to pervade her entire dialogue. Turning first to her aggressor, she indignantly refutes the erroneous assertions contained in the German note. With dated documents in her hand, she conclusively shows that it was the Teuton that decided to plunge Europe into a War; there is no difficulty in exposing the imposture. She vigorously denies that victory has been won by the Germanic Empires; it is because they see all chance of success disappearing that they have taken hurried steps for the purpose of securing peace. She is not to be easily duped, she perceives that the peace offer is but a decoy. The innumerable crimes committed by Germany and her Allies demand the infliction of punishments and compel the Entente to demand guarantees for future good conduct. It is easy to see through the Teutonic game, Germany seeks to disturb the relationship of the Allies, to encourage the faint-hearted amongst her own people, to intimidate Neutrals in order to justify a resort to further crimes more abominable, if that were possible, than those she has been guilty of hitherto. Its very insincerity makes it impossible for the Entente Governments to consider the Teutonic proposition. It is emphatically announced that the only peace with which the Entente Powers will be satisfied is one which provides reparation for the rights and liberties violated, the recognition of the principles of nationalities and of the free existence of small States. At the same time it is clearly stated that causes tending to put the security of nations in jeopardy must be effectively eradicated.

Addressing President Wilson, the Entente acknowledges the purity of the sentiments with which he is inspired. She is animated with the same desire for peace that he is; she also wishes to see the creation of a League of Nations whose duty would be to ensure Right and Justice throughout the wide world. But a durable peace can only be brought about by securing a suitable decision in the present conflict; since the responsibility for setting this conflagration ablaze rests on Germany's shoulders, punishment must be meted out to her. All the wrongful acts witnessed have been Germany's doing, and Neutrals must alone blame her for all the sufferings caused them by the War. It was but necessary to recapitulate briefly the facts relating to the incidents which preceded the War to establish, without any possibility of contradiction, the intentional aggression committed against the Entente Powers by Germany and Austria-Hungary.

Having made the above preliminary observations the Entente declares herself ready to reply to the question put by President Wilson. She experiences no difficulty in doing so, for her war aims are already known

and have been announced openly on several occasions. Without pomposity or boasting, she again proclaims the noble and grand programme she has laid down wherewith to crown her efforts when success finally is assured to her arms: restoration of the territories of the Small Powers devasted by the enemy, evacuation of the invaded provinces, restitution of regions taken by previous acts of violence, liberation of oppressed peoples, in a word her war aim is to bring about a reconstruction of Europe on lines which will provide a sufficient guarantee to ensure a stable peace in the future and the free economic development of the European nations. It is to secure these ends that so many and great sacrifices have been suffered.

Monsieur Reynald next seeks the secret springs, hidden behind the scenery, which have been actuating the machinery brought on to the stage. What was Germany's motive in coming forward as the herald of peace? And why at the particular moment chosen? The replies to these questions are by no means simple to frame; the duplicity of Germany tends to complicate the terms to be employed in the answers. "Berlin," says Monsieur Reynald, "has not involved itself in such an adventure without having first carefully weighed the *pros* and *cons*, without having turned over all the hypotheses and without having clearly in view the ultimate consequences of the step taken." He expresses the opinion that Germany was animated with a real desire to obtain peace, and this for extremely sound reasons. The course taken by the War has been widely different to the one that the German nation persuaded itself to anticipate, and their hopes have consequently been bitterly disappointed. The Great General Staff thought that it had considered every contingency and that it had succeeded in making complete arrangements to meet them all. It was imagined that the campaign would be short and brilliantly successful; a few weeks alone would suffice in which to woo Nice, the goddess of victory, to win her, and to lead her to the Teutonic camp as a laughing bride. In consequence, the German Mars started off light-heartedly on his errand to court the goddess; no one in Germany doubted for a moment that the sedulous care which had been taken to prepare the way to win her affections would fail to achieve the purpose in view; minuteness and method were the accompaniment to the Teutonic love song. The harmony, it was expected, would be perfect. But Nice proved obdurate, she was not prepared to accept the advances of this suitor. Many months slipped away and she still continued to refuse to fall a victim to the Teuton's wiles; there now seemed to be little hope of causing her to change her mind. The disappointments met with in this courtship have adversely affected the German nation in other fields also; German commerce, hitherto so prosperous, is paralyzed, the economic life of the Empire is at a standstill, mourning is spreading far and wide over the Fatherland, and serious discomfort and inconveniences have to be faced at every hearthside. The courtship upon which the German nation entered, instead of providing it with a richly dowered bride, has brought for its people nothing but sadness and ruined hopes. That which was to have proved advantageous to the nation now turns out to be a heavy and onerous burden. Public opinion in Germany has

become weary, and discouraging symptoms have taken the place of the enthusiasm which burst into ebullition in the first days of August, 1914.

Germany further recognized the fact that, since the Entente Powers were not smashed by the first shock of her assault, they are now able to develop their latent strength to its fullest capacity. Meanwhile, Germany herself is far from being inactive or resigned. She has indeed surpassed herself and is striving to prepare herself for a supreme effort to turn the tide into channels which will spell success for her; she has concentrated her attention on everything imaginable likely to be of service to her; she is inventing new foodstuffs; she is increasing enormously the output of her factories; she is unceasingly improving her artillery and increasing the number of her guns; she is multiplying the number of her submarines; indeed, in all domains affecting military operations, she is making the most prodigious efforts; but at the same time the Entente Powers show no less activity. France, instead of becoming weaker and disheartened, as the German psychologists persuaded themselves, and had also taught their compatriots to believe, would be the case, remains unconscious of any feeling of exhaustion, indeed her sons are redoubling their deeds of heroism; Great Britain, breaking with all old traditions, has become a nation in arms and has performed miracles in the matter of raising armies and equipping them for War; Russia in the East and Italy in the South are both working in the same spirit as their Western Allies and are compelling the Central Empires to employ their forces on extremely extended fronts.

Can it be wondered then that, under the circumstances then existing, a feeling had grown that it would be well for Germany to finish with an adventure which had miscarried and whilst it was not yet too late for her to obtain some profit therefrom, in spite of the partial failure of her great designs. The War map, at all events, was bringing some comfort to her people, and if deductions as to the nature of peace terms could with certainty be based thereon, their expectations might reasonably be of an optimistic rather than of a pessimistic kind.

The German nation unquestionably wished for peace, but for a peace in which its own interests alone would be served and safeguarded. However, for the German proposals to be acceptable to her adversaries and to receive serious consideration, it was indispensable that the Chancellor at the Wilhelmstrasse should formulate his offer in very precise terms and should at the same time adopt a conciliatory attitude. The Imperial Chancellor acted, however, on directly contrary lines; he displayed considerable reticence and also attempted to bemuse his adversaries, and the world at large, with equivocations. Monsieur Reynald points out that it is not necessary to be a wiseacre to realize that Berlin had not, in making the offer of peace, renounced in the slightest degree the extreme limits of its domineering ambition, and that what was offered under the euphemism of peace was but that condition of existence which others have labelled *servitude*. Germany has been the victim of her pride and of her bluff, she has placed herself in a cleft stick from which she will find it difficult to extricate herself. She has exaggerated the extent of her victories; she has stimulated the expectations of Pan-Germanists; she has enlarged upon the rights and future of the Teu-

tonic race; she has heralded the apotheosis of a still Greater Germany than that of 1914. She finds it difficult now to save face; and the Imperial dynasty desires to avoid the dangers to which it would be subject in the event of a termination of the War without some compensating advantages to the German masses, who have borne the burthen of the War, exasperating them to such an extent as to cause them to turn against those who must be finally held responsible for all the sufferings and misfortunes that have overtaken them.

Monsieur Reynald points out that however obtuse its psychological instinct may have been, nevertheless the Wilhelmstrasse had distinctly foreseen that its attempts to secure the peace it was seeking would most certainly have met with failure had the German war aims been disclosed in their true and hideous colours. It was expected that the chances of securing the end in view were greater if the magic word *peace* could be dangled before the world to act as an enticing bait wherewith to hook an unwary belligerent.

The Teutonic calculations proved false. The *manœuvre* distinctly displayed considerable ingenuity, for Germany in no way committed herself; she arranged that she should hold all the trump cards in her own hand. The ruse was well contrived, at least, so it was thought in Berlin. Germans do not readily renounce the error of their ways. The licensed intellectuals of the Empire had decreed that France was incapable of carrying on a prolonged war; her sons did not possess a genius equal to that of the Germanic peoples. Facts which daily and hourly are contradicting the doctrines preached by the Teuton professors, have not yet upset the faith of the Germanic peoples in their teachers and leaders. It continues to be thought in Germany that there is some weak place in France's armour which can be enlarged into a fissure of sufficient size to enable the decisive stab to be struck through it. It was hoped that the peace offer would throw so bright an illumination on the figure of France as to lead to the discovery of this weak point in her armour. It was known that there was a section of the French people that was eager for peace; it was on the cards that the old quarrels between the several parties in France might be renewed and that pressure might be brought to bear on the Government by those blinded by false appearances. In this event, the infection might spread to others of the Entente group; a powerful pacifist clique had existed in Great Britain in former times, its members might possibly be aroused from their torpor by the alluring German offer! There was want of unanimity in war aims in Italy also. Finally, there were those in Russia who, for many reasons, would be inclined to listen favourably to a proposal promising peace. Germany might yet obtain by diplomatic means, so it was hoped, the victory which had escaped her grasp on the blood-stained fields of war. In this, as on a former occasion, she deceived herself and her illusion was of very short duration. The answer to Germany's cunning manœuvre is to be found not alone in the collective note of the Entente Powers, but in the hurricane of indignation of the people of the Entente group, which spontaneously swept the treacherous peace offer into the cloud of things unacceptable; the halls of the legislative assemblies in every Entente country resounded with the ener-

getic and vigorous rejection of the proposal. The impudence with which Germany began the War, her contempt for treaties, the cynicism of her people, at a time when the German armies were temporarily in the ascendant, were recalled with vividness. How could Germany dare to undertake the safeguarding of the interests of civilization? By what title or right did she claim to speak of conciliation and of peace? Could any confidence be safely placed in her? These were some of the questions asked to which reliable answers were sought.

The rebuff that Germany met with, says Monsieur Reynald, must have been extremely disconcerting to her; it is always an unpleasant experience when some particularly smart trick, of which one is the inventor, fails to come off. In the case of the German peace offer the failure was particularly galling in view of the fact that the manœuvre was intended to deceive not only the Entente Powers, but also Neutrals; aye, even the whole of the Teutonic race in addition.

Neutrals were by no means without a stake in the situation, and this had been fully recognized by Germany. One has only to recall the patience and tenacity shown by German agents in their attempts to manage public opinion in the United States; the Wilhelmstrasse has at least endeavoured to persuade President Wilson that much importance was attached to the views of his government; Von Bülow and a whole host of Teutonic underlings had been haunting the German Legation at Berne for months with a view to creating the impression that considerable value was attached to Helvetic sentiment. Finally in Spain too, to refer only to one other of the Neutrals, a vast amount of propaganda work had been done with a view to sow the seeds of Germanophilism. How is it, the question is asked, that none of these Neutrals appear to be flattered at being chosen as intermediaries to bring about a state of affairs that will cause the ills they have been suffering from the War to come to an end? The answer will be found later.

So far as the docile and confiding masses of the German people were concerned the failure of the manœuvre was not likely to cause the governing classes any serious anxiety. It could always be represented that they were the conquering nation, but that their adversaries obstinately withheld the fruits of the successes won, and were firmly resolved to seek the ruin and destruction of the Germanic races. Consequently, the Entente people merited neither compassion nor mercy at the hands of the Teutons who should therefore brace their energies and consecrate all their resources to obtain one end, a crushing German victory. Hate thrives particularly well on German soil, and the prospect of seeing Entente innocents fall victims in the Great Conflict would momentarily console the Teuton for the sacrifices he would himself have to make.

Neutrals naturally formed their judgment on the situation with little or no bias. War is hard on all alike and Neutrals cannot escape from its toils. So that when Germany began to seek for pretexts to justify "frightfulness" of a novel and atrocious kind that would cause added sufferings to Neutrals and belligerents alike, she raised against herself every Power who had an interest that could be injured, and in consequence, powerful and legitimate protests were raised in every quarter of the globe.

The United States of America had already defined her attitude and had claimed to be qualified to speak in the name of right and humanity. President Wilson was not to be cajoled into surrender of his opinions by any hocus-pocus conciliatory proposals. He wanted a plain answer to a plain question. Hence it was that the anger of the German people rose to white heat. A short and sharp answer was given by the Wilhelmstrasse and President Wilson was made to understand that his intervention was considered inopportune and that Germany was not prepared further to pursue the matter of the offer she had made.

Germany has as many War aims as she has enemies. She has from the beginning hoped to sow dissensions in the Entente camp and thus to divide its members by indirect and secret intrigues. She still retains the hope that she will succeed in doing this and then make a separate peace with each of her adversaries. She has had the chagrin to see her "*offensive diplomatique*" suddenly crumble away. To announce to Neutrals her intention of making her promiscuous submarine warfare was indeed something that required delicate handling. Had Germany put forward more plausible arguments than she did, it is probable that she would still have failed in her attempt; but, being caught in her own trap, she has lost all authority and to-day finds herself utterly discredited. No longer able to persuade, Germany has taken refuge in wild anger and manifestations of extreme violence.

Wilhelm II., no longer able to contain himself, launched out on the 12th January, 1917, with a bellicose proclamation to his people; the pacifist of yesterday became the frenzied apostle of destruction; he even found it necessary to antedate to the preceding October, a letter addressed to the Imperial Chancellor, and satisfied his personal vanity, says Monsieur Reynald, by sandwiching this period of diplomatic activity between two acts emanating from his brain and between two documents bearing his signature.

Germany has been baffled; she deceived no one and is still saddled with full responsibility for her misdeeds. She has slunk back into the crooked paths she has been following for so long. She is defying the whole world and playing the pirate on all the sea routes. The great American nation has ceased to utter vain protests. President Wilson, acting on behalf of his compatriots and as a true interpreter of international law, has made known the judgment of the American people; a judgment which contains the condemnation of a cruel, rapacious and treacherous Power.

Such has been the end of the *Manœuvre Allemande*.

The following brief summary of the documents, etc., in the volume under review may prove of interest:—

Section I. opens with the text of the Kaiser's letter dated 31st October, 1916, addressed to "My dear Bethmann." This letter is followed by the text of the radio-telegram sent out from Nauen on the 12th December, 1916, announcing that the Imperial Chancellor had placed the now famous Note, containing the German peace offer, in the hands of the diplomatic representatives at Berlin charged with the task of looking after the interests of the Entente belligerents. Next follow the text of the Note in question; the Imperial Chancellor's speech in the Reichstag

dealing with the situation; the German Note to the Pope; the telegram sent by the Austro-Hungarian Government on the 12th December, 1916; the orders issued, on the date last mentioned, by the two Kaisers to their own armies respectively; the statements of Baron Sonnino and of Monsieur Briand made, on the 13th *idem*, in the Italian and in the French Chambers respectively; the statement of Tisza made, on the 14th *idem*, in the Hungarian Chamber; the Russian Note (in reply) issued on the 15th *idem*; statements of the British Prime Minister and of Mr. Asquith made, on the 15th and 19th *idem*, in the Commons.

Section II. opens with the text of President Wilson's Note of the 21st December, 1916, to the belligerent Powers; it is followed by the Swiss Note of the 23rd *idem* to the same Powers, and concludes with the manifesto of the Czar to his Army and Navy (issued 25th *idem*).

Section III. contains the text of the replies of Germany and Austria-Hungary to the American Note and also the text of their replies to the Swiss Note, all four bearing the same date, viz., the 27th December, 1916; then follow the Spanish Note to President Wilson and the Note of the Scandinavian States to the Entente Powers (both dated 29th *idem*).

Section IV. is devoted to the reply of the Entente Powers to the Central Empires (dated 30th December, 1916).

Section V. contains the texts of the reply of the Entente Powers and of the Belgian Note addressed to President Wilson (both dated 10th January, 1917).

Section VI. contains the texts of the second Notes to the Neutrals by Germany and by Austria-Hungary (both dated 11th January, 1917); Kaiser Wilhelm's proclamation to his people (dated 12th *idem*); the British Note to President Wilson (dated 16th *idem*); the texts of the replies of the Entente to Switzerland and to the Scandinavian Powers (both dated 17th *idem*); the text of the Bulgarian reply to the Entente Note (dated 21st *idem*).

Section VII. is devoted to the message sent to the American Senate, on the 23rd January, 1917, by President Wilson.

The Appendices contain extracts from the American and Continental Press covering the following periods:—

I. That succeeding the issue of the first German Note.

II. That succeeding the statements made in the Entente Legislatures in relation to the German Note.

III. That succeeding the issue of the American Note.

IV. That succeeding the definitive reply of the Entente Powers to the Central Empires.

V. That succeeding the definitive reply of the Entente Powers to the American Note.

The 130th number is entitled *Les Sous Marins*, and consists of seven chapters contributed by Monsieur J. Hutter, Engineer-in-Chief of the French Navy.

Chapter I. of the volume is devoted to the "History of Submarine Navigation." The progress of science, Monsieur Hutter points out, has enabled man in recent years to explore regions which, in former times, was reserved exclusively for the use of the fish species and of the winged creatures of the air. A close similarity exists in the problems

connected with aerial flight and submarine navigation; aircraft and U-boats both direct their courses in fluid media and possess the valuable quality of being propelled in spaces of three dimensions. The engines which supply them with the necessary power have, however, motions in but two dimensions. A close study of the theory of the two kinds of craft in question discloses the fact that in matters connected with buoyancy, steering and stability the requirements as to the means and machinery to provide for these qualities are identical in the two cases.

The success of the first aeroplanes was due, as is well known, to the work and experiments of the two American brothers, Wilbur and Orville Wright, in 1908; it is less well known that the first U-boat was also of American design, being invented by Robert Hudson, of Pennsylvania, in 1797. Fulton was considerably in advance of his times; steel constructions had not been thought of in his day and therefore the hull of his U-boat was built entirely of wood, and the muscles of human beings directly provided the power necessary for the submersion, propulsion and steering of his craft. Many details concerning Fulton's U-boat will be found in the volume under review. The next step in advance was taken by two Frenchmen, Admiral Bourgois and Charles Brun, the engineer; their work too was premature, as suitable machinery for causing U-boats to submerge had not yet been invented. However, the original U-boat, the *Plongeur*, built at Rochefort in accordance with their designs, is still in existence, being in use as a reservoir ship. The characteristic feature, and one to which its want of success was due, consisted in the use which was made of compressed air for its propulsion. The idea was good and was later utilized by Whitehead for driving his auto-torpedo; but a torpedo is a small thing compared with a U-boat. The space required and the weight of the compressed air cylinders was very considerable in the *Plongeur*, and, even so, the craft could only be given an extremely small radius of action. The great defect in the *Plongeur*, however, was the fact that the air exhausted from her engines could not be got rid of without betraying her whereabouts and disclosing her track. The *Plongeur* also suffered under the disadvantage that she was not provided with a periscope. She was, however, provided with a specially designed lifeboat. This lifeboat was housed in a hollow space in the upper part of the *Plongeur's* hull; into it the crew could climb. So that in the event of any mishap to the U-boat, which might prevent her from rising to the surface, it was possible for the crew to take refuge in this lifeboat; after having closed the water-tight doors the crew could unfasten the bolts which hold the lifeboat to the U-boat. They could in this way escape from their submerged prison-house.

It was not until dynamo-electric machinery and electric storage batteries were invented that it was possible to make any real progress in the construction of U-boats. France led the way to further improvements by the construction in 1890—1892 of the *Gustave-Zédé*; this boat was entirely an electric submarine and had a speed of 9 knots submerged. The construction of U-boats proceeded apace in France; the progress of technical knowledge was taken advantage of and many improvements were introduced. The invention of the periscope took

place about this time and added enormously to the value of the new weapon of naval warfare. Laubeuf now appeared on the scene and designed the submersible, of which the *Narval* was the prototype; he revolutionized the construction of submarines. Two difficult problems were solved by him; one connected with the motive power, the other with the design of the hull. Electric storage batteries by themselves are too heavy to give a U-boat a sufficiently wide radius of activity. By providing for the coupling of specially designed liquid-fuel steam-engines and also electric storage batteries on to the propeller shafts, Laubeuf solved at one stroke the problems connected with the economical propulsion of U-boats on the surface of the water, and those connected with their rapid submersion and propulsion under the water.

The problem connected with the design of the hull of the U-boat he solved, by the provision of an inner and outer shell. He endowed the hull simultaneously with the form best able to resist the hydrostatic pressure when submerged and with lines best suited to meet the requirements of buoyancy and speed when the boat is travelling on the surface of the water. He provided an inner shell, the transverse section of which was at every point a true circle, and also an outer shell, the lines of which were those of a destroyer. The space between the two shells was utilized for the water ballast used for causing the U-boat to submerge. Much interesting information is given concerning the *Narval* and her first voyage from Cherbourg to St. Malo and to Brest.

The next step in the progress of naval architecture in relation to the design of U-boats was naturally that connected with an increase in their tonnage. Four submersibles were built on the model of the *Narval*, each of 150 tons, and then followed two others each of 175 tons. The two last-mentioned were provided with Diesel oil engines and therefore their design marks a further step in advance. Step by step U-boats became larger and larger and it is recorded that the French Government in a short time built 34 U-boats (18 of the *Pluviôse* and 16 of the *Brumaire* type), each of 400 tons. These boats had a length of 163 ft. 9 ins., a surface speed of 12 to 13 knots, and a speed of 8 knots when submerged. They carried a crew of 26 men.

In a few years France had built herself a superb flotilla of submarines, and in 1906 possessed a distinct superiority in this respect over the other Powers in Europe. Between 1908 and 1910, both the British and German Governments took up the matter of the provision of submarines seriously and large sums were included in the naval budgets of the two countries.

The competition of the various nations naturally resulted in still further technical progress, so that before the present War broke out submarines, having a surface displacement of 900 tons and capable of steaming at 19 knots, had already been constructed. Some of these boats can travel at a speed of 11 knots under water and can remain submerged continuously for 48 hours without having to recharge their accumulators; they possess a radius of action of from 200 to 250 miles on a charge.

Chapter II. is devoted to "The Submarines of the Different Belligerent Powers." Before dealing with the U-boats in possession of these

Powers, the considerations affecting the employment of submarines are briefly stated. A matter of considerable importance is the speed of U-boats. The main thing to be borne in mind is that by attention to details in design the difference between the surface and submerged speeds can be sensibly reduced. In some cases this difference is as high as 35 per cent., but usually it is somewhere between 25 per cent. and 15 per cent. The most important consideration, however, is the radius of action of U-boats; a matter which is closely bound up with their engine power, and the fuel used. It has to be remembered that by travelling at a speed less than her maximum a U-boat can enormously increase her radius of action; indeed, in the ratio of the square of the reciprocals of the maximum and reduced speeds, *e.g.*, a U-boat with a maximum speed of 16 knots for a radius of activity of 1,000 miles, by halving the speed increases her radius of activity fourfold, *i.e.*, to 4,000 miles.

A high surface speed and a wide radius of action are two qualities which it is difficult to provide for simultaneously in the present-day U-boat. But the use of the Diesel oil engine has helped forward the solution of this problem.

The following is a very brief summary of the information contained in the volume under review concerning the submarines, completed and under construction, in possession of the several belligerents in August, 1914:—

Country.	No.	Displacement of Largest Submarine in tons. On Surface.	Sub-merged.	Speed of Fastest Submarine in Knots. On Surface.	Sub-merged.
France	69	870	1200	19	11
Great Britain	91	550	1200	20	9
Italy	27	700	not given	18	12
Russia	23	700	,,	16	12
Germany	46	700	890	17	12

Monsieur Hutter tells us that Great Britain was at first not inclined to take the submarine seriously and therefore did not begin the construction of submarines till somewhat late in the day. But when once she had made up her mind on the subject she tackled the question very thoroughly and bought the best types of these boats to be obtained in the market, so that when the War broke out she had quite a first-rate flotilla of U-boats.

The Italians have constructed U-boats possessing many features displaying originality and have continued to improve on their first designs. Unfortunately, the Italian Admiralty have been hampered by the lack of funds in obtaining a submarine flotilla of the dimensions desirable to meet all requirements of defence and offence.

In her programme of naval development Russia has afforded the most perfect example of eclecticism; her U-boats have been purchased from the shipyards of many countries and represent many types. Her naval constructors have also provided her with several types of submarines of home design.

Germany also lost time before taking up the question of building of submarines. The first German U-boat was built in accordance with

the designs of a young engineer who received his training in the French School of Marine Engineering at a time when the designs of the *Narval* type of submarine were being elaborated there. The first German U-boat was an almost exact copy of an improved French submersible named the *Aigrette*; the discovery of this fact caused no little consternation in France. Perhaps, in future, greater precautions will be taken in France, as well as in other countries, to prevent secrets of national importance becoming so easily known to students of foreign nationality. Having a relatively short coast line to protect and with her harbours and dockyards situated mostly in the estuaries of big rivers, Germany has not had to preoccupy herself to any extent in considering the problem of the design of submarines for defensive action; on the contrary, she has from the earliest days concentrated attention on the production of a type of U-boat having a wide radius of action. Her ambition has been to possess a type of submarine which, being based on Wilhelmshaven, could operate off Constantinople or even the coasts of America. Germany was the first nation to provide her submarines with guns; there is little doubt that this step was taken with the deliberate intention of some day carrying on the very war of frightfulness against merchant shipping which we see in progress to-day.

Monsieur Hutter warns us that the information as to the number, etc., of German submarines given by him is not very exact; the *Marine Amt* has at all times taken care not to publish much information concerning the German U-boats.

Chapter III. deals with the subject of the "Utilization of Submarines," and is subdivided into sections dealing with the several aspects of the question.

The following notes present a brief summary of the contents of this chapter.

The Submarine in Defence.—From the earliest days of the existence of submarines, naval experts realized that they constituted a powerful weapon of naval defence; for the *rôle* of harbour and dockyard guards there is nothing to equal them. By the use of submarines, the bombardment, by a naval squadron, of important harbours and dockyards can be rendered practically impossible; such is the experience of the present War. Special types of submarines are not a necessity for defensive action; those of the oldest as well as those of the newest design serve the purpose equally well.

The Submarine in Offence.—As soon as a high-powered oil engine, suitable for use in submarines, was invented, naval architects concentrated their attention on the design of U-boats endowed with a wide radius of activity and with a speed which would enable them to accompany squadrons of battleships. Much progress has been made in this direction, but the ideal submarine for offence has not yet been constructed. However, submarines have, in the present War, proved their value in the offence with fleets operating not far from their bases, notably was this the case in the Battle of Jutland. The lessons accumulated so far teach that there is a great field for submarines in offence acting as independent squadrons at considerable distances from their bases. It appears probable that in the future small submarines will be built for

defensive purposes whilst very large ones, capable of cutting their way through the water at very high speeds, will come into existence for the purpose of waging an offensive naval warfare.

Submarine Minelayers.—The idea of constructing submarine minelayers was born some years before the outbreak of the present War; but the invention and rapid improvement of the Whitehead torpedo caused the further consideration of this type of U-boat to be abandoned for the time being. The great use which has been made of floating mines in the present Great Conflict and the dangers run by the ordinary types of minelaying vessels caused the question of providing submarine minelayers to be reviewed. In consequence, a certain number of U-boats, designed for the specific purpose of laying floating mines, have been constructed since August, 1914, and have now been in use for some months.

Submarine War on Merchant Shipping and the Commercial Submarine.—In addition to the foregoing legitimate methods of utilizing submarines in war Germany has added a fourth.

The nature of the fourth method of warfare, for which piracy is a mild term, was certainly not entirely unknown, but Germany has developed this method of warfare with her customary thoroughness and in defiance of all the rights of nations and dictates of humanity. The acts of her U-boats, in carrying on this fourth mode of warfare, indicate the latest phase of the impotent rage of her rulers and the degree of the loss of mental balance from which the German people are suffering. It is indeed a case of *quos vult perdere Jupiter dementat.* From the point of view of naval warfare the resort to submarine piracy by the German Admiralty exposes its poverty of imagination, whilst from the political view the German people perhaps now realize that this use of U-boats has been the most serious blunder of all the big mistakes which can be laid to the charge of their rulers.

The now famous commercial U-boat, the *Deutschland*, and the problematic *Bremen*, were but efforts of the German authorities to excite the imagination of their own people and, perhaps, the whole world besides, that is to say, the creation of the Commercial Submarine was a part of the great game of bluff Germany has been playing since she let loose the dogs of War. No very difficult arithmetical calculations are necessary to prove that even a very large fleet of commercial submarines of the *Deutschland* type would not enable Germany to reduce the inconveniences of the present blockade, quite apart from the question of the immense capital expenditure and huge running costs that would have to be met for providing and maintaining such a fleet.

Some Unforeseen Uses to which Submarines have been put.—In view of the fact that, by submerging with rapidity, the submarine is able to acquire almost complete invulnerability from the effects of gunfire, U-boats have often been used in the present War as scouts, in cases where the ordinary vessels used for this purpose in former times would have run very considerable risks or could not have carried out the mission allotted to them.

Chapter IV. deals with the question of the design of "Engines for Submarines." It is this part of the equipment of a submarine which

is of prime importance. A great deal of technical information on the subject is contained in this chapter of the volume. It is pointed out that there is a limit to the size of the Diesel oil engines which can be built for use in submarines. As U-boats increase in size more and more powerful engines will be required; it is suggested that in those cases in which Diesel oil engines of 1,000 h.p. will not provide the requirements for the giant types of submarines now contemplated some type of steam propulsion may have to be resorted to.

Chapter V. is devoted to the "Explosives and Armaments used by Submarines"; the subject is dealt with under several heads. It was the invention of the automobile torpedo that made the U-boat a really formidable weapon of naval warfare; and it is with torpedoes of this type that U-boats are largely provided. Some of these torpedoes travel at a speed of 50 knots for the first 1,000 yards after discharge and have an extreme range of 6,500 yards; it is expected that automobile torpedoes will shortly be introduced having an extreme range of 11,000 yards.

The average cost of such a torpedo is about £600, but as a hit from one of them can destroy a battleship worth 3 millions sterling (*i.e.*, 5,000 times its own cost) in a few minutes, such torpedoes must not be considered a luxury.

Guncotton is the explosive which is most commonly used in automobile torpedoes; the charge as a rule weighs 2 cwt.

Many details are given concerning automobile torpedoes and the tubes from which they are fired. A little space is also devoted to a description of the mines and the guns provided for use with U-boats.

Chapter VI. gives a brief description of "The Measures of Defence against Submarines." At first purely defensive action was alone taken; squadrons of light boats were used as patrols at the entrances to harbours, etc., to hunt down submarines; next the use of specially designed nets was brought into use, but now, in addition to the foregoing measure, steps have been taken to arm merchant ships to beat off and attack U-boats, and a considerable use is also being made of hydroplanes and seaplanes in carrying on a vigorous offensive war against the modern pirates.

Chapter VII. deals with "The Exploits of the Entente Submarines." Brief descriptions are given of the deeds of daring carried out by the U-boats of the Entente Powers in (*a*) the Sea of Marmora; (*b*) in the Baltic; and (*c*) in the Adriatic. The officers and crews of these U-boats have afforded great examples of courage, resourcefulness and skill; the names of many of them will be handed down from generation to generation as a tradition of how to do and how to die.

The 131st number contains the official communiqués issued by the Central French Government to the Provincial Authorities during the months of February and March, 1917; it is Volume XXVIII. dealing with this particular subject.

In an Appendix are given the text of the message of congratulation sent by President Poincaré to King George V. in February, 1917, after the capture of Kut-el-Amara, and the latter's reply thereto.

W. A. J. O'MEARA.

NOTICE OF MAGAZINE.

REVUE MILITAIRE SUISSE.

No. 5.—May, 1917.

THE GERMAN OPERATIONS IN THE WESTERN THEATRE OF WAR, 1914 TO 1917.

Colonel Feyler has been peculiarly advantageously placed for studying the momentous events which have been shaking Europe to its foundations since August, 1914; he gives us the benefit of his views in an article, the first part of which appears in the number of the *Revue* now under notice. The article appears at a very opportune moment, *i.e.*, at a time when after campaigns representing the three phases of war, the offensive, the counter-offensive and the defensive, the German Army in the Western Theatre has had to withdraw to the "Hindenburg Line." Colonel Feyler seeks, in his article, to explain the causes which have led to this retrograde movement of the Kaiser's hosts.

The operations carried out since the beginning of the War to the end of 1916 can be considered to possess six principal phases, as follows:—

1. The invasion of Belgium, including the battles on the French frontier.
2. The Battle of the Marne.
3. The Race for the Sea.
4. The Battle of Flanders.
5. The Battle of Verdun.
6. The Battle of the Somme.

1.—The Invasion of Belgium, including the Battles on the French Frontier.

The events connected with the early days of the Great War are still fresh in men's minds. Seven German Armies having concentrated on a front lying between the N.W. Swiss frontier and S.E. Dutch frontier, operations were begun by these Armies making a great wheel to the left, with Basle as a pivot of manœuvre. The German right wing marched rapidly across Belgium, between the Meuse and the sea, with the object of enveloping the left, and may be both flanks, of the Entente Armies concentrated in the N. of France and supposed at the time to be ranged up along the Lorraine front and in the Belgian Ardennes.

Colonel Feyler points out that so long as precise documentary evidence is not available, it behoves a critic to exercise extreme circumspection in forming a judgment on the acts of an Army Chief. The great public, however, do not appreciate the importance of maintaining reticence under such circumstances. Should a General meet with reverses the bitterness of their reproaches are as extreme as the loudness of their praise when he

meets with successes. The qualities of a General, as indeed of a man in any calling, cannot be estimated alone by the success or failure of his plans, but account must also be had of the intelligence that has been brought to bear in framing them, of the nature of these plans and of the method adopted for executing the same. History teaches that in the same way that the best of schemes are, at times, liable to miscarry by reason of some mischance which cannot be allowed for, likewise schemes which are most unpromising are, at times, crowned with the most brilliant success by reason of some unforeseen accident. In the first case the superior skill of a General is not transformed into incapacity merely because of the jeers of the public; in the second case the mediocre qualities of a General undergo no conversion into brilliant leadership by reason of the acclamations of the public.

Colonel Feyler is content for the present to state that so far as the main framework of the German plans is concerned it creates an impression on the mind of a manœuvre which was worked out with great minuteness, launched with great skill and supervised with great care. Whether his remarks are to be taken as praise or condemnation depends, he says, on the point of view from which the subject is examined. Praise must be implied in his words if the view is taken that it is right to employ troops in accordance with a reasonable plan, although without providing fully for the counter-measures likely to be adopted by an opponent to meet it. On the other hand condemnation must be read into the Colonel's words if the plan spoken of as reasonable is merely the simple manifestation of a preconceived idea. It may well be that in 1914 the German Higher Command expected their faith in an idea to work miracles for them. A nation endowed with the genius for organization organizes victory as it organizes success in other realms of life. To do so it is but necessary to ascertain with some measure of exactness the factors in the equation the answer to which spells *victory*.

It is most desirable that the German official account of the Franco-German War of 1870—1871 should be studied by those who desire to understand the nature of the preparations made in Berlin for the campaign of 1914; this work pretends at being something more than the story of the events of a successful campaign, it claims to be a treatise on the best method of conducting a modern war.

Moltke, the victor of 1870, became, in the imagination of the swollen-headed Teuton, the prototype of the General who organizes war on scientific and perfect lines, a war in which what is left to chance is reduced to microscopical proportions; Moltke was proclaimed by the sons of the Fatherland as a military genius superior to Napoleon, and many other great captains. This belief arose not solely by reason of the military successes achieved by him but was as much due to the very extraordinary assumption that the Germanic race excels all others and is superior to them in every field of adventure. And yet Moltke only conducted two great campaigns to the great Corsican's fourteen, and on each of these occasions repeated the same manœuvre. Sadowa, the attempts to envelope the French flanks on the Sarre, at St. Privat and at Sedan are all operations of the same type.

On comparing the German deployment of 1914 with the operations just

referred to an impression is created on the mind that the Great General Staff, or at least the General who inspired it, have adopted this as their *standard manœuvre*, the sure road to organized victory. The military literature published in Germany during the past forty years has drummed the same idea into the heads of generations of Teuton officers. The lessons to be derived from ancient and modern wars have only been considered useful so far as they bear on the German *standard manœuvre*. Attention is called to an article entitled "Cannae" by Field Marshal Schlieffen, which appeared in the *Viertel Jahrshefte für Truppenführung* just before the outbreak of the present War. In the article in question Moltke's strategy at Sadowa and at Sedan is likened to that of Hannibal's at Cannae, and the opinion is expressed that victory is the heritage of the General whose plans are most nearly modelled on the manœuvres which won Cannae, Sadowa and Sedan. It was on these lines that the Great General Staff arranged for the imposing wheel to the left of the Teuton hosts in their march across Belgium in 1914.

What actually was witnessed on the French frontier were German attacks against both the Allied wings and against their centre.

The French General Staff, having decided to violate neither the neutrality of Belgium nor that of Luxemburg, had concentrated five Armies along the Vosges and had held them ready to advance into Alsace and into Lorraine. As soon as the German invasion of Luxemburg and of Belgium became an established fact, the French left flank was extended westward, in the Ardennes, and preparations were made for an offensive stroke towards the north. During August, 1914, the British Army prolonged the French left further westward as far as Mons.

On the immediate right of the British troops stood the French 5th Army, between Mons and Charleroi. It was against this left wing of the Entente Army that the German I. and II. Armies, comprising some half million men, was directed. In spite of their numerical superiority, the *élan* of the Teuton soldiers and the *communiqués* of the Imperial Great General Staff reporting that the British Army was dispersed and flying to its ships, the German right wing failed to envelope the left flank of the Allies. The latter escaping from the grip of the invaders retreated up the valley of the Sambre and then descended towards Paris down that of the Oise.

The central attack took place in the Ardennes, where a number of collisions took place between the opposing armies, viz.:—between the German III., IV. and V. Armies, comprising some 550,000 to 600,000 men, and the French 4th, 3rd and Lorraine Armies, comprising about 450,000 men. Some very hard fighting took place, but here also the vanquished troops were able to free themselves from the invader and retired southward, crossing the Meuse, the Aisne and the Marne in doing so.

The German VI. and VIII. Armies directed against the French right wing were soon held up by the fortified barrier held by the French 2nd and 1st Armies (Castelnau and Du Bail).

2. *The Battle of the Marne.*

As was the case in 1870, when the first attempt of the Germans to overwhelm the French troops (on the Sarre) failed, so was it in 1914. The

right wing of the Allies maintained their hold on the French eastern military frontier. The centre and left of the Allies were able to break off their engagements with the invaders before they had become too seriously entangled; they were thus able later to make a stand on a united front further south on the Marne, with its left resting on the fortress of Paris and its right on the fortress of Verdun. In prolongation of the Marne front Du Bail's and Castlenau's Armies continued to hold on to the line Verdun-Nancy-Belfort and thus safeguarded an inroad into the area in rear of the river front in question.

The Allied Armies on the Marne were drawn up in the following order :—

French 3rd Army S. of Argonne heights, facing N.W., with its right resting on Verdun.

French 4th Army astride the Marne at Vitry-le-François, to the S. of Chalons. French 9th Army (a new formation placed under Foch) Mailly to Sezanne.

French 5th Army in the region N. of Provins. The British Army was in the gap between the French 5th Army and Paris.

The French 6th Army was, at this time, in process of being formed in Paris under Manoury. Gallieni was in command of the Paris garrison.

The above positions were occupied by the 5th September. The German troops in pursuit of the Allied forces had made a great wheel to the left and on arriving at the northern frontier of France faced S.W. They continued their southward movements in the following order :—

German V. Army, the pivot for the great wheel, stretched along the borders of Argonne in the direction of the French 3rd Army, to which its left was slightly exposed.

German IV. Army had come through Belgian Luxemburg; crossing the Meuse at Mezieres, it deployed S. of Chalons opposite the French 4th Army.

German III. Army crossed the Marne at Epernay and struck the right of the French 9th Army, whilst the German II. Army, which had crossed the river at Château-Thierry, aimed at the left of this French Army.

To the German I. Army under Von Kluck was assigned the task of enveloping the Allied left. It formed the German right and consisted of five Army Corps and one Cavalry Corps. This was the Army which had driven the British Army from Mons on Paris. On reaching the neighbourhood of the French capital, it wheeled to the S.E. leaving this fortified centre on one side. This German Army, having crossed the Marne at Meaux, found itself faced by the French 5th Army and the British Army, whilst Manoury threatened it on its exposed flank.

The movements of Von Kluck's Army provided the determining factor in the issue of the battle. Whilst, at the time that the invaders reached the French frontier, their Armies were converging on the front occupied by their opponents as if to nip them between the jaws of a pair of pincers, on the other hand, in the further advance southwards the German columns closed on one another and ended by narrowing their front to such an extent as to march into the jaws of the Allies' nutcracker.

Von Kluck only left one of his Army Corps on the north bank of the Marne to watch Paris. Consequently, when Manoury issued against

the German right and it became necessary for Von Kluck to reinforce the single Army Corps originally left on the N. bank of the Marne successively by the other four corps of his Army, a gap was created between the German I. and II. Armies. This gap was for a time filled by Von der Marwitz's Cavalry Corps, but under the circumstances this Corps could alone form a screen. When the German II. Army had to conform to the retrograde movement of the I. Army another gap was created between the German II. and III. Armies, and into it Foch's Army, supported by other French troops, penetrated. This settled the matter; the five German Armies thereupon took refuge behind the line of the Aisne.

Comments on the Strategy.

The question of whether Von Kluck did right or did wrong to advance to the Marne as he did has been much discussed in the past, and is likely to be much discussed in the future.

Colonel Feyler expresses the opinion that Von Kluck acted strictly in accordance with the dictates of correct strategy; he aimed at the destruction of the enemy's main army before all things else. Had the Allies been defeated on the Marne, it is hardly likely that Paris could have been saved.

The defeat of the French Armies in the autumn of 1870 eventually led to the capitulation of Paris in January, 1871; by like relations of cause and effect, the success of the Allies in the autumn of 1914 saved Paris in the present War. It must not, however, be assumed that had the Germans won on the Marne Paris would for a certainty have fallen to Von Kluck's Army.

One great fault must nevertheless be imputed to Von Kluck, one of which other German leaders, aye, the whole of the German Army and the nation itself have also been guilty; he and they have altogether underestimated the power of resistance of their adversaries and have failed to put a proper value on the early German victories won in Belgium and on the Meuse.

The Great General Staff made their first mistake in strategy at this stage. Their intention being in the first place to effect the concentration of the largest possible German force in the Western Theatre for the purpose of crushing France completely before dealing with the Russians, nothing should have been allowed to disturb this plan of campaign. The retreat of the Belgians into Antwerp led to a part of the German Army, originally intended for the offensive stroke against the French Army, being detached for the capture of the Belgian fortress; this could not be avoided. But the Russians, having mobilized earlier than was expected and having invaded East Prussia, the army originally told off for the operations against the French Army was further weakened by the transfer of one, or may be of two, Army Corps to the Eastern Theatre; this was wrong. Had the Great General Staff entertained the smallest doubt as to the issue of the struggle in the Western Theatre they should most certainly have refrained from withdrawing any troops whatever from Belgium or France. The presence on the Ourcq of the one, or the two, Army Corps transferred to East Prussia might have produced a totally different situation in the region immediately east of Paris than the one now recorded in history.

The *communiqués* of the Great General Staff issued between the 21st August, the date of the first German success, to the 3rd September clearly indicate the views held by the German leaders. The perusal of these *communiqués* creates the impression that the complete annihilation of the enemy by the Teuton hosts was believed to have been accomplished. The German thrust against the Allied front on the Marne was not an isolated move. The Great General Staff had not at that time abandoned the hope of enveloping the right as well as the left wing of the Franco-British Armies. Evidence of this exists in the attack made on the Grand Couronné of Nancy, the capture of which would have opened a line of advance for the German Armies by the Charmes gap, between the fortresses of Toul and Epinal. A German victory in this region would have been decisive, as it would have made it impossible for the Allies to hold the Marne position.

3. *The Race for the Sea.*

When the Allies found it impossible to pierce the fortified front taken up by the Germans on the Aisne, they endeavoured to envelope the German right and to turn it. To meet this danger the Germans in their turn attempted to carry out a similar operation against the Allied Armies. Thus it was that by successive steps both the opposing armies extended their westernmost fronts in a northerly direction until the flanks of these armies eventually reached the sea on the Belgian littoral. But before this movement could be completed, a new and imposing German Army made its appearance in Western Belgium. It was announced that the objective of this new Army was Calais.

These new German formations first came into collision with the Belgian Army, which, having escaped from Antwerp, had marched along the sea coast and on reaching the Yser faced about to make a stand against their pursuers.

A French Army having been sent to the assistance of the Belgians, the new German formations in question next came into collision with these reinforcements at Dixmude and Ypres and finally met the British troops about Ypres. The two great struggles on the Yser and Ypres, which lasted from the middle of October to the middle of November are now spoken of as the Battle of Flanders.

Comments on the Strategy.

Having met with a reverse on the Marne, the Germans withdrew to a fortified position on the Aisne; they had now decided to act on the defensive for a time. Colonel Feyler points out that no army acts on the defensive when any other course is open to it; and even then it only does so in the hope of being able to obtain the initiative again, in order to resume the offensive as early as possible. Under cover of fortified positions defenders are often able to collect large masses of reserves. Such reserves are then available, on the one hand, for repelling the attacks of troops that may succeed in piercing a defensive position, and, on the other hand, these reserves can be used for a counter-offensive, which, if successfully carried through, may enable the defenders to dominate the movements of their assailants.

A modern battle consists of a prolonged struggle in which fresh troops are successively and constantly being brought up, from the beginning of the fight or as they become available, to those parts of a front where they can be utilized with the most telling effect. Defeat is suffered by that side whose freshest reinforcements, worn out by a succession of violent onslaughts, persuade themselves that further efforts on their part for the purpose of altering the course of the battle are useless.

The above statement describes the general character of the fighting which ended when the Race for the Sea proved a dead-heat. The Allies tried to find out the weak portion of the German front on the Aisne in order to pierce it; the Germans, however, not only effectually covered the portions of their front which were assailed, but in their turn counter-attacked against the portions of their adversary's front which they thought to be most vulnerable or which were most suitably situated as starting places for the resumption of the offensive by them.

The Germans first of all strengthened their right wing; it was here that the danger to them was most threatening. They were compelled to swing back this wing, on the right bank of the Oise, so as to face westward.

At the same time, they made a counter-thrust in a way that seems to prove that they had not lost all hope of continuing and renewing *offensive operations with both their wings*. Until about the 20th September, 1914, they were active around Verdun and in the angle in the part of the front W. of Noyon. Simultaneously a violent blow was struck by them against the Allied centre about Rheims. Shortly, it may be said that the Germans delivered a *general counter-attack*.

Subsequently the German counter-attacks became local. The thrust against Verdun and the Allied centre were abandoned, troops being withdrawn from these sectors in order to be used as reinforcements to the German right wing. Frequent counter-attacks, designed in great depth, were launched in the directions of Noyon and of Roye, where the French were obliged in consequence to give ground. As new French formations were brought to the front to prolong the Allied left flank, the German counter-attacks were delivered further and further northwards. The Germans thus successively reached the Ancre, the Somme and Arras, but they persisted in the efforts further south, at Roye, at Noyon, at Lassigny.

In Belgium, an attack was undertaken against Antwerp. It was urgently necessary to release the German troops in this neighbourhood for other purposes, but this could not be safely done until the last of the Belgian strongholds was in German hands. The fortress fell, but the Belgian field army within it was able to make its way out. A part of the Belgian Army made good its escape and reinforced the Allied left wing. At the time it was approaching the Yser, the German counter-attacks had enabled the Kaiser's troops to reach Lille and the valley of the Lys.—(*To be continued*).

The Italo-Austrian Theatre of Operations.

The article on the above subject begun in the *Revue* for April, 1917 (*vide R.E. Journal*, August), is continued in the number under notice.

A number of photographs showing Italian defence arrangements in the snow-clad mountains are reproduced in the text and a sketch-map is also provided showing the Italian front from the Adriatic, near Monfalcone, to M. Santo.

An extract is given from Capt. Paul Simon's *Les Principes de la Guerre Alpine* in which he says with reference to the Alps: "Not only are they the strongest and most magnificent rampart to France, but they comprise the only field where ideal warfare can be conducted in these days, warfare in which numbers count for little, in which valour is the paramount consideration!"

Events of the past few months have confirmed the accuracy of the above statement. Those who have been living in the mountains along the Italian frontier and have expended their energy in the national cause will some day be able to tell of the extraordinary things that have been accomplished.

The object of all military operations is to-day, as of yore, the destruction of the enemy forces; but in order to accomplish this it is, perhaps, more necessary to-day than was formerly the case for a commander in the field to reach the decisive zone not only with his full strength and with the various parts of his command united, but it is also essential that he shall have under him troops sufficiently large in numbers to enable him to deal effectively with the forces his adversary may bring against him. On the Italian northern front, Austrians not only desired to draw as large a part of the Italian Army as possible into the Trentino, but also to cut it off completely from the Venetian plains in such a way as to bring about the capitulation of the Italians operating on the Isonzo.

It is pointed out that in order to succeed in a venture such as that upon which the Austrians entered in 1915 it is essential to utilize every means of communication and to attack along the whole front simultaneously and with equal energy. The Trentino is ill-provided with roads and it is, in consequence, difficult to establish lateral communication between columns moving on more or less parallel roads. This accounts for the fact that the important fighting on the Italian northern front took place in the near neighbourhood of the great routes that traverse this mountain barrier. In retiring from successive positions, the Italians continually made offensive thrusts whenever an occasion offered; the Austrians had, in consequence, to make superhuman efforts to enable them to effect any progress. The Italians knew the ground on which they were fighting intimately and took advantage of all its features which could be turned to profit by them. It is suggested that those who read the accounts of the fighting in which the Italians have been engaged are apt to lose sight of the great difficulties they have had to contend with in the upper mountain regions (above 6,000 ft.). It is for the special benefit of such persons that the photographic views which appear in the *Revue* are published; these views have certainly a high educative value.

The Austrian offensive in the Trentino might have had important consequences in spite of the fact that Austrian forces were unable to penetrate as far as the Venetian plain, if thereby the Italian operations had been paralyzed along the whole front on which the Austrian and

Italian Armies were in contact. However, as it is well known, the Italian Higher Command, towards the end of June, 1916, was able to conduct an offensive on the Isonzo; by the first week in August the Italian artillery and other attacking troops had moved into position. Active operations actually began on the 4th August.

The Italian Eastern Front, of which Gorizia is the principal objective from a military as well as political point of view, consists of four distinct sections:—

1. The section Sabotino-Oslavia-Podgora to the N.W. of Gorizia.

2. The section M. Santo-M. San Gabriele-Zocrenz to the N. and N.E. of Gorizia.

3. The Carso section, with Doberdo as its centre and bordered on the east by the Vallone.

4. The Vertojbizza section with its culminating point of San Marco.

The above four sections of this front constitute a quadrilateral and form a strong retrenched camp. Further south lies the section of front to the E. of Monfalcone and comprises the important Vallone-Duino road.

The Carso plateau is perhaps the most formidable part of the front on which an attack can be delivered. The Vipacco and the Isonzo form natural ditches along this bastioned-like front, whilst San Michele and the Cosich constitute extremely strong keeps on the N. and on the S. of this front respectively. From these keeps the whole plain and the passages of the Isonzo can be brought under fire.

It is owing to the very difficult nature of the *terrain* that it has taken the Italian Army so long a time to become master of the Carso.

The attack on the Gorizia-Carso section was preceded by an action S. of Monfalcone, launched on the 4th August, 1916, with the object of drawing the enemy's forces to this region. The Italians at first succeeded in gaining the heights immediately to E. of Monfalcone, but were driven back later by a violent counter-attack. However, two days later the Italians again moved forward early in the morning; M. Sabotino, the heights of N.E. of Oslavia and M. San Michele were captured by the attacking troops, who succeeded at nightfall in reaching the lower slopes bordering the Isonzo.

Fighting continued and, on the 8th August, the Italians succeeded in crossing the Isonzo and in establishing themselves on the eastern bank of the river. On the day following, the Italians entered Gorizia and established themselves on the heights E. of Gorizia and San Andrea.

The operations on the Carso and at Monfalcone continued for some days, powerful attacks being delivered against the Austrians who fought with desperation. The Italians eventually captured the Doberdo plateau, and this caused the fall of Debeli. On the 15th August, the western slopes of the Pelinka passed into Italian hands. The character of the fighting now changed. It became necessary to devote a little time to the replenishing of gaps in men and materials caused by the heavy fighting. Time was now devoted by the Italians to the work of consolidating themselves in their newly gained positions. During these operations the Italians took 18,758 Austrian prisoners, including 393 officers, and captured 30 guns, 63 trench mortars, 92 machine guns, 12,226 rifles, 5 million rounds of S.A.A., 3,000 rounds of artillery ammunition, 60,000 grenades, etc., etc.

Whilst fighting was in progress on the Isonzo, minor operations were also engaged in by the Austrian and Italian Armies in the upper valleys of the Avisio, of the Brenta, of the Tofane, on the heights of the Cristallo, and of the Tonale, in the valleys of the Ledro and of the Astico, on the heights of Asiago, in the Val Sugana and along the mountain tops further east. From September to the end of 1916, fighting continued along the whole of the Italo-Austrian front.—*(To be continued).*

IMPRESSIONS FROM THE AUSTRO-HUNGARIAN FRONT.

The article on the above subject begun in the number of the *Revue* for August, 1916 (*vide R.E. Journal* for November, 1916, *et seq.*), is continued in the number under notice. A sketch-map on a scale of $\frac{1}{200,000}$ is included in the text of the *Revue* article.

VI. *The Upper Isonzo.*

The more important points along the Isonzo front from Flitsch to M. Sabotino near Gorizia are the Romlon (7,242 ft.), Flitsch, M. Nero (7,364 ft.) and the bridgehead of Tolmino. The Italian frontier on this part of the front follows the crest of the mountains on the western bank of the Isonzo. At the time that the *Revue* article was written the Austro Hungarian troops were holding the left bank of the river, except at Flitsch and at Tolmino.

The bridgehead, at the last-mentioned place, is not of any considerable military value; but the Austrian infantry have made frequent attempts to seize this river crossing. The bridge at Santa Luzia, 2¼ miles below the Tolmino Bridge, just north of the confluence of the Isonzo and the Idria Rivers, is really the most important point on this part of the front. Although it is dominated by M. Kolovrat yet it is covered to a great extent by the wooded heights S. of Santa Maria and by the Santa Luzia Ridge, both situated on the right bank of the river.

The Upper Isonzo front (31 miles in extent) was, in December, 1915, defended by a single Austrian Army Corps, reinforced by a few Landsturm battalions belonging to this region and by troops of the Customs service. When the Italians arrived on the scene, the Austrian *troupes de couverture* were withdrawn to the left bank of the river. The personal observations of the author of the *Revue* article during a visit to the Tolmino Sector are recorded in this part of the article. He tells us that, as is the case in other theatres of operations in Europe, so also on the Isonzo, the artillery has been continuously increased; consequently the proportion of guns to rifles is much higher now than at the date on which shots were first fired on this front. The losses of the Austrian artillery have been slight, since artillery duels have been the exception on this front.

The Austrian troops occupying a part of this front are Italian-speaking soldiers drawn from Istria. It is stated that they bear no friendly or fraternal feelings for the Italian troops opposed to them. The national sentiment is stronger in them, it is said, than the tie binding them to their parent stock, now that the defence of the soil of their natal land is the problem which faces them

Notes and News.

Switzerland.—A special correspondent contributes a few notes concerning affairs in Switzerland. He opens with a few sarcastic remarks regarding the censorship and refers to a few of the "secrets" which are public property and are being openly discussed.

Complaint is made that belligerent aviators, both German and French, have frequently flown over Swiss territory since the spring campaigns started. They have been even fighting one another over neutral territory. These aviators as a rule fly, it is said, at too great an altitude to offer a good target to the Swiss anti-aircraft guns.

The violations of aerial neutrality, it is pointed out, lead to the expenditure of a large quantity of ammunition, neutral as well as enemy, and this has the serious disadvantage that Swiss subjects are put in jeopardy by the rain of projectiles fired on these occasions. The experience of the past year points to the fact, in the opinion of the writer of the original *Revue* notes, that the Swiss anti-aircraft defences are insufficient. He urges that the time has arrived for the authorities to take energetic steps for the purpose of installing a large number of long-range anti-aircraft batteries along the Swiss frontier.

It is further pointed out that the civil and military authorities are out of touch with one another; the friction between them is causing the Swiss citizens inconveniences in many directions. It is emphasized that the Swiss national motto is not: *Every one for himself*, but *One for all, and all for one*.

Portugal.—A special correspondent contributes an article dealing with the Portuguese Expeditionary Force which had just arrived in France at the time the *Revue* notes were written. He recalls the attitude of the reactionaries, who, in the early days of the War, did their best to prevent any military co-operation with the Entente Powers on the part of Portugal. Strange doctrines relating to neutrality were preached at that time. However, the sympathies of the Portuguese masses for Belgium and for France were too genuine to allow the Portuguese Government to stand aside; the masses well understand that had not Portugal's geographical position protected them their fate would have been similar to that of the Belgians, the Serbs and the Roumanians. It is pointed out that by the terms of the recent Anglo-Portuguese Treaty Portugal was practically bound to come into the War. However, Germany forced the pace by her treatment of the Portuguese Colonies and merchant marine.

Two Portuguese divisions have been mobilized and have linked up with the Entente forces on the Western Front. Portuguese soldiers are proud of the privilege that has been accorded them of playing a part, small though it must necessarily be, in building a new Europe on a foundation the basis of which is the Right and Justice of Nations.

International News.—Attention is called to an interesting work entitled *Le Mensonge du 3 Août, 1914*, recently published by Payot et Cie, of Lausanne and Paris. It not only deals with the diplomatic situation preceding the Great War but also with the early operations on the Western Front. The author of the work remains anonymous; whoever

he may be the work in question indicates that its author is exceptionally well informed concerning the events on which he writes.

This number of the *Revue* contains a bibliography relating to works of military interest.

SUPPLEMENT.

A further instalment of the Colonel Galiffe's, *L'Occupation des Frontières par les Troupes Suisses en 1870—1871* is issued with the number of the *Revue Militaire Suisse* for May, 1917. This instalment completes the story of the events dealing with the Defensive Period (January and February, 1871).

Chapter IV. of this section of the work is entitled "Entry of the Army of the East into Switzerland."

The Swiss Military Authorities continued during January, 1871, to move Federal troops from Porrentruy on Neuchatel in order to meet eventualities in the neighbourhood of the latter place.

During the night of 31st January—1st February, 1871, columns of French artillery and supply trains, accompanied by a large disorganized band of French soldiers, were moving by road from Pontarlier on Verrières. The Chief Paymaster of the French Army of the East, who had arrived at Verrières, was most anxious to save the specie in his charge and made an urgent request to the Swiss Military Authorities for permission to be allowed to enter Switzerland with the vehicles carrying the treasure chests. In the meantime, the French Consul at Neuchatel called on General Herzog on his arrival there and requested him to allow Clinchant's Army to retire into Switzerland and to receive a *parlementaire* from the French Commander; this *parlementaire*, Colonel Chevals, presented himself at the Customs post of Meudon at 3.30 a.m. on the 1st February. General Clinchant was at this time at Verrières, impatiently awaiting the decision of the Swiss authorities in relation to his request. General Herzog at once met Colonel Chevals who had been delegated by General Clinchant to enter into a Convention detailing the conditions under which the French Army would be permitted to cross the Franco-Swiss frontier. General Herzog's proposals, except one relating to the sale by auction of horses which was postponed for future consideration by the French and Swiss Governments, were at once accepted by General Clinchant's representative.

Under the terms of this Convention, the arms, equipment, vehicles, horses, munitions, etc., of Clinchant's Army were to be delivered into the custody of the Federal Government, in order to be restored to the French Government on the conclusion of the War; private wagons carrying supplies, etc., for the troops were to be permitted, after depositing their contents on Swiss soil, to return to France with their drivers and teams; officers and other ranks were to be interned at places to be selected by the Federal Government. General Herzog spontaneously offered to allow the French officers to retain their swords, horses and effects; he was warmly thanked for his generous act by Colonel Chevals.

Three copies of the Convention were sent off post haste to General Clinchant, who was waiting for the same on the frontier; having read the terms of the document in question he signed the same without comment. At 5 a.m. the Swiss officer in command at Verrières

received instructions to allow the French troops to enter Switzerland.

General Clinchant, who exhibited much impatience, was one of the first to enter Switzerland. The French column was headed by the vehicles carrying the treasure chests and by the postal vans; these were followed by the artillery. This part of Clinchant's Army occupied eight hours in passing from French into Swiss territory. Next followed a disorganized mob of soldiers of all arms who had completely lost all cohesion, all trace of a military organization having disappeared.

The disarming of the French soldiers was effected at Meudon, no difficulty being experienced in carrying this out. Owing to the narrowness of the valley by which the French entered Switzerland at Verrières, it was necessary for the French soldiers continually to march forward. In consequence even those who had entered first were kept on the move till late in the evening. During the night the French column was brought to a halt owing to a block which took place in Fleurier. It had been decided to suspend the entry of the French into Switzerland during the night, but it was not possible strictly to do so. During the whole of this day (1st February) the guns of Fort de Joux were pouring out shot and shell, and the valley along which the French were retiring was occupied by lines of *franc-tireurs*.

The preparations which the Federal Authorities had made for supplies provided for the feeding of 80,000 men; this provision was based on a report made by General Herzog. However, the French Staff appeared to have come to the conclusion that a part of the Clinchant's Army would be able to make good its escape from Manteuffel's Army and that only some 42,000 men would be neutralized in Switzerland.

The Swiss troops occupying the various passes of the Juras had been advised on the 31st January that Clinchant's troops were to be allowed to enter Switzerland and to be disarmed on entering Switzerland, but the whole of the terms of the Convention were not communicated to the Cantonal Authorities until the 2nd or 3rd February; this led to some misunderstandings in a few cases. Further, the German Commander was not notified that a Convention had been entered into with General Clinchant permitting him to enter Switzerland with his army; had this been done, it is probable that some useless bloodshed might have been averted.

The French retirement into Switzerland was continued on the 2nd February; during these first two days, at Verrières alone 33,500 men, 400 horses, about 300 guns and 1,000 military vehicles crossed the frontier. On the date last mentioned, 13,000 to 14,000 men with 1,100 horses also entered Switzerland at Sainte-Croix. Bands of soldiers continued to pass over from France into Swiss territory at various points up to the 5th February; on the date last mentioned, after a lively cannonade at the Fort de Joux, about 100 French soldiers crossed the frontier and arrived at Vallorbe. At many other points of the frontier French soldiers were able to escape the vigilance of the Federal troops and enter Switzerland by routes on which no guards had been placed.

The Germans followed closely on the heels of the French and formed a cordon along the Swiss frontier; they occupied les Fours and placed

a regiment at Jougne. On the 9th February, the bulk of the German Army was withdrawn from Pontarlier, where it had concentrated, in order to regain the Saone Valley.

The French force which took shelter in Switzerland comprised the following :—85,410 men, of whom nearly 5,000 were sick ; 10,778 horses ; 266 field guns and 19 machine guns ; 1,158 military vehicles.

Chapter V. deals with the demobilization of the Swiss troops.

The French Army of the East being safely interned and the Germans having in consequence withdrawn from the Swiss frontier, the probability of a violation of Swiss territory now became remote. The Swiss frontier zone was still infested with *franc-tireurs* who caused more annoyance to their own people than to any one else. General Herzog announced that, after the 3rd February, the *franc-tireurs* who had not taken advantage of the Convention but remained in arms would no longer be considered as regular belligerents and would, in consequence, not be allowed to enter Switzerland after that date. The *franc-tireurs* who were at this time roaming along the Swiss frontier were desperadoes who behaved themselves as veritable brigands ; they took practically no notice of General Herzog's announcement. Here and there the Swiss Military Authorities had to call up additional units or to alter the disposition of troops to meet the situation created by the presence of these *franc-tireurs*. However, on the 6th February, a partial demobilization of the Swiss Army was commenced by dismissing to their homes the greater part of the artillery that had been called out. By the 9th *idem*, the men who had composed Clinchant's Army had been removed sufficiently far inland to justify a further demobilization and orders were issued accordingly and only a very thin cordon of Swiss troops were left on the frontier ; by the 16th *idem*, only 3 brigades, 3 companies of dragoons and 1 battery remained on duty. On the 3rd March one of these brigades was demobilized and on the 25th *idem* the remainder of the Swiss troops were released from duty and the military cordon which had been in existence along the Swiss frontier for seven months was completely withdrawn.

During the third period of vigilance in Switzerland 19,439 men and 34 guns of the Federal Army were employed on observation duties along the frontier.

W. A. J. O'MEARA.

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