

PART I

MILITARY AND NAVAL DEVELOPMENTS

CHAPTER I

HOW WAR WILL BE WAGED ON LAND

IN former times bullets, for a great part of their course, flew over the heads of the combatants, and were effective only for an insignificant distance. The modern bullet will strike all it meets for a distance of 660 yards, and after the introduction of the more perfect arms now in course of preparation the effective distance will be as great as 1210 yards. And as it is most improbable that on the field of battle it will not meet with a single living being in such a distance, we may conclude that every bullet will find its victim.

The old powder was a mechanical mixture of nitre, sulphur, and charcoal, upon the ignition of which were liberated many elements which did not enter into new combinations. The new powder is a chemical combination which gives scarcely any smoke and produces no empyreuma in the barrel. At the same time the explosive force of the new powder is much greater than that of the old, and its quality of smokelessness or of giving little smoke, in the first place, renders it impossible to judge of the position and forces of an enemy by smoke, and, in the second, frees the marksmen from the clouds of smoke which formerly were an obstacle to aiming. And as in the opinion of many authorities the last word concerning explosives has not yet been said, in the war of the future, especially if it should take place some years from now, explosives of such strength will be employed that the concentration of armies in the open field, or even under the cover of fortifications, will be almost impossible, so

4 IS WAR NOW IMPOSSIBLE ?

that the apparatus of war prepared at the present time may prove itself useless.

The improvement of small arms goes forward with incredible speed. By the almost unanimous testimony of competent persons, the changes which took place in the course of five centuries cannot be compared in importance with those which have been made since the wars of 1870 and 1877-78. The well-known specialist, Professor Gebler, made a comparison, expressed in figures, between different modern small arms, taking as his standard of effectiveness at 100 degrees the Mauser rifle, 11 mil., of 1871. On this basis he worked out the effectiveness of modern weapons as follows :

The modern French rifle	433
The modern German rifle	474
The new rifles in use in Italy and Spain	580
The 6-mil. rifle adopted by the United States	1000
The 5-mil. rifle now undergoing test	1337

Therefore, if in the war of 1870 the German and French armies had been armed with weapons of modern type, speaking theoretically, the losses in that war would have been $4\frac{1}{3}$ to $4\frac{3}{4}$ times greater than they actually were. Had they been armed with the 6-mil. rifle used in the United States of America the losses would have been ten times greater.

Nevertheless, specialists declare that the new weapons adopted in European armies, and even the 6 mil. rifle, are already obsolete, and that the future will see a self-loading weapon made out of an alloy of aluminium, from which a series of shots may be fired without taking the rifle from the shoulder or losing time and energy in reloading.

Experiments made in Belgium with the new self-charging rifles and pistols of the Mauser system show that (firing only such a number of cartridges as will fit into the magazine) a trained soldier can fire from six to seven times a second ; upon shooting a greater number of cartridges from a gun, which requires reloading, the maximum number of shots with the 6-mil. gun is :

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Without aiming	78 per minute.
Aiming	60 „

But the efforts to improve small arms do not stop there, and governments will continue to strive to lessen calibres, as is maintained by Professor Gebler, General Wille, Professor Pototski, and other authorities, to 4 and, it may be, even to 3 millimetres. It is true that there are great difficulties in the utilisation of such small calibres, but the successes already achieved by technical science may be taken to guarantee that these also will be surmounted.

Such a weapon will excel the present in efficiency even more than the present rifle excels the past. The diminution of the calibre of rifles to 5 mil. makes it possible for a soldier to carry 270 cartridges, instead of the 84 which he carried in 1877; the reduction of the calibre to 4 mil. would enable him to carry 380 cartridges; while with the reduction of the calibre to 3 mil. the number of cartridges borne would increase to 575. In addition, the levelling of the trajectory of the bullet would give to shooting such deadliness that it would be practically impossible to strengthen the fighting line with reserves.

Professor Gebler declares that these improved weapons will be forty times more effective than those used in 1870. From this must result the complete re-armament of all armies, if before that time limits be not placed upon the rivalry of the nations in preparation for war. For the re-armament of their infantry, Germany, France, Russia, Austria, and Italy would, by our calculation, be compelled to spend the immense sum of £150,800,000.

But, apart from future improvements in arms, it is easy to see with existing improvements the following consequences: (1) The opening of battles from much greater distances than formerly; (2) the necessity of loose formation in attack; (3) the strengthening of the defence; (4) the increase in the area of the battlefield; and (5) the increase in casualties.

It is enough here to cite some statistics as to the action of modern arms as compared with the arms of 1870-71 and 1877-78. Thus, the bullet of the Chassepot, the

Berdan, or the Prussian needle-gun fired from a distance of 1760 yards could not penetrate a human skull, whereas the bullet of modern low-calibre rifles at a distance of 3850 yards will penetrate the hard bones of an ox.

But many military writers declare that the improvement in small arms will be neutralised by the fact that rapidity of fire will deprive the soldier of coolness and capacity to turn to account the superiority of the modern weapon.

Let us admit for the moment that modern long-range rifles, even with their future improvements, will not prove more deadly in battle than their predecessors. Such an improbable and apparently unfounded proposition is directly refuted by the experience of the Chilian war of 1894. In that war the armies of the Congress were armed, partly with old, partly with modern weapons, and it was proven that each company of soldiers armed with rifles of a modern type put out of action 82 men in the armies of the President-Dictator, while a company of soldiers armed with obsolete weapons, put out of action only 34 men. The absence of smoke alone must increase immensely the deadliness of modern arms. The history of past battles relates that at a distance of sixty paces combatants often could not see one another, and that their fire proved ineffective. And even if long-range rifles do not prove more deadly than their predecessors, it will still be absurd to deny that a certain number of projectiles will disable a certain number of men. And as, in the wars of the present century, the number of shots fired for every disablement has fluctuated between $8\frac{1}{2}$ and 164, it is plain that the supply of cartridges now carried by each soldier is sufficient to disable at least one opponent ; while the supply of 380 cartridges with the 4-mil. rifle, and of 575 with the 3-mil. rifle, will be more than enough to disable two or three of the enemy. In other words, even supposing the effectiveness of modern arms to be in no way increased, the fire of one rifle may disable two or three of the enemy. From this it is plain that, even with the weapons now adopted, the effectiveness of fire presents the possibility of total mutual annihilation.

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Such is the comparison when regard is had alone to the increase in the supply of cartridges arising from the reduction of the calibre of rifles.

But in addition we must take into account the rapidity with which modern weapons may be fired. In a given time twelve times as many shots may be fired as in 1867, while the chances of missing fire and of injury to the powder by damp have been removed. In addition to this must be borne in mind the long range of modern weapons, the absence of the accumulations in the barrel of the rifle, the adoption by officers of instruments for precisely ascertaining distances, the use by under-officers of field-glasses, and finally, the substitution of the old powder by smokeless powder. All these conditions will undoubtedly increase the number of losses, and if the operation of each were considered as a factor in multiplying past losses, we should attain almost incredible but technically and mathematically trustworthy figures.

To this must be added the improvement, since 1870, in the instruction of soldiers in firing. In the training of soldiers every year an immense quantity of ammunition is expended. In addition, mechanical means are employed to show the direction of the barrel on aiming and firing. These are new conditions entirely, or in a great degree, unknown in the time of the last great wars. If we take into account the fact that 500 cartridges are prepared for every rifle, the expenditure of which, of course, is not stinted, we are confronted with a direct denial of the possibility, even for armies of millions of men, in the event of equal strength, to sustain such losses.

In addition to small arms the power of artillery has increased in a measure incomparable with the past.

A glance backward at the development of field artillery shows that from the date of the invention of powder improvements in arms took place very slowly. In imperfect weapons, it would seem, it would have been much easier to effect improvements. Nevertheless, to within a recent date, the effect of artillery fire remained very inconsiderable.

In 1891 Professor Langlois estimated the increase of

the power of artillery fire since the war of 1870 in the following manner : With an equal number of discharges, modern artillery will be five times more effective than the artillery of 1870. But as modern field guns are capable of discharging in a given time from two to two and a half more projectiles than the old guns, it follows that the power of artillery fire has multiplied since 1870 no less than from twelve to fifteen times.

The calculations made by Professor Langlois in 1891 are already out of date. In France, in Germany, and in Russia quick-firing guns are being made, and from the testimony of such authoritative writers as General Wille, Professor Pototski, and Captain Moch, we find that the fire of these new guns is at least twice as powerful as that of the gun of 1891, of which Langlois speaks in the following terms : " We have before us a whole series of improvements of the greatest importance, and must admit that munitions of war are entirely different from those in use in the past." So that in order to form some idea as to the total losses in a future war it is necessary to compare the action of the latest perfected arms with the action of the old guns employed up to the present time. Such a comparison only shows that, as in the case of quick-firing rifles, the past can give no precise forecast as to the effect of artillery in future wars.

With the introduction of smokeless powder and the employment of nickel steel on the one hand, and the strengthening by wire of the barrels of guns on the other, arms of tremendous power are being made.

A comparison of the result of the firing of a thousand rifle bullets by soldiers attacking in loose formation with the action of shrapnel, shows that one round of shrapnel is effective over a space double the length of that covered by a thousand rifle bullets, and not less in width. Experiment has also shown that the fragments of shrapnel disperse themselves over a space 380 yards in length and 440 yards in breadth. Prince Hohenlohe, commander of the German artillery in the war of 1870, in the most emphatic manner declared that " a battery placed against

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a road fifteen paces in width might annihilate a whole mass of infantry on this road for a distance of 7700 yards, so that no one would even think of standing there."

Not less are the successes attained in the improvement of projectiles. The use of steel in their manufacture permitted their being charged with a greater number of bullets. The use of explosives four times more powerful than were formerly employed gave to each splinter and bullet immense force. The flight of bullets and splinters may be likened to the action of a sieve from which drops of water are driven. Imagine such a sieve revolving at great speed, and some idea will be gained of the manner in which the fragments of shells would be dispersed.

In the war of the future, shell, which is much less effective than shrapnel, will be employed less than formerly. Shrapnel will be the chief ammunition of artillery, although if we believe French reports, it is proved that all in the vicinity of a bursting Brisant shell will be knocked down by the agitation of the atmosphere and sustain serious internal injuries, while in the case of the shell bursting in a covered space every one there will be killed either by the action of mechanical forces, or by the poisonous gases liberated by the explosion.

By a comparison of the effect of artillery ammunition with the effect of that employed in 1870, it is shown that, on the average, shells burst into 240 pieces instead of 19-30 as was the case in 1870. The shrapnel employed in 1870 burst into 37 pieces, now it gives as many as 340. An iron bomb weighing 82 pounds, which, with the old powder gave 42 fragments, filled with peroxylyene gives 1204 pieces. With the increase in the number of bullets and fragments, and in the forces which disperse them, increases also the area which they affect. Splinters and bullets bring death and destruction not only, as in 1870, to those in the vicinity of the explosion, but at a distance of 220 yards away, and this though fired from a distance of 3300 yards.

With such improved ammunition the destruction pro-

duced in the ranks of armies will be immense. From the statistics furnished by the Prussian General Rohne, we have estimated the losses which would be sustained by a body of 10,000 men attacking in loose formation a fortified position. From this estimate it is shown that before the attacking party succeeded in covering 2200 yards in the direction of the defenders' trenches every individual composing it may be struck by bullets and fragments of shells, as the defenders' artillery in that time will have succeeded in firing 1450 rounds, scattering 275,000 bullets and fragments, of which 10,330 will take effect in the attacking lines.

But artillery fire will be directed not only against the attacking troops, which, when within range of the trenches may be destroyed by rifle fire, but also, to a greater extent, against supporting bodies which must follow in closer order, and among which, therefore, the action of artillery fire will be even more deadly.

And as at the same time the quantity of artillery in all armies has considerably increased, we may well ask the question whether the nerves of short-service soldiers will stand the terrible destructiveness of its fire.

The improvement, in all respects, of fire-arms, and the high degree of perfection achieved in artillery and artillery ammunition are by no means all that the mind of man has contrived as weapons of destruction. The whole series of auxiliary instruments which in a future war may have immense importance has, since the last war, been improved. Velocipedes, carrier pigeons, field telegraphs and telephones, apparatus for signalling by day and by night, and for illuminating the field of battle, photographic apparatus for the survey of positions from great distances, means of observing the movements of armies by the use of observation scaffolding, ladders, watch towers and balloons—all in a great degree do away with that insufficiency of information which formerly prevented united and successful operations.

As a necessary consequence of the increase in the

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power of fire, we find the more frequent and more extended adoption of defences, and cover for protection in attack and for hampering the enemy. Even in times of peace, positions are prepared for the defence of certain points of the railways and main roads and of water communications.

In addition to this in the future war every body of men appointed for defence, and even for attack—if it is not to attack at once—must immediately entrench itself. It must dig, so to speak, in the earth its line of battle, and, if time permit, must raise a whole series of defensive points, taking advantage of natural obstacles, and perfecting them with defensive works. Sheltered behind such works, and in a position to devote all their energy to fire against the enemy, the defenders will sustain losses comparatively slight, only their heads and hands—that is, an eighth part of their height—being exposed, while the attacking bodies will be exposed to the uninterrupted fire of the defenders, and deprived almost of all possibility of replying to their fire. For the construction of such trenches and earth-works, each division of an army is now furnished with the requisite tools.

In the opinion of competent military writers the war of the future will consist primarily of a series of battles for the possession of fortified positions. In addition to field fortifications of different kinds, the attacking army will have to deal with auxiliary obstacles which will be met with in the neighbourhood of fortifications, that is, in the very position where they will be subjected to the greatest danger from the enemy's fire—obstructions formed of beams, networks of wire, and pit-falls. To overcome these obstacles great sacrifices must be made.

The part of cavalry in a future war presents this primary difference with its part in the past. At the very beginning of war, and even before the attacking army has passed the frontier, it will be sent to make irruptions on the territory of the enemy, penetrating the country as far as possible, destroying communications, depôts, and telegraphs, seizing government resources, and preventing the concentration of

troops. After this the cavalry which follows as part of the constitution of the regular army will be employed in the making of reconnaissances. In a future war such duties will be undoubtedly more difficult than before, owing to the adoption of smokeless powder. Even after having determined the general position of an enemy, cavalry will hardly be in a condition to acquire any precise information, to determine his strength, and even the distance of his advanced posts. The pickets of the enemy will not stand in the open field, but under cover, behind eminences, groups of trees, and hedges. From a distance of a quarter of a mile the fire from the concealed pickets of the enemy will be very effective, yet the pickets themselves will be invisible. In all probability pickets will open fire at the distance of half a mile, to prevent the closer approach of the reconnoitring party, and as with modern arms horsemen may be picked from the saddle from a great distance, the patrol will be unable to determine the distance of the enemy by the effect of his fire. With modern arms and smokeless powder a single marksman in a sheltered position may cause serious loss to a body of troops, as witness the case cited in the "Military Album," when in an attack by Bavarians on a French battalion sheltered behind a low wall, a Bavarian soldier climbed into a tree, and picked off the French at will, while no smoke betrayed him, and several volleys failed to kill the daring marksman.

Thus scouting parties will be forced to move with great caution, and will not always be able to collect sufficient information, all the more so because, having come under the fire of insignificant posts, and having been obliged to withdraw, they will naturally not wish to admit that they were engaged with small numbers of the enemy. More precise information may be attained only by means of infantry commands which are more easily sheltered, and which can approach more closely the positions of the enemy. Such a definition of the duties in reconnaissances of cavalry patrols and infantry commands is laid down in the Instructions for Infantry elaborated by the French technical committee: "Cavalry may obtain only general,

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approximate information as to the position and strength of the enemy; for the acquiring of detailed and precise information infantry must be employed." And actually, in the French military manœuvres, cavalry are now kept at some distance, and close reconnaissances are made by infantry. Nevertheless, the reconnoitring importance of cavalry, in the strategical sense, has increased. It must be taken into account that the territory of the enemy will be sown with a multitude of permanent and improvised fortified positions and points, and an army will not attack without having around itself, and more particularly in advance, a network of cavalry detachments split up into small parts and patrols. To a large extent such cavalry will operate independently, as when crossing the frontier in the beginning of war. It must alarm the enemy, destroy or seize provisions, guard the bridges, seize despatches, collect information as to the enemy's movements, and protect the communications of the army in its rear.

The greater the importance played in modern war by railways, telegraphs, and improvised entrenchments, the more essential has become this strategical employment of cavalry. Military writers generally assume that the chief strength of cavalry must be sent forward for investigation, and for the protection of the advanced guards of armies, as Germans expressed by the German saying, "Die Reiterei allzeit voran!" (Horsemen always to the front). In view of the power of modern arms, and the resulting practice of disposing troops behind natural and artificial defences, and in view of the great network of defensive points prepared in advance, an attacking army will more than ever find it necessary to feel its way, and to reconnoitre the country into which it is advancing. Thus the capacity of cavalry as the "feelers" of an army has become especially important.

As to the part cavalry should play in actual battle, military writers differ in a remarkable degree. Some, as the French Captain Nigot, believe that the desperate massed attacks of cavalry, which prove so effective in manœuvres, are impossible, as with the great increase in the power of fire, cavalry will not be able to strike at infantry even when

weakness is observed. From his calculations it appears that a battalion of 800 rifles, with one volley fired at a range of 330 yards, would unhorse 424 troopers, and if a battalion were to open fire at 880 yards, and continue firing, at a distance of 110 yards 2656 men would have been put out of action, that is several battalions of cavalry, attacking one after another.

Such is not the view of all military writers. Thus one author, relying on the fact that cavalry will cover a given distance at twice the speed of infantry, contends that although cavalry is subjected to treble the possibility of disablement, yet one factor neutralises the other, and therefore the loss of cavalry will be no greater than the loss of infantry in the same distance.

Of one thing there is not the slightest doubt, that is, that cavalry is threatened with treble probability of being struck. In France it was shown that under equal conditions cavalry losses under fire are from two and a half to three times as great as infantry losses, and that cavalry cannot, therefore, remain immovable under fire. Therefore, in France it is considered proven that in time of battle cavalry must keep at a distance of not less than 3850 yards from the enemy, and may draw nearer only towards the close of the battle. Otherwise it would be swept away by rifle and artillery fire.

The speed at which cavalry may attack is taken by some at 550 yards a minute, but most authorities limit it to 440, even to 374, yards a minute. But even if, notwithstanding inequalities of the battlefield and the close formation which lowers the general speed to the speed of the slowest horses, the speed of attack is taken as half a mile in two minutes—almost racing speed—nevertheless, in the course of these two minutes' exposure to effective fire before it can get to close quarters with infantry, cavalry must suffer immense losses which will force it to disperse or make its attack feeble.

It must be understood that for the consideration of this question we have only the opinions of different military specialists. The German author of the "Militärische

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Essays" says that modern conditions in no way involve the fascination which surrounds cavalry in the traditions of the Seven Years War, and that the German army would enter upon war with from 30,000 to 40,000 superfluous cavalry, which would only create difficulties in concentration and to the Commissariat. But other authorities declare that the smokelessness of the battlefield will be favourable for cavalry attack, since it will be easier seen at what points the enemy's infantry is weak, while it will be more difficult for infantry to await from afar, without the covering of smoke, the impetuous shock of masses of cavalry.

This moment when weakening is observed in the enemy's infantry is relied upon by the advocates of cavalry attack in battle. One even goes so far as to say that upon the clash of cavalry upon infantry "it will matter nothing what may be in the hands of the trembling infantry—magazine rifles, flint-locks, or simply pitchforks." But, as Von der Goltz observes, weakness may be very plain in the ranks of an army and yet not be seen by the enemy. Such weakness can only be seen from advanced positions, and while the information is being conveyed to the proper quarter and cavalry is being sent to attack, the auspicious moment may have passed. On the other hand, the movement of masses of cavalry is always visible owing to the dust it raises, and all the fire of the enemy may be concentrated on these masses, artillery fire against cavalry being effective from a long range, as the mass presents an immense target.

In comparison with the times of the Seven Years War cavalry has itself made progress. It is furnished with stronger and swifter horses. But this improvement can in no way be compared with the increase in range and rapidity of fire. In addition to this, as the same author observes, in former times it was sufficient to break up thick masses of infantry and their opposition was at an end; now infantry begins the battle in loose formation, each individual command constitutes a unit fit for battle, and even the solitary soldier will not lose his wits while a

cartridge remains upon him. Thus the relations between cavalry and infantry have entirely changed.

It is questionable, indeed, whether in the future cavalry will have that importance which formerly belonged to it, as a force deciding battle and afterwards completing the overthrow of the enemy by pursuit. Even in the wars of 1870 and 1877 this importance of cavalry seemed diminished, although, on the other hand, its importance in the reconnoitring of occupied territory, the protection of armies, and its value in independent action have increased.

In addition to this, a new function for cavalry has been created—immediate irruption into the territory of an enemy, and the destruction of his arrangements for mobilisation, and his communications. To what extent such action of cavalry in the moment of the declaration of war will prove successful is still to be proven by experience. In the event of success such action would cause disorganisation in the enemy's arrangements, and force him to accelerate them. And as operations, considering the immensity of modern armies, may be successfully carried on only by the precise execution of strategical plans elaborated in advance, then the disorganisation caused by sudden cavalry irruptions might have the most important results.

As concerns the *rôle* of cavalry in pursuit, it is more important to consider this *rôle* in the pursuit of retreating armies to their farthest movement than in the pursuit of armies in their actual retreat from the field of battle. Doubts have been expressed as to the decisiveness of future battles. It is very probable that in the majority of cases the road selected for retreat will be guarded by defences constructed in advance, the retreating army falling back upon the nearest position and offering fresh resistance to the victors, who, on their side, will be weakened by the storming of the first positions. In such case the most important *rôle* of cavalry may be to prevent the retreating army drawing reinforcement from other sections of the army which, owing to the vastness of the

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field of battle, may find themselves at considerable distance from the main army.

In any case it will be seen that the duties of cavalry in war remain very important, although the fulfilment or non-fulfilment of some of the tasks appointed for it has still to be shown by experience.

Quite otherwise is the case of artillery.

It is an accepted axiom that without the aid of artillery it is impossible to drive infantry, even infantry considerably weaker in numbers, out of a fortified position; and as all infantry when acting on the defensive will be entrenched, then armies in future will find themselves mainly dependent upon artillery.

The successful employment of artillery will depend upon the opposition it meets from the artillery fire of the enemy. The artillery of the attacking side will begin by attempting to silence, or at least to weaken the artillery fire of the defenders, which object being accomplished, it will be able to turn its attention to the enemy's infantry. The artillery of the defending army, possessing as it will many advantages, will attempt to prevent this. The result of such a duel, if the defenders have artillery of nearly equal strength and quality, in all probability will be the annihilation of the attacking artillery; while if the superiority of the attacking artillery be substantial, the result will more probably be mutual annihilation.

The increase in the artillery of all armies, the improvement of ammunition, the adoption of smokeless powder and of new explosives, the improvement in tactics, all these must lead to such great losses in the artillery service that their action will be paralysed, or the losses in the armies will become so tremendous that war itself will be impossible.

Such a conclusion may seem risky, but it is founded on the investigations of the most competent artillerists, and in the justice of their conclusions it is difficult not to concur, when we consider the changes which have taken place since the time of the last great war.

As relates to the employment of artillery, it may first of

all be noted that the adoption of new powders has changed for the worse the position of artillerymen. In former times a thick cloud of smoke hampered the aim of the artilleryman. But on the other hand it prevented the enemy's artillery and infantry from taking accurate aim.

As long as ordinary powder was used there was no especial need for increase in accuracy and rapidity of fire, for quick firing produced so much smoke that after a short time it was necessary to slacken fire, except on those occasions when there was a favourable wind ; and accuracy also was not as important as it is at the present day. With smokeless powder it is possible to discharge more shots in a few minutes favourable for fire than were formerly discharged in a day's battle. In this connection the accuracy of modern fire must again be insisted upon. Cannon at a distance of 2011 yards has placed shot in the same hole four times in succession.*

It must be borne in mind that against the enemy's artillery the defending army will make use also of sharpshooters. Using the new powder, sharpshooters will have full possibility to approach the batteries of the enemy, and concealing themselves behind inequalities of the field of battle, with no smoke to betray them, may pick off all the enemy's gunners and horses.

Manœuvres in which smokeless powder has been used confirm the opinion that from a distance of 440 yards it is impossible to discover marksmen hidden behind trees or bushes. But from this distance every shot of a skilful marksman will claim its victim. In addition to this, all armies now possess specially organised bodies of chas-seurs, trained to fire from great distances, and accustomed stealthily to approach their mark. It is plain that for such commands there can be no especial difficulty in stealing up to a battery and picking off the artillerymen. The French, German, and Austrian armies dispose of sufficient numbers of such soldiers. It is well known that Germany, France, Austria, and Switzerland yearly expend considerable sums

* Löbell, "Militärische Jahresberichte," 1894.

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on the encouragement of good shooting, and that among the population of those states there is a considerable number of first-rate shots. In the Russian army chasseur commands are also found with the different army divisions.

According to the data of the Prussian General Rohne 100 sharpshooters will put a battery out of action, firing from a distance of—

	880 yards in the course of	2.4 minutes.		
1100	"	"	4	"
1320	"	"	7.5	"
1650	"	"	22	"

But even if the destruction of the gunners be not accomplished by sharpshooters, it is very probable that it will soon be done by the artillery of the enemy.

The quantity and power of artillery in all armies has been multiplied many times. If the figures which represent these increased quantity and increased power be multiplied it will be shown that in comparison with 1870 the strength of the French artillery has been multiplied 116 times, and of the German 42 times. But after the introduction of the improved artillery now being accomplished the strength of artillery will be again redoubled.

If, to form some idea how losses in a future war from the action of artillery alone will exceed the corresponding losses in 1870-71, we multiply the figure of these latter losses by the figures which represent the increased force of modern artillery, the result would be incredible, for it would show that there could not be an army large enough to sustain such losses. But for the purpose of giving an idea as to the power of modern artillery these figures have a theoretical value, resulting as they do from simple arithmetical calculation.

In one sense calculation will not be uninteresting. What number of soldiers will be disabled by the use of that quantity of shots which is found in the ammunition cases of the batteries of different countries, taking into account the conditions for marksmanship less favourable in war than in peace? When we make this calculation,

on the figures of the Prussian general and well-known military writer Müller, we find that the ammunition carried by the batteries of the French and Russian armies, taken together, would put out of action six millions of soldiers. Continuing our calculations upon the data of the same authority we find that the Franco-Russian artillery, with its ready supply of ammunition, would be capable of withstanding the attack of double that number, or twelve millions of men. The ready supply of ammunition in the united German, Austrian and Italian armies would disable five millions of men, and successfully repulse the attack of ten millions of infantry.

A writer no less authoritative, a professor of the chief artillery school in France, Colonel Langlois, speaking as to the character of future battles, expresses the opinion that for one field-piece up to 500 rounds will be required. If we estimate the quantity of artillery, and the number of fragments produced by explosion, it is shown that these are sufficient for the destruction of forces eight times stronger than the armies opposed to them. It is necessary to mention here that modern projectiles, filled with powerful explosives, will be dangerous not only to the enemy, but also to the army which employs them. The storing, transport, and employment of such explosives under the well-directed fire of an enemy may lead to catastrophes which will still further increase the horrors of war. In France *fougasse* shells, containing 4 pounds of melinite, have been adopted. The majority of writers are agreed that in view of the possible premature explosion of melinite shells, *fougasse* shells are very dangerous, as in such event, the bursting of the gun seems inevitable. But the danger is not limited to the possible bursting of guns. Against entrenched armies, mortars and siege artillery of great size will be employed. The projectiles of these will be filled with strong explosives, such as peroxylyene and melinite. Now these explosives are capable of exploding unexpectedly on certain changes of temperature and from other causes not yet ascertained. The agitation of the air caused by the enemy's shells may also cause explosions.

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It is enough to note that explosions are by no means uncommon during experiments, although these experiments are carried on by trained men under the supervision of picked officers. The very mystery with which not only the experiments but the accidents which arise therefrom are surrounded, proves recognition of the difficulties that arise and the uncertainty of success. England is the only country where circumstantial accounts of accidents in dealing with explosives are published. In the yearly memoranda of inspectors we usually find a long list of accidents in the making or transport of explosive substances, and this, among other things, shows that notwithstanding all measures of precaution, armies are sometimes supplied with dangerously defective ammunition. For the sake of safety in many armies explosive projectiles are painted various colours, and, in order to distinguish them at night, are given a different form. In addition to that they must be transported separately, and the very fitting of the tube into the projectile is done at the time of loading.

It is very natural to find that in time of battle, when armies are in a state of tension, perfect coolness is found only among exceptional natures. During the American Civil War thousands of rifles were found upon the battle-fields doubly and trebly loaded, and sometimes charged to the very muzzle. If in such a simple matter as the loading of a rifle such mistakes are made, what is to be expected in the use of highly explosive ammunition, the safe handling of which demands the greatest precision and caution?

Even if we were able to assume that cartridges will always be furnished with explosive tubes only when operations begin, or on the very position on which they are to be employed, and that guns will always be loaded with due caution and regularity, even in that case we find the possibility of a new and even greater danger.

Fougasse cartridges consist of a long steel cylinder, of which the smooth interior is filled with melinite, roborite, ecrasite, or some other explosive. All these substances differ from one another by admixtures and mode of pre-

paration. It is obvious that the thinner the case of the cartridge the greater the quantity of explosives it will contain.

In the opinion of experts, the direct action of gases on explosion is limited to a comparatively small space—16½ yards—but their explosion develops such force that for a certain distance it will drag gun, gunners, and horses. It cannot but be observed that if in the manufacture of the ammunition any faults were to escape detection, the very gravest consequences might ensue. In one of the latest English compositions on artillery the following sentences occur: "The founding of ordinary shells demands great care in order to prevent premature explosion in the barrel of the gun. Shells must not have on their internal surface any roughness which might cause explosion."

On the explosion of such a shell in the barrel of a gun the body of the latter was shattered into more than twenty bits, the carriage was completely destroyed, and the wheels turned into a heap of splinters. Individual fragments of the destroyed weapon weighed 363 pounds, and were flung 99 yards forward and backward from the place on which the gun had stood, and nearly 108 yards on either side. Notwithstanding the distance between guns, a single explosion might embrace several guns with all their ammunition.

Not far from the battery ammunition cases will be placed. If these be not exploded by the concussion of the atmosphere they may very easily be exploded by some of the heavy fragments which fall upon them. Is there any one who can declare that all such accidents will be obviated by perfection of technical construction and, with the present constitution of armies, by the careful selection of those who are to deal with explosives?

All this leads to the conclusion that even if we do not consider the dangers proceeding from explosions, the artillery and ammunition already prepared is sufficient for the destruction of much larger armies than will be moved on the field of battle. But such destruction may not take place for the very simple reason that the artillery of each

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combatant may in a very short time silence the fire of its adversary. And as the quantity of artillery, their quality, and the training of their crews will, in the opinion of most authorities, be almost equal on both sides, then common sense tells us that in the artillery duel with which battles will commence either the attacking side, having less protection, will be destroyed, or mutual extermination will result. Thus the problem might arise for infantry to attack without the support of artillery, and as this, as we shall hereafter show, is impossible without terrible losses, tactics would probably be changed, and with the remnants of its artillery the side having the advantage in the artillery duel must await the attack of the enemy; conditions which would probably result in a repetition of the events of 1632 at Nuremberg, when Gustavus Adolphus and Wallenstein entrenched themselves and laid all their hopes of victory on the exhaustion of the enemy.

As concerns the operations of infantry in the future war there is no settled opinion even on the chief question, that is, the deciding influence in battle of an infantry attack. If war were to break out to-morrow all armies in this respect would find themselves under the influence of the contradiction between instructions, manœuvres, and the views of the more noted military writers, General Skugarevski, Müller, Von Rohne, Janson, and others. There is no reason to be surprised at this, as the introduction of smokeless powder, improved rifles ten times more effective than the rifles of the old type, better instruction of soldiers, and their equipment with instruments for the construction of earthworks have changed in every respect the conditions of war.

Modern tactics are primarily the result of our experience of the last great war. As long as the progress of military technical science was comparatively slow it was not difficult to rely upon the experience of the past. At the present day the state of affairs is entirely different; in former times re-armament took place after hundreds of years, then after many decades, now it takes place in a very short time.

But not only the change in armament will influence the action of infantry. The smokelessness of the battlefield, the perfection of rifles, artillery, and explosives, and at the same time the employment of army hordes consisting largely of short-service soldiers, have created entirely new conditions for the war of the future.

In battle a combatant may from a distance three to four times greater than before inflict serious losses on attacking troops. The killing off of the officers and consequent weakening in leadership, will be direct consequences of a smokeless battlefield, and of the precision of modern small arms which makes it possible for marksmen to select their victims at will.

Meantime, the *rôle* which will be played by infantry has become more complex. In preliminary operations infantry must take a far larger part than formerly. The close reconnoitring of an enemy's position has become the duty of infantry scouts, who will be obliged to advance stealthily in order to obtain the information necessary for any successful attack. Without such service by infantry scouts an immense superiority would remain on the defensive side which, having studied the locality in advance, and occupying a commanding position, would simply with the aid of field-glasses direct all its blows successfully.

For the carrying out of such reconnaissances and the collecting of information, not only daring but skilful and sagacious soldiers are required, and with the modern composition of armies it will be very difficult to find such men. The determining of positions by smoke is no longer possible; while to determine positions by sound is extraordinarily difficult. Experiments carried out on French shooting ranges show that the sound caused by the explosion of smokeless powder does not penetrate as far as that of sulphur powder; a single rifle shot is heard no farther than 880 yards, and volleys, according to the number of rifles, no farther than from 1320 to 1540 yards. Yet knowledge of the strength and position of an enemy is much more essential than before, as the losses from an unexpected encounter will be very great.

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From modern infantry men much more endurance also will be required. Marches will be made in deep columns in consequence of the growth of armies; while the number of these marches, as a consequence of the massiveness of modern armies, will increase in comparison with former times, since, owing to considerations of space and commissariat, modern armies must be split up and the individual sections must reunite with the main body on drawing near to an enemy superior in numbers.

Thus the conditions surrounding advance to battle and battle itself have become extraordinarily complicated. Yet on mobilisation for every hundred soldiers serving with the colours under present arrangements from 26 men (Italy) to 361 men (Russia) will be drawn from the reserve. The majority of these men will have long forgotten what they learnt during their period of service, while of their officers only a fraction will be in a high state of efficiency.

With such conditions it would seem necessary that field instructions and regulations must be elaborated in time of peace, giving precise directions as to tactics in all contingencies. But in this very respect in every army we find deficiencies of different kinds. Theoretical instructions do not correspond to practical necessities and are constituted from a limited standpoint. Colonel Mignol says that the tactics recommended in the latest French official instructions in essence differ very little from those introduced after the invention of firearms and the adoption of bayonets, that is, when firearms were about forty times less effective than they are to-day. At that time in the first line of battle marched musketeers who opened the combat, followed by pikemen who carried out the actual assault. Now battle is opened by moving forward lines of riflemen, after which storming columns will advance. But are these two forms of tactics in essence the same? Is it possible that all the progress in ballistics which has strengthened the defensive power of infantry and increased the mobility and strength of artillery, has not led to a change in the very nature of war? Is it possible that war remains the

same as in the time of matchlocks, flintlocks, and ramrods with the mere difference that musketeers have been replaced by sharpshooters, and pikemen by reserves and the *masse* ? The inadequacy of the recommended systems is so obvious that as soon as new instructions appear they are submitted to criticism and changed. In truth, the views concerning the duties of infantry present a labyrinth of irreconcilable contradictions, one incompatible with another.

The reader must not think that these contradictions are apparent only to the layman. General Luset, a very well-informed specialist, speaking of French tactics, asks : " Who has not been astonished by the differences of view found in the text-books of our schools on questions touching the actual condition of tactics ? Can we admit that the teaching of infantry officers in the lower schools agrees with that which they receive in the highest military training institutions ? The teaching of this higher school does not correspond to the courses of the *Ecole d'Application*. The ideas insisted upon in the teaching of the higher military school change continually. There is a chaos of contending ideas and principles, and out of the general confusion not a ray of light appears. Is it surprising that officers ask. 'What is the use of study ?' Let teachers first agree among themselves ! "

Attentive study of German writers will reveal differences no less great. But for many obvious reasons they are expressed with greater caution. Many German military writers are restrained from a too frank admission of the dangers and difficulties of war under modern conditions by the fear of giving food to the agitation against militarism.

Rules hasten after rules, supplementary explanations are constantly added, and in the result of results we find a chaos of inconsistencies. It could not be otherwise. When all units of infantry are furnished with trenching tools in such quantities that in the course of a very short time earthworks may be thrown up, each attacking body is subjected to eight times the danger of their sheltered opponents. But in addition to rifle fire, attacking forces

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will be subjected to fire from the protected artillery of the defenders.

It is not surprising therefore that, concerning the character of the future employment of infantry, the views of different authorities present numberless and grave contradictions.

A considerable number of military writers, judging from the experience of past wars, conclude that the main points in the employment of infantry in battle have not changed. Infantry will be employed in battle as in the past, but in loose formation, and the command of infantry will not be especially difficult not only for experienced officers, but even for those who have been taken from the reserve. On the other hand, other writers declare that for the command of infantry on the battlefield even more ability will be required than for the command of artillery and cavalry. For 300 officers who are capable of learning to command a battery or a squadron not 100 will be found in any army capable of leading infantry under fire. What, then, shall we expect from the officers of the reserve? In one thing, however, all are agreed—that whatever be the tactics adopted, their successful execution will require great skill in taking advantage of cover and in overcoming obstacles, knowledge when to seek shelter on the ground and to advance again at the proper moment. Will the reservists only just summoned to the colours be in a condition to fulfil these duties? But even suppose that a considerable part will consist of perfectly trained and enduring officers and soldiers, what in such event will be their losses?

Some say that there is no reason for supposing that in a future war armies will sustain greater losses than in the past. Others, no less authoritative, declare that attacks having with their object the occupation of an enemy's position in a future war will be so difficult and bloody that neither side will be in a condition to celebrate the victory. Before the defended position will be formed a belt 1100 yards wide, for both sides equally inaccessible, limited by human bodies over which will fly thousands of bullets and shells, a belt over which no living being

will be able to pass to decide the battle with the bayonet.

But another view is expressed. All this, some writers say, would be true in view of the small-calibre rifles and improved artillery now in use if the field of battle were a drill-ground where distances were known and marksmen guaranteed that they would not be struck by the enemy's fire, and if the field of battle were a perfectly level space ; but in nature such positions are rarely met with, and armies will take advantage of the shelter of woods and undergrowth, eminences and depressions. Hidden behind the first line of riflemen who will constitute the *Kugelfang* the succeeding lines will advance with much less losses.

To this is replied : It will be easy for commanders to follow the approach of the enemy by means of balloons from permanent points of view and from portable observation points, which will be set up by every detachment intending to occupy a position. Therefore with the long range, precision and striking power of modern artillery, which make it possible to scatter fragments and bullets to immense distances, it will be possible to shell an enemy out of woods and from behind bushes and inequalities of the ground. There is no foundation for supposing that the enemy will select precisely those positions which will not give him the possibility of taking advantage of long-distance rifles and artillery. In addition to this, and to trenches and earthworks, he may prepare other obstacles for the overcoming of which the attackers from a short distance, in more or less dense masses, and under a constant fire will require no little time.

To this is replied that at short range the losses, notwithstanding the unquestioned improvement of the ballistic qualities of modern arms, will not be great. When the enemy is within close range the soldiers will be nervous, they will aim badly or not at all, and modern perfected small-arms will be little better than bows and pitchforks in the hands of barbarians.

But the soldier under cover will be subjected to very little danger. Resting his rifle upon the trench, he will

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fire without aiming, holding his rifle horizontally, and the bullet will bring death to whatever lies in its path for a space of 660 yards, while even if fired at too great an elevation it will fall among the reserves. The experience of the Chilian war demonstrates that at a range of from 1100 to 1320 yards the losses from random shots may be very considerable.

All this is well known to the advocates of war, yet they continue to maintain that soldiers will shoot badly, and that the perfected rifles now in their hands will be no more effective than the weapons they bore in the past. But, is there any reason to suppose that with the favourable conditions for defence above indicated, soldiers acting on the defensive will aim badly? Why, then, assume that the attackers will have sufficient courage to advance openly, exposing their whole bodies, when the defenders will be subjected to a danger eight times less? In reality even this danger will not exist. At very short distances the fire of an enemy approaching at a running pace will be quite ineffective, while his rear ranks will be forced to cease fire.

Even if we were to admit that the defending army will always be of inferior quality, in such case his fire will be so heavy that it must work immense destruction among the attackers. To this also a reply is found. We are told that the stronger the fire the farther the contending armies will remain from one another; they will rarely see one another; rivers, woods, and hills will sometimes separate them; there will no longer be direct clashes of troops, making of man a bloodthirsty beast, and ending in the ruin of one of the combatants. And since battles will take place at immense distances it will not be difficult in case of need to retreat from the field. But in such event more or less mutual extermination will have taken place without definite result.

Other writers admit the probability of terrible bloodshed and immense losses, but maintain that not this but the gaining of victory is the important point, whatever the losses may be. The war of 1870 showed that infantry is capable of enduring immense losses. Other

specialists regard this opinion with suspicion in view of the fact that modern infantry is very different from that which fought in 1870. For many causes they admit that the losses will be incomparably greater.

Modern arms not only increase the direct danger but paralyse the medical service, since it will be impossible to organise ambulance stations in positions exposed even to the random shots of the enemy, and equally difficult to carry off the wounded. Modern rifles kill at two miles, artillery is effective at more than three and a half miles. And armies no longer consist of professional soldiers, but of peace-loving citizens who have no desire to expose themselves to danger. The propaganda against war may turn their minds in another direction. It is impossible to rely upon modern armies submitting to sacrifice and deprivation to such an extent as is desired by military theorists who lose sight of the tendencies which obtain in western European society.

Such contradictions of opinions are met not only by questions of a general nature, but even by matters of detail. Some declare that the improvement in firearms, and the adoption and application to military purposes of all the latest inventions, have cast into the background mere muscular strength, replacing it by military technique. With immense armies and high mental training of leaders, it will be possible by means of the strategical concentration of marching columns at a certain point to outflank and surround the enemy—all the more possible because the defence will be weakened in consequence of the greater distance of reserves.

To this the reply is: In order to carry out such an operation it will be necessary to know all the movements of the enemy, while against smokeless powder, long-range firearms, and against the precautions taken for guarding the centre of an army, the obtaining of information and the examination of the inhabitants will be more difficult; the quick construction of light trenches will render vain attempts at turning flanks and surrounding an enemy; while the constant arrival on the field of battle

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of fresh forces, which will be frequent owing to the distribution of armies over great areas, will endanger the position of an army which attempts a flanking movement.

Thus we find before us a whole series of hopeless contradictions. This it seems is inevitable and springs from the very nature of things. A war alone is capable of solving these questions.

In the future war, whatever the combinations may be, one side will stand primarily on the defensive; and if after the repulse of the enemy's attacks it in its turn resorts to attack for the purpose of finally overthrowing him, such operations can only be carried on for a short distance, as the newly attacking army will meet with similar insuperable obstacles. The contending armies in all probability will often exchange their parts.

French statisticians estimate that every attacking body, in order that it shall not be inferior to the defenders, when it has got within $35\frac{1}{2}$ yards (the distance at which it will be possible to rush upon the enemy), for each hundred men of the defenders it must have 637 men; while if it wishes to reach the actual positions of the defenders not numerically inferior, it must have eight times as many men.

By the statistics of General Skugarevski, a body of troops, double the strength of the defenders, beginning an attack from 800 paces, by the time they have advanced 300 paces will have less than half their strength available against the defence. With equal forces the defenders may allow the enemy to approach to within a distance of 220 yards, when they will only need to discharge the six cartridges in their magazines in order to annihilate the attacking force.

The celebrated Prussian authority, General Müller, declares that in order to avoid total extermination "soldiers will be compelled, in scattered formation, and as much as possible unobserved by the enemy, to creep forward, hiding behind irregularities in the field, and burying themselves in the earth as moles."

If this is so, is it possible to dream of taking an entrenched position? Let us suppose that, following the

advice of General Müller, attacking troops will begin to form at 225 paces from the enemy, up to that time having suffered no loss. Let us also suppose that at that distance of 225 paces the attacking body numbers 400 men and the defenders in the trenches only 100 men. Now from the statistics of General Skugarevski, after the distance between the combatants has been traversed, only 74 men will be left to the offensive side for the actual attack with the bayonet. To suppose that the defending troops will have a clear field for aiming of less than 225 paces, or that 74 men will be able to wrest an entrenched position from 100 would be absurd.

All this leads to the conclusion that concerning methods of attack there can be no certain knowledge. To rely upon the assistance of artillery at the present day, when the quantity and quality of artillery will be on both sides the same, is impossible. To obtain a superiority of rifle fire over that of the defenders will be equally difficult, even with a considerable preponderance of strength ; so that the defending army in the very moment of attack may find itself in a position of complete security.

The Prussian General Janson expressed the view, to this time uncontroverted, that for attack it will first be necessary to employ artillery upon the enemy's position, and this of course can only be done by the concentration of a more powerful artillery than is at the disposal of the defence. If the rifle-pits and trenches of the defender's position are furnished with internal covering the assistance of siege artillery may be necessary for their destruction.

Only after such preliminary action may the actual attack by infantry begin. But to approach an adversary in a strongly fortified position, in the face of a fire over ground the distances of which have been ascertained beforehand, is a laborious task, and may even require two days to accomplish. In the first day the attacking body will advance to the limit of the line of fire of the enemy's artillery, and upon the approach of darkness must send into the belt of rifle fire small bodies, that is, companies taken from the assaulting army, always according to their

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order in the ranks. The advanced troops will proceed to the points selected, and immediately entrench themselves. These selected points of defence will form a line from which on the following day the storm of the position will be begun, after the opening of a strong rifle fire against the defence, and the advance of the rear echelons into the foremost line.

Now here comes in the chief difficulty in the execution of General Janson's plans. First of all the enemy will take such precautionary measures that it will seldom happen that the echelons advanced into the firing line before dawn will be able to find natural cover; on the contrary, the greater part of these echelons will remain without protection, and will stand exposed for a long time, while the attacking army, by means of fire, is preparing the position for attack.

General Janson himself is far from persuaded that the system of attack recommended by him will prove successful, even in the majority of cases. Indeed, as a condition precedent for the success of the attack, he assumes that the defenders will be disorganised and panic-stricken; at the same time adding that "we have no right to assume concerning the enemy what we would never admit about ourselves." Of course the system of attack he advocates could only prove successful after immense losses, and not always even after such losses.

To rely simply on the strength of the bayonet in face of modern intensity of fire would be to judge only by the tradition of those times when the bayonet was the last argument in battle. In the Russian army, faith in the bayonet is still sometimes expressed. Among foreign authorities it is no longer met with. The conditions have wholly changed. In former times the result of an infantry battle was thus decided: the combatants advanced upon one another without flinching, exchanged a volley or two, and then rushed upon one another. By such an assault the fate of the battle was quickly decided, the weaker side gave way, and escaped without

difficulty if the enemy employed no cavalry. The victors sent two or three volleys after the vanquished, and the battle was over.

The conditions are very different now. Before an attack with the bayonet can be made a zone of murderous fire has first to be passed. Retreat after a repulsed attack upon a fortified position, will be accomplished only after the loss of more than half the attacking force. At such short ranges as will be found in bayonet attacks, almost every rifle bullet will disable one soldier, and often more than one. On a smokeless battlefield the results of such an overthrow will be visible to all. At such close ranges the present covered bullet will penetrate the cranium ; but in other parts of the body will have a shattering and tearing effect.

If we accept the opinions of the specialists cited that the defending troops by the force of their fire can stop the attack at some hundred yards distance, making further progress impossible, we are bound to admit that the defenders in their turn will not be able to undertake an assault, which would merely result in changing their positions with the enemy.

The attainment of success, as happened in the past, and especially in the war of 1870, by means of manœuvres and enveloping, will, in the war of the future, also be unlikely. In the first place such operations demand great superiority of force, whereas armies will be almost equal. Further, for the enveloping of an enemy's position reconnaissance under fire is necessary, and this is a very arduous task. A defending army driven from its positions, will begin to retreat by convenient roads, either finding new points of resistance prepared in advance, or again entrenching itself in suitable positions, continuing its opposition to the attacking army, and inflicting upon it new losses until reinforcements arrive.

In view of the conditions of modern war the question inevitably arises : Will leaders be found gifted with sufficient talent to decide the problems of war, and overcome

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difficulties which seem almost insuperable? Year by year the mechanism of war undergoes improvement, and it must continue to become more complex. The fortification of frontiers continues, the strength of armies grows. Would it not be madness to begin a war when the very methods of attack are the subject of dispute, and the only indisputable fact remains that every mistake, in consequence of the immense power of firearms, will be followed by ruinous results?

In enunciating the more important questions which arise from the new mechanism of war, we naturally meet the question: Is there not a strange contradiction in the preparation of powerful weapons of extermination, and the subjection to military service of almost the whole of the grown population in those states where the spirit of the time is so decidedly opposed to militarism? In order, however, to prepare a basis for a reply to this question we should be compelled to describe the entire action of that mechanism denominated an army of which the constituent parts are here marshalled.

General Count Caprivi declared in Parliament that the people was possessed by a madness for figures. And indeed all European states from the time of the introduction of universal military service have been in a position to call under the colours almost the whole of their able-bodied male population.

But these men are not soldiers. They are worthless save when they are properly armed and instructed. In addition they must be commanded, and without leadership the best army in the world would be an inert mob. Only men with commanders can be named soldiers.

Different authorities variously estimate the strength of armies which might be placed in the field on the outbreak of a war. To preserve impartiality we must introduce all such estimates.

But the following figures, which relate to the year 1896, appear to us the most probable.

The military strengths of the Powers are as follows:

Germany	2,550,000
Austria-Hungary	1,304,000
Italy	1,281,000
Total	5,135,000
France	2,554,000
Russia	2,800,000
Total	5,354,000

To arrive at this result the governments of these countries have lavished milliards. Yet it is a remarkable fact that the relative strength of armies has not changed, notwithstanding the efforts of every State to outdo its neighbours.

Conscription, as at present systematised, has one good side—it bears in itself the embryo of the abolition of war. On the mobilisation of the whole working population in the different countries difficulties may easily arise the consequences of which it would be difficult to foresee.

Within recent times immense sums have been laid out to ensure the rapid concentration of all possible forces as quickly as may be after the declaration of war, in positions near to the enemy, in order at once to begin a determined attack. Such arrangements in 1870 gave the Germans the most splendid results, and their necessity is now generally acknowledged. But since then the conditions have changed. The superiority which rapid concentration and mobilisation will give may be counterbalanced by the greater order which will result from less haste, and the less grave economic disorganisation which slower mobilisation will cause.

There can be no doubt that the immensity of modern armies and the weight of their equipment enormously increase the need for endurance among the rank and file. Infantry soldiers are compelled to carry a weight of from 25 to 35 kilogrammes, or from 70 to 87 pounds. To become inured gradually to this there will not be time; long marches must be undertaken at once, and not a small proportion of the soldiers will break down from exhaustion.

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The French medical authorities declare that after the first two weeks of marching the hospitals will contain 100,000 men, excluding those disabled by wounds.

To obtain quarters for an immense number of men will be impossible, and armies in the very beginning will be deprived of the most necessary conveniences. It will be difficult to guarantee large masses of men with provisions, with the same speed with which those men are mobilised. The local stores at the chief points of movement will be exhausted, and the transport of provisions from the central organisation will require time. Of the consequences of mobilisation we may judge, although imperfectly, by the experience of manœuvres. In France the manœuvres have already revealed imperfect training of officers, and unsatisfactory fulfilment by the reservists of their military duties. At every obstacle these men broke up into formless mobs; they fired badly, so badly, indeed, that it was admitted that in the event of war three or four weeks' training would be required before they could be sent to the front, especially upon offensive operations.

It is improbable that in other countries similar inefficiency has not been observed; and that this inefficiency is not spoken of so openly may be due to greater restraint or to insufficient means of publicity.

It may, indeed, be said that universal military service for short periods presents conditions in which lie concealed the germs of the impossibility of war itself. This impossibility lies mainly in the difficulty of providing for immense masses, as a consequence of the diminution in productiveness, the possibility of economic crises, and popular commotions, and, finally, in the extreme difficulty of directing armies consisting of millions of men.

With the growth of populations armies will continue to grow, and since even now the immensity of armies and the condition of armaments and tactics make the apparatus of war so complex that the directing, feeding, and forcing of armies into battle has become very difficult, in a not very distant future it will be more than questionable.

The more complex the apparatus the greater intelli-

gence will be required for its management, both in those who command and those who obey. As the methods of extermination grow more powerful the more essential will it be to act at the psychical moment. In the network of opinions, conditions, needs, and dangers which will arise at almost every point of a struggle, in the opinion of General Dragomiroff only a powerfully developed intelligence will be in a position to act. The immensity of armies will cause great complexity in the whole apparatus of war ; but, at the same time, side by side with the increase in the size of armies, grows the power of weapons of destruction. The power of the rifle has been increased fourteen times and that of artillery forty times.

In the past, success in war depended upon the ability of the commander and the courage of his army. In the future, success will depend more on the ability of the commanders of individual bodies of troops, on the initiative and energy of all officers, on the personal example which they set to their men, and finally even on the condition of the soldiers themselves.

For the just direction of all this gigantic mechanism much experience will be required. But where will experienced commanders be found in the future, when experience even of the present conditions is lacking ?

The conditions of modern war are such that of necessity the directing power must pass from the hands of the older commanders, not to speak of generals—from the hands of colonels and even commanders of battalions—into the hands of captains. Yet the French Professor Coumès, in his work, "La Tactique de Demain," declares that for the command of infantry on the field of battle such skill will be required that in no army will there be found 100 officers out of every 500 fit to lead a company under fire.

If this can be said in time of peace concerning the officers of standing armies, what will be the state of affairs in war ? What will the chaos be when two-thirds of the men in the ranks shall have been taken from the reserves, who have forgotten their duties, who do not know their officers, and to whom their men in turn are equally strangers ?

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The army will pass under the bâton of the Commander-in-Chief as it has been made by mobilisation. Consequently the dispositions for mobilisation have greater importance than before, and defects in mobilisation cannot be remedied in time of war. In view of the colossal size of modern armies their direction in time of war will be extremely difficult even for the most gifted leaders.

In addition to military skill, it will be necessary that a commander-in-chief shall be a good administrator. Everywhere it is recognised that the supply of an army will be a labour of Hercules, and attempts will continually be made by the enemy to destroy communications. To lead an immense modern army, to concentrate and deconcentrate it as necessity requires, is a labour in no way easy; but to keep it in supplies will be an especially burdensome task.

Before the introduction of long-range firearms, battlefields were no larger than the exercise grounds of a modern brigade. The battlefields of the future will prove to be much greater in area than those of the past. The most powerful mind will not be able to embrace and combine all the details, requirements, and circumstances of an immense field. The receiving of information and the despatch of orders will be very difficult in the general uproar. The position will be all the more difficult since it will be seldom possible fully to concentrate the army for battle; often many divisions will approach at their own time. Hence it will happen that the independence of commanders of divisions will play a considerable part. The wars of the eighteenth century required one commander. The present more mobile tactics necessitate as many commanders as there are independent sections of an army.

And yet Europe has no generals experienced in leading such masses, and none experienced in the keeping of armies supplied with provisions and ammunitions on a scale even approaching that which will be needed in the future. If dealing with such complex problems the commander-in-chief prove incapable, tremendous losses are bound to be sustained before he can be superseded.

Not only the question of supreme command, but the action of subordinate commanders, and of the officers generally, in view of the way in which troops will be scattered and of their loose relations to one another, and in view of the difficulty of taking advantage of cover as a consequence of smokeless or nearly smokeless powder, has become considerably more complex, and in future much more independent action will be required from officers. But in this necessary independence of action lies concealed another great danger.

Every meeting with an enemy will prove more threatening, and every mistake, every hesitation will have much more serious consequences than in the past, both in its material and its moral relations. A cloud of smoke will not cover the battlefield, concealing the horrors of the conflict. The soldier will not see the enemy, or hear the shot which may deprive him of life, but he will see around him his dead companions. As a consequence of such conditions, the nerves of all, in the battles of the future, will be subjected to a terrible and hitherto unexperienced strain.

The lack of officers trained in warfare is another notable fact. Since the Franco-German war twenty-nine years have passed, and since the last Russo-Turkish war twenty-two years. But even if these wars were less remote, conclusions drawn from them would be inapplicable to modern conditions, all the more so because each of these wars was characterised by exceptional circumstances. In the war of 1870-71 the strength and qualities of the two armies were too unequal, while the war of 1877-78, in European Turkey, presented itself chiefly in the form of the siege of a single fortress. Since then the introduction of smokeless powder, the general improvement of arms, and the growth of the importance of field fortifications, have completely changed the system of tactics.

Of officers who have studied military science, not on exercise grounds but on the field of battle, there are fewer than there were in former wars, and in a few years there will be none at all. The absence of experience must be

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replaced by scientific instruction. But military science in one important respect differs from other branches of knowledge, inasmuch as its theoretical teaching is not accompanied by the constant test of experiments, such as are made for instance in chemistry, mechanics, and medicine. Manœuvres give neither complete nor trustworthy information, as much that is allowed would prove impossible in war, and moreover they lack what Bismarck, at the siege of Paris, called the "psychological moment." It was not without reason that General Dragomiroff observed that manœuvres would be much more instructive if even one out of a thousand cartridges contained a bullet.

Meantime a fundamental change has taken place in the very elements of war from which depend, on the one hand, its course, and on the other, its influence on all the departments of social order. On the field of battle, instead of moderate, easily supervised armies and their reserves, marching in deep and thick formation, elbow to elbow, there will advance whole peoples up to fifty years of age, commanded for the most part (three-fourths) by officers from the reserve, who will have almost forgotten the military art.

These immense mobs will have at their disposal new explosives of tremendous power, and arms with incomparably greater range and deadliness than before, but never tested in a great war.

The immense extent of the theatre of war ; the vastness of the field of battle ; the difficulties presented by attack on entrenched positions and fortifications, and those natural defences on the battlefield which soldiers are now taught to utilise, and which inevitably will be utilised in view of the deadliness of modern fire ; the impossibility of massed attacks ; finally, the duration of battles, which may be prolonged for several days, and which owing to the impossibility of pursuit may yield no decisive results—all these are new circumstances.

In view of the increased importance of officers under these conditions, systematic attempts will be made in all

European armies to kill off the officers of the enemy. Experience even of the last wars, when it had not been adopted as a principle to disable the officers of the enemy, showed how possible was the rapid diminution of the number of officers on the field of battle. At the end of the Franco-German war at the head of battalions and half battalions stood reserve officers of lower rank, and even sergeant-majors. In December 1870 in a Bavarian division there remained but one line captain.

As an illustration of what may happen in the future we may take the Chilian war, although only a part of the army of one of the combatants was armed with small-calibre rifles.

The losses in two battles were as follows :

Officers killed	23 per cent.
„ wounded	75 „
Men killed	13 „
„ wounded	60 „

The high percentage of officers killed vividly illustrates the heavy cost of leading masses in war.

But the war of 1870 showed that if officers are lacking to give example the men will not attack. If this were so in 1870, what will be the case in the future, when for every hundred soldiers in the standing army it is proposed to draw from the reserves :

By Italy	260 men.
„ Austria	350 „
„ Germany	566 „
„ France	573 „
„ Russia	361 „

The majority of these reservists will have forgotten what they learnt during their period of service with the colours. Of the officers only a small proportion will be trained up to date. But it is in their hands that all leadership will rest. Yet the percentage of officers who possess a good preparatory training is :

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In Russia	41 per cent.
„ Germany	100 „
„ France	38 „
„ Austria	20 „

Thus although experience has superseded science, we find that the officers who have been serving continuously will constitute less than half the staff, the other half will consist of officers of the reserve of all denominations, the majority of whom will have long forgotten the military art. Of this first half almost all will be taken for the formation of new staffs, &c., and the supply of line officers will be so exhausted that at the front there will remain in each battalion no more than eight of such officers—that is, no more than a fifth part, or 20 per cent., a deficiency of four-fifths remaining which must be supplied partly by retired officers, and partly by serjeant-majors and non-commissioned officers, for the greater part taken from those serving with the colours, but to some extent even from the reserve.

Thus every military undertaking owing to lack of leaders will present a terrible risk, and only daring advocates of a policy of adventure would now determine to solve international questions by war.

The frontiers of all states are sown with fortresses and fortified camps, and every road by which invasion might be made is prepared for defence beforehand. Even in times of peace immense forces stand at short distances from one another, and for the purpose of reinforcing them quickly strategical railroads have been built, so disposed that there can be no talk of the occupation of any country at once. A few days after mobilisation the opposing armies will almost directly confront one another.

In former times to hold great masses in hand, even in the case of failure, was comparatively easy. Long service and tactical exercises had turned soldiers into automata; in manœuvres as in war, great masses of men advanced, mighty by their own inert obedience.

In the present day armies almost always advance and act in loose formation, and with this the influence of the

mass on the individual unit disappears. It is obvious that for the attainment of success the employment of a thin line of riflemen will not be sufficient. It will be necessary to prepare for an assault by artillery fire, and then by gradually strengthening the firing line with reserves, after which the position of the enemy will be finally attacked. Napoleon said that no decision in favour of battle should be taken where the chances of success were less than 70 out of 100; for when battle is once begun either victory or destruction must result. This rule of course remains applicable at the present day, but it must be noted that, with the immensity of modern armies and the vast spaces covered by the field of battle, if it be not impossible it will at least be much more difficult to estimate chances of success and to foretell the course of events.

Whatever technical improvements may exist, the first rule in battle is—obtain a superiority in numbers. The strategical problem (in the theatre of military operations) which lies in the union of forces exceeding the enemy's, corresponds in battle to the tactical problem, the acquirement of a preponderance at important points. Due defence, however, of the other points of one's position must be provided for, and the troops defending these latter points must sufficiently occupy the enemy's attention to prevent his forces from concentrating on the important point. A commander undertaking an assault must calculate the general consequences which will result from his initiative, and justly calculate as to his decisive blow, while providing in the execution of his plan for those contingencies which arise in the moment of battle.

Thanks to the system of furnishing troops with trenching instruments there will always be sufficient time for the construction of light earthworks, except of course on those occasions when the soil will prove frozen, marshy, or stony. A company by means of its own trenching tools may in the course of two and a quarter hours construct protection sufficient for a line of riflemen 250 paces in length. Small trenches, 100 paces long, for the protection

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of a whole company also require no more than two and a quarter hours, but larger earthworks and cover for artillery need from two and a half to eight hours' time. A battery is also provided with trenching tools, so that in the course of from two and a half to eight hours, according to the magnitude of the work, it may construct protection for its guns.

The chief difference between the tactics of modern and those of ancient times consists undoubtedly in the rare employment nowadays of direct attack. With modern arms and modern systems of defence generally, direct attack is accompanied by such immense losses that commanders, in all probability, will prefer flank attacks, especially if the enemy occupy a strongly fortified position.

But for this a considerable superiority of force will be required. In the words of Von der Goltz, the growing power of resistance of every military unit will enable a single division to accept battle with an army corps if it be confident of reinforcement within a brief time by another division. Even if the first division were exhausted by battle, yet so much time would be required for its decisive defeat that it might await the arrival of strong reinforcements, when the course of the battle might be entirely changed.

As an example we may cite the case of the army manœuvres in Eastern Prussia in the presence of the Emperor in 1894. Two divisions of the First Army Corps found themselves at the distance of a day's march from one another, yet the first of them succeeded in holding out against the assaults of the 17th Army Corps till the arrival of the second division, after which the defending divisions succeeded even in gaining some advantage over the enemy. In addition to this the flanking army cannot be certain that it will not meet with a fortified position on its road, and to count upon the negligence of the enemy would be foolhardy.

Formerly the conditions were much more favourable for attack. Napoleon, who, as the history of his campaign shows, always had a plan of battle ready,

nevertheless allowed a considerable margin to accidents, to meet which he changed his plan in the very moment of action. "It is necessary," he said, "to strike at the enemy and then to think what further to do." This policy answered well at a time when, although armies were very large, the commander nevertheless held in his hand all the threads of the battle, thanks to the fact that with clouds of smoke, short range weapons and the closer order of the armies, he could himself follow the course of the battle, learn precisely all its events, and have ready close at hand considerable reserves. In the future such direct command will be incomparably more difficult, and, in consequence, in order to preserve unity of action it will be necessary to observe more rigorously the original plan.

Not only the question of supreme command, but also the action of the subordinate commanders and of officers generally, in consequence of the loose formation of armies and of the difficulty of taking advantage of the ground owing to smokeless powder, has become much more complex. In the war of 1870 one of the circumstances which helped the Germans to victory was that the German officers were much more independent and self-reliant than the French.

But what would the result have been if the French army had not been from the very beginning several times weaker than the German, and had been even in part well trained ?

The following is the judgment of the Prussian General Janson: "The characteristic features of the campaign of 1870-71 were, on the German side, a general advance and extraordinary liberty of the subordinate commanders—even down to captains. But this was accompanied by such dismemberment in the leadership that if the first attack had not succeeded there might have been the greatest danger for the attacking armies."

Let us examine a modern battle. As examples we will quote two sketches, the one borrowed from the celebrated work of Von der Goltz, the other from the French Captain Nigote. Both these sketches represent the course of a

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battle in its general features, and the second shows great skill also in depicting the battle of the future—that is, a probable picture of a battle under modern conditions.

Goltz describes an accidental battle, and then considers the differences between such a conflict and a battle which has formed part of the plans of the commanders-in-chief. It is obvious that in the accidental battle the chief part will be played by the eye of the commander-in-chief, his readiness in the appreciation of complex circumstances, and his resolution. "In such a state of affairs," he says, "the fortune of battle will lie with the commander who first comes to a clear decision, and who judges better the most distant events of the battle." On the other hand, in the "planned battle" all is arranged in advance, although plans may demand alteration owing to changed circumstances, contingencies requiring from the commander ability to take advantage rapidly of his position.

This picture gives no image of that which will happen.

The French Colonel B. in his composition "La Poudre sans Fumée," which awakened much interest, says: "Having no means of precisely judging our position, the enemy will be constrained to advance towards us in marching columns in order to deploy immediately on the discovery of our lines. But where shall he gain information? He will be struck by artillery fire from a great distance, and the position of this artillery will be extremely difficult to determine precisely. . . . He will neither hear nor see enough for his purposes, and thus in a particular sense the words of Scripture may be applied: 'Eyes have they and they see not, ears have they and they hear not.' Reconnaissances and other means may be employed to determine the position of an enemy, but after these are made, changes in disposition may have taken place, and basing his operations on information thus obtained, an enemy may open fire on unoccupied points, and waste his ammunition, firing, as is said, 'at the sparrows.'"

Thus smokeless powder ensures long ignorance of positions and much search, and in consequence serious losses until the true position of things is ascertained. If

the attacking troops be opposed by a capable and active foe, the period of uncertainty may cost them immense losses.

But the battle is now in full play. We will quote here the picture of a modern battle drawn by Captain Nigote. This picture is, of course, only the fruit of imagination, as all the new instruments of extermination have not yet been employed in practice. But imagination has worked upon a knowledge of the subject, and Captain Nigote's picture has as much claim on our attention as other theoretical sketches.

"The distance is 6600 yards from the enemy. The artillery is in position, and the command has been passed along the batteries to 'give fire.' The enemy's artillery replies. Shells tear up the soil and burst; in a short time the crew of every gun has ascertained the distance of the enemy. Then every projectile discharged bursts in the air over the heads of the enemy, raining down hundreds of fragments and bullets on his position. Men and horses are overwhelmed by this rain of lead and iron. Guns destroy one another, batteries are mutually annihilated, ammunition cases are emptied. Success will be with those whose fire does not slacken. In the midst of this fire the battalions will advance.

"Now they are but 2200 yards away. Already the rifle bullets whistle around and kill, each not only finding a victim, but penetrating files, ricocheting, and striking again. Volley succeeds volley, bullets in great handfuls, constant as hail and swift as lightning deluge the field of battle.

"The artillery having silenced the enemy, is now free to deal with the enemy's battalions. On his infantry, however loosely it may be formed, the guns direct thick iron rain, and soon in the positions of the enemy the earth is reddened with blood.

"The firing lines will advance one after the other, battalions will march after battalions; finally, the reserves will follow. Yet with all this movement in the two armies there will be a belt a thousand paces wide, separating

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them as if neutral territory, swept by the fire of both sides, a belt in which no living being can stand for a moment.

“The ammunition will be almost exhausted, millions of cartridges, thousands of shells will cover the soil. But the fire will continue until the empty ammunition cases are replaced with full.

“Melinite bombs will turn farmhouses, villages and hamlets to dust, destroying everything that might be used as cover, obstacle, or refuge.

“The moment will approach when half the combatants will be mowed down, dead and wounded will lie in parallel rows, separated one from the other by that belt of a thousand paces swept by a cross fire of shells which no living being can pass.

“The battle will continue with ferocity. But still those thousand paces unchangingly separate the foes.

“Which will have gained the victory? Neither.”

This picture serves to illustrate a thought which, since the perfection of weapons, has occupied the minds of all thinking people. What will take place in a future war? Such are constrained to admit that between the combatants will always be an impassable zone of fire deadly in an equal degree to both the foes.

With such conditions, in its application to the battles of the future, the saying of Napoleon seems very questionable: “The fate of battle is the result of one minute, of one thought, the enemies approach with different plans, the battle becomes furious; the decisive moment arrives, and a happy thought sudden as lightning decides the contest, the most insignificant reserve sometimes being the instrument of a splendid victory.”

It is much more probable that in the future both sides will claim the victory. Examples of indecisive battles are found even in the war of 1870. Thus near Metz three battles took place which really constituted parts of one great battle. But which was decisively victorious at Metz? In reality neither. The German artillery proved its superiority; the French infantry, armed with the Chasse-

pot, proved its. Notwithstanding heroic efforts on both sides, neither one army nor the other gained a victory in the older and decisive sense of the word.

The shutting up of the French army in the fortress and its subsequent surrender were the consequence of the cutting off of supplies, the result of the numerical superiority of the Germans. Theirs was not a victory of genius or military initiative—it was a victory of figures.

In a future war these conditions will be all the more important since the seal and sign of victory—the pursuit of the enemy—will be almost impossible. The celebrated Liebert puts the matter in a few words: "In the past battles were ended thus: the field was ours, the enemy turned in flight; the command to pursue was passed from flank to flank, and this crisis put strength into weary limbs; instinctively horses were spurred, all thought only of drawing the greatest possible profit from victory, of causing the enemy even greater loss. Now matters are very different." Infantry having sustained modern destructive fire for a whole day, will be in a state of prostration, and so vast will be the space occupied by the army that even the reserves who are on the spot at the end of the battle will not be fresh. As for cavalry, while rifle and artillery fire are powerful it must keep at a distance. Napoleon's cavalry constantly went into attack at a trot, but Seidlitz at Zorndorf led his cavalry at a trot to within one hundred paces from the enemy, and at this distance raised it to a gallop. In the face of modern fire, cavalry must exert all its strength to gallop across the zone of extermination.

In view of the difficulty of direct attack in the face of modern fire, the idea naturally occurs of attacking under cover of night. Some military writers attribute immense importance to night attacks; others, for a variety of reasons, find them inconvenient. Concerning this question, it is useful to cite the opinion of Lieutenant-General Puzuirevski as the most impartial. General Puzuirevski emphasises the laboriousness of movement by night after the work of the day, the difficulty of maintaining discipline, and the difficulty of looking after the soldiers. "Notwithstanding all this," says this authority, "move-

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ments by night are sometimes necessary in war, and therefore must be reckoned with."

Modern military history presents a remarkable example of a night attack—at Gorni Dubnak on October 12, 1877. After great losses the army was unable to continue the assault, but remained on the captured positions close to the enemy's trenches, and on the approach of night rushed upon the redoubts and captured them with trifling loss.

General Dragomiroff emphasises the following advantages of night attack: The attacking body may escape observation for some time; it may find an unexpected enemy, whose fire under such circumstances will be insignificant, and the bayonet may also be employed. General Dragomiroff finds that such operations as the storming of Kars and the battle of Kagaretsch, where the Turks possessed an immense preponderance of forces, are possible only by night, and that generally in view of the destructiveness of modern fire, it will be necessary to accustom soldiers to operations by night. General Kuropatkin also declares himself in favour of night attacks, although he thinks they will succeed easier with small bodies of troops, and that picked men will be required.

On the other hand, the majority of foreign writers expect little profit out of night attacks. It is true that the French authority, Colonel B.,* thinks that having the advantage of smokeless powder the attacking body may approach very near to the enemy and create a panic in his ranks, but the author of an article in the *Neue Militärische Blätter*, † as an illustration of the danger of mistakes by night, quotes a case in the war of 1870 when the 101st Regiment of the French army, having come into conflict by night with a superior force of Germans, was defeated, and immediately fell under the fire of their comrades, who mistook them for the enemy. Hoenig ‡ cites as example the battle at Le Mans in 1871, in which the Germans gained possession of all positions, but in another place he expresses himself decidedly against night attacks, on the ground that panics may easily occur in the attacking force.

* "La Poudre sans Fumée." † Jahrgang 1890, p. 286.

‡ "Die Taktik der Zukunft," pp. 170 and 286.

However it may be, preparations are made in all armies for such contingencies. An illuminating bomb has been invented which burns from one to three minutes, according to calibre, and electrical projectors also which are capable of illuminating houses at a distance of 5500 yards, and by the aid of which the smallest movement on the part of the enemy may be observed.

It is unquestionable that the possibility of a night attack will cause great anxiety in every army. In former wars there were many cases of false alarms and panics. Assuredly they will be more common in future, as the dangers of war have increased, the nerves of modern soldiers are weaker, and owing to the system of short service, soldiers cannot be inured as were the veterans of the past. As far as nerves are concerned it may be assumed that the superiority will lie with the Russian soldier. The endurance shown by the Russian soldiers in the passage of the Balkans in the winter of 1877-78 awakened the astonishment of strangers. The Prussian General Von Kähler declared that the work which they accomplished surpassed the strength of men.

The following well-known saying of Napoleon is no longer applicable, "When the battle is over the vanquished in reality are little weaker than the victors, but the moral result constitutes such a great difference that the appearance of two or three squadrons is enough to cause great results." We have seen that such authoritative writers as the Prussian General Janson and the French Professor Langlois prophesy that battles will last several days, but a French Captain (formerly Professor) Nigote says plainly that battles may last for three or four days or even for a fortnight.* Other military specialists, and among them the well-known writer Fritz Hoenig,† think it not improbable that we are returning to the epoch of sieges. Belgrade, Mantua, and Plevna may be repeated. It is very possible that the attacking armies, finding decisive victory unattainable, will attempt to enclose the enemy in the position where they find him, and, after

* "La Bataille de Vesles," Capt. Nigote.

† *Op. cit. ante.*

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entrenching themselves, begin to make raids in order to prevent the provisioning of the besieged. Such operations would be continued until the enemy are starved out.

It is hard to imagine it otherwise, when we remember that, with much inferior weapons, even the badly trained French mobiles of 1870 were rarely beaten at once, a second day having usually been necessary to drive them from newly occupied positions.

But the nature of the future war will be influenced by fortresses to an extent hitherto unknown. In the past, fortresses were situated in the more important strategical positions, but were only individual points equipped for passive defence. Nowadays, at all the most important thoroughfares are situated fortresses and fortified camps which contain such immense masses of troops that their turning is inconceivable. In addition to these, railways and roads are specially built to ensure the rapid concentration of troops immediately after war is declared; and, if the concentration of the enemy's troops should make it necessary, to provide for the quick transportation of troops from one spot to another.

Having constructed such works on their frontiers, States consider it more than probable that they will be able with inferior forces to oppose an enemy, thus counterbalancing all the advantages which he may draw from the more rapid accomplishment of mobilisation. But, however powerful modern systems of defence may be, science has yet contrived such destructive weapons that the question has already arisen: How many fortresses in a future war will accomplish that purpose for which they are destined? This question has been the object of especial attention in military literature.

For us, the question whether modern fortresses will justify the hopes placed in them has an importance of the first degree. If an attacking army be held upon the frontier for a long time in conflict with an enemy defending himself in fortified positions prepared beforehand, the economic consequences of war will be very different from those which would follow if the invaders were to break at once through the lines of defences, and, having defeated the

defenders in the interior of their own country, were within a short time to occupy the greater part of their territory.

All examples from the past, and even the history of the two last campaigns, throw little light on this question. Although fortress warfare in 1870-71 had an importance hardly dreamt of before, as the Germans captured fifteen French fortresses, still the methods taken from this campaign can hardly be applicable to the future. The objects of attack, with, to some extent, the exception of Paris, Metz, and Belfort, were fortresses of an obsolete type, and their defence was badly conducted.

On the other hand, the battles at Plevna, in the war of 1877-78, mainly proved the close bonds which exist between field and fortress warfare. But it has become clear to all that in a future war the example of the Turks will be followed as much as possible by an army acting on the defensive. At Plevna the besieged had but an insignificant quantity of artillery, yet the thought of taking Plevna by storm had to be abandoned; it was hunger alone which compelled Osman to attempt to break out, and Plevna fell only after all the methods of siege warfare had been put in operation.

Since those days the science of fortress construction has made great advances, while, on the other hand, the means of attack have increased proportionately. The subject of fortress construction is very complicated, and its full elucidation would require detailed technical exposition, which would have too special a character.

Here we can quote only the general conclusions to which a study of the best authorities leads. The more important the fortress the more difficult will it be for the attacking army to pass it, since, if the fortress contained troops in a condition to attack, they would threaten the communications of the invaders. To seek a guarantee against such operations merely by placing against it posts of observation is impossible, since if the fortress contains a capable commander he will attack and defeat these detachments. The investment of great fortresses, from which vigorous sallies might be made, requires large armies and considerable time.

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For the investment of a modern fortress, say, with thirteen forts, with intervening distances of $2\frac{1}{2}$ miles, and with fortified batteries between the forts, would require, according to a calculation made by Brialmont, an army of 122,000 men and a special siege corps of 50,000 men, in all 172,000 men. It may be mentioned here that the line of investment of Paris required 2·8 men for every $3\frac{1}{2}$ feet of fighting line. For the investment of the fortress postulated by Brialmont, according to this precedent, the investing army must be 246,400 strong, or together with a special siege corps, 296,400 men and not merely 172,000.

In order to give some idea of the time required for the siege of a modern fortress we will cite the approximate estimate, taken from a French publication on the attack and defence of fortresses : *

Period of investment, and arrival of sieg- ing weapons, &c.	{	Defeat of the enemy's advanced lines 8 days	}	30 days.
		Occupation of posi- tions for close in- vestment of the fortress 10 "		
		Setting in position and construction of parks 12 "		
Attack on forts of the first line.	{	Construction and equipment of bat- teries of the first position 12 "	}	45 "
		Artillery duels and bombardment 8 "		
		Occupation of posi- tions for batteries of second position, &c. 25 "		
Successive capture of contiguous forts and attack on interlying defensive lines				20 "
Attack and capture of the fortress itself				25 "
		Total		120 days

* "Attaque et defense des places fortes ou Guerre de si ge."
Publi e avec le concours d'officiers de toutes armes et tout le
patronage de la R union des officiers, Bruxelles 1886.

At the present day there is a conviction widely spread among military engineers and artillerists that, in view of the perfection of modern artillery, fortresses will not be subjected to siege, but will be attacked with open force. The downward firing of shrapnel out of short guns and mortars will deprive the fortification of defence ; direct fire from heavy artillery will batter the walls and open a free path for the storm of the fortress ; the introduction of shells containing five and a half hundred-weight of powerful explosives, will so increase the destructive power even of individual shots that all the older constructions will prove worthless, and even the new fortifications defended with armour will prove little better. Even a comparatively short bombardment with such projectiles will be sufficient to make the fortifications useless to the defence.

The chief upholder of such opinions is General Von Sauer, who proposes a system of shortened attack. The difference between systematic and accelerated attack in the exposition of General Sauer consists in the following : "Systematic or regular attack is directed mainly on one side of the fortress, while accelerated attack threatens all accessible sides. And since on the employment of the first method the besieged may devote all their strength to the defence of one side and even of one threatened point, accelerated attack is calculated to prevent such concentration, thus making it easier to overcome the scattered strength of the defence."

Against systematic attack the measures of defence consist firstly in this. The front or fronts which, according to the position of the roads are the nearest to materials which might serve for the construction of batteries, and which by the configuration of the country will be most threatened, will be strongly fortified in advance. Against accelerated attack, which will be founded on considerations rather tactical than technical, it will be necessary to fortify strongly all fronts, for which resources will not always be found. But it is relying precisely on this circumstance, on the mobility of modern artillery, and on the difficulty of

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complete protection from projectiles, that the "tactical" attack is founded—the attack, as will easily be conceived, being directed not on the strong but on the weak parts of the defence.

But the defenders of a fortress will oppose the enemy with four consecutive lines of obstacles, that is, a first line of opposition, a chief defensive line, an intermediate line or line of reserves, and finally, a fortified unbroken rampart or central citadel. The capture of even the first line will require considerable effort, since this will consist of a series of field defences. The field will be strewn with numerous but small earthworks in the form of pits which the enemy cannot see from afar, and upon which artillery will have little effect, while, on the other hand, the skilful marksmen concealed in these pits may cause considerable loss.

In the attack on the chief defensive line it must be remembered that the improvements made in small arms and in artillery will prove as much in favour of the defence as of the attack.

The North American war of 1861–64, the Franco-Prussian war of 1870–71, and the Russo-Turkish war of 1877–78 offer sufficient examples of the immense efforts and sacrifices which will be required in order finally to overcome an antagonist who has turned his circumstances to advantage in advance. What will happen in the war of the future when the defenders will have the support of a whole system of defensive works ready at hand?

Milliards have been expended in Germany and France since 1870, in Russia since 1882, and in Italy, Austria, Belgium, and Switzerland in more recent times, in attempts to render frontiers impregnable, and, to provide for the contingency of the frontier defences failing to stop the enemy, on other defensive points at a greater distance from the frontiers.

Not only are the frontiers of all states studded with fortresses, but even in time of peace great forces stand at short distances from one another, and for the conveyance to them of reinforcements a system of railways exists so complete, that from the very outbreak of war armies will

almost immediately confront one another, and the space free for movement will be very small. With these conditions, in the war of the future an operation hitherto unknown must be undertaken—namely, to break through frontier defences. In view of the hundreds of thousands of soldiers who will immediately be concentrated, the breaking of a frontier line without a whole series of battles is inconceivable.

The defenders, says General Leval, will know in advance the approximate position of the field of battle. They know the chief points of the enemy's concentration, indicated by the position of his roads and military stores. Mass attracts mass, such is the law of gravitation in war. The enemy will advance upon our main forces, and even the points of conflict may be approximately prophesied. And so those "great uncertainties," of which we hear so much, from the very beginning of war will not exist, and both sides will have full possibility to fortify themselves in corresponding positions.

The present armaments of all European armies may be taken as equal in effectiveness, and the preparation of the soldiers, both as concerns training and courage is the same. Therefore, if we set aside the capacity of the commander-in-chief, as something which cannot be foreseen, we shall be obliged to conclude that the only element of inequality is the number of soldiers in the ranks. Supposing equality in the numerical relation, there would be complete balance between the opposing forces, and equal probability of success on both sides. From this the question naturally springs—With the equality of strength which France and Russia have as against the Triple Alliance, will it be possible for the armies of the attacking powers in the present state of fortified frontiers to attain any immediate and decisive success ?

Comparison with the past gives us little information in this respect. We find ourselves confronted with an awful phenomenon. In all armies a theory is proclaimed as to the superiority of offensive action. But meantime such strong positions have been created for

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defence that their existence cannot be without influence on the course of events. The war of the future, whatever may be said, will be a struggle for fortified positions, and for that reason it must be prolonged.

If, in addition to the advance towards perfected mechanism, another fundamental change had not taken place, then it might have been possible out of the past to draw conclusions as to the future. But to-day whole nations will be under arms, the flower of every race—millions of men, just taken from the ranks of the workers, the producers of the substance of the people. The places they forsake will remain unoccupied, and their absence will be felt every day. The news of their fate will be waited with anxiety by the remaining millions; the destruction of whole divisions will call forth the groans and it may be the protests of hundreds of millions of people.

But the majority of those military writers who pay attention to the technical conditions of the matter, look on the question of the future war so objectively that they fail to see its relations with psychological and sociological questions—to express it in a word, they disregard the human side of the question. For this reason investigation of the conditions of a future war cannot be limited to the comparative military efficiency of the different States. Armies at present are the products of nations themselves. But the people, as Taine observed, judge not with the head but with the heart. It is therefore in the sentiments of the people that we must seek an indication of the frame of mind with which armies will enter upon war, and some guide as to the consequences among them of the first successes or failures. The temper of armies is a product of enlightenment, national character, culture, preponderance of civil or agricultural population, and those political and social ideals which in certain times influence the various countries.

Such were the considerations which impelled us to examine the data bearing on the condition and spirit of armies; to consider, for instance, those impressions which

will be caused on the field of battle by the absence of a thick cloud of smoke obscuring the riflemen. Speaking generally, we attempted to determine the military spirit of the various European peoples according to the character peculiar to each. We attempted to bring under consideration all that might be drawn from the study of former wars, in order to form an idea as to the qualities of the chief European armies. But conclusions drawn from former wars have but very conditional significance. The spirit of armies in different countries does not always remain at the same level; after great height sometimes follow sudden fall and changes. And such changes take place in periods no greater than that which separates us from the last great European war.

A remarkable feature of our time is the rapidity with which changes occur both in the material and intellectual spheres. In the course of a few years greater changes take place in social life than formerly took place in decades. In this there is no ground for surprise. This great movement in life is ensured by the spread of education, the activity of parliaments, associations, the press, and means of communication. Under the influence of these conditions the intellect of the West finds itself under constant movement.

Another characteristic feature of our time is thus emphasised by Gervinus: "Movements in our century proceed from the instinct of the masses, and it is a very remarkable fact that in modern history are rarely found examples of the strong influence of individual personalities, rulers, or private workers. In our time as in the sixteenth century peoples move in masses."

The list of great gifts decreases, while the number of moderate talents have grown to an extraordinary extent. Few great and exalted personalities are produced, but in the whole a great revolution in social life has taken place.

It is for these reasons that the study of the spirit of armies in the future has such immense bearing upon the present work.

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It was necessary to ask ourselves the questions: What will be the temper of modern armies in the event of defeat, or even of victory, if war should be prolonged? What will be the effect of the news from the field of battle on the civil population? What convulsions must we expect after the conclusion of peace when millions of excited soldiers return to their destroyed and desolated homes?

We attempted to collect data for the consideration of these questions, and with this object classified them in their constituent elements, resting upon precedent modified by the changes which have taken place in the constitution of armies, in armaments, and in tactics. But in order to draw from these data conclusions on all the different points, it would be necessary to make a tiresome repetition of the degrees of different qualities in armies, and, in addition, it would be difficult to represent in words with any precision the total of military qualities in the different armies in their twofold relationship—that is, their applicability to attack and defence. It would be necessary to cite the statistics of morals, culture, and sanitary condition of the various European armies. Only after such a laborious process could the system upon which we have estimated the respective values in attack and defence of the various European armies be followed. It is enough to give here the categories under which we have classified the elements which together constitute the general efficiency of armies:

- (1) Susceptibility of application to the new conditions of war.
- (2) Composition and completeness of the corps of officers.
- (3) Capacity for initiative.
- (4) Endurance under difficulty and privation.
- (5) Discipline.
- (6) Absence of egoism, dangerous for the general welfare.
- (7) Faith in leaders and in companions-in-arms.
- (8) Supplies and sanitary conditions.
- (9) Age, disposition, and method for supplementing the lower ranks.

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- (10) Conviction in the merit of armaments.
- (11) Courage.

As the final result we have obtained the following figures, showing the comparative military efficiency of the chief European armies in attack and in defence :

	IN ATTACK.		IN DEFENCE.	
	1st Summons.	2nd Summons.	1st Summons	2nd Summons.
Germany	95	80	98	86
Austria	80	68	86	76
Italy	65	51	74	59
France	72	59	85	72
Russia	88	80	94	86

Of all the details in the above chapter we find most clearly in relief the threatening features which a future war must present, both as regards the sacrifices of the population, and as regards the risks which must be run by the states participating. But both these factors are explained more fully in the chapter devoted to "Plans of Military Operations."