

27TH YEAR OF PUBLICATION

THE FIELD ARTILLERY JOURNAL

MARCH-APRIL, 1937

MAPS FOR TOMORROW
THE 1937 PRIZE ESSAY
—CAPTAIN THOMAS NORTH, FA

PUBLISHED BIMONTHLY BY
THE UNITED STATES FIELD ARTILLERY ASSOCIATION

March-April, 1937

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No. 2

MARCH-APRIL, 1937

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ARTICLE II OF CONSTITUTION

"The objects of the Association shall be the promotion of the efficiency of the Field Artillery by maintaining its best traditions; the publishing of a *Journal* for disseminating professional knowledge and furnishing information as to the field artillery's progress, development, and best use in campaign; to cultivate, with the other arms, a common understanding of the powers and limitations of each; to foster a feeling of interdependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country."

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★ A Message to the Officers and Soldiers of the Field Artillery ★

The Field Artillery is to have its own meteorological service. This is an important step. When registration is permitted, adjustments by *K*-transfer methods are rapid and accurate, but, when registration is prohibited for reasons of secrecy (and this may occur with even greater frequency in the future than in the past) dependence must be had on the metro message.

At present, the metro service of the Signal Corps furnishes data not alone to the artillery, but to other arms, particularly the Air Corps and Chemical Warfare Service. This requires the establishment of the station, and of the mean datum plane, at locations and levels consistent with the sum of the requirements of all three; and hence, occasionally, at some handicap to each.

The new field artillery metro sections will not predict the weather. They will determine, and supply, only such data as the field artillery requires, and at the times required.

The organization of the sections has not been completed. Consideration is being given to the establishment of a section with the observation battalion of each corps, and with the artillery brigade headquarters of each division. It is expected that the section, of two to four men, may be transported, with its instruments, in a 1½-ton truck, and made available to distant units, for service practice, within its radius.

The advantages of current metro reports, from locations near the pieces, offer the possibility of greater accuracy when map-data-corrected are computed. This will be determined by experience.

UPTON BIRNIE, JR.,
Major General, U. S. Army,
Chief of Field Artillery.



ON THE LEFT LEAD

THE FIELD ARTILLERY JOURNAL

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NUMBER 2

WINNER, PRIZE ESSAY CONTEST, 1937

Maps for Tomorrow

BY CAPTAIN THOMAS NORTH, FA

THE advent of the rapid-fire field-piece in the last decade of the nineteenth century reduced counterbattery to a simple and deadly task for that gunner who first detected his opponent and thereby gained a few minutes advantage. Ranges increased. The growing emptiness and expansion of the battlefield turned the business of describing targets into a time-consuming task; it was found simpler to use an aiming point and to conduct the fire of the battery with this aiming point as a reference. The artilleryman's next and obvious step was to move his guns from the open battlefield to behind a mask, and in so doing he assumed the mantle of the geodesist.

The intensification of the power of the defense which developed during the World War principally by reason of the greatly increased numbers of highly effective small-arms which were employed, called for a corresponding increase in the artillery support demanded by the attacker's infantry. To derive the fullest advantage from this artillery which was, perforce, emplaced over a relatively wide area, its fire must be wielded as a flexible and powerful mass in harmony with the operations of the attacking infantry. The field artilleryman must fire on hidden targets; he must fire during the night; and he

must fire with greatest accuracy not only to ensure accomplishing his mission but also to avoid hitting his own infantry. During the World War this feat was of no particular difficulty because the Allies eventually covered the forward area with excellent fire-control maps; of these the French Plans Directeurs were the most familiar to the AEF, being unusually accurate and detailed maps at a scale of 1/20,000 and even larger for limited areas. True enough, many a time the fire missed the target, and in a few cases it is said to have fallen among our own troops, but the error lay in the use of faulty information rather than in the map. So the homecoming AEF brought with it this 1/20,000 map which it had found so readily available and which had proved such a useful and essential tool.

During the years that followed, training continued in the direction in which it had become oriented, for was it not written in Army Regulations 100-15, paragraph 3, to give chapter and verse, that the 1/20,000 map scale had been adopted for field use? True enough, many there were who kept their fingers crossed. The case-hardened sceptics who directed the training of the Field Artillery persisted in reiterating the principle that all artillery fires should be observed wherever

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possible, even if the map were available. Eventually, in 1933, the Engineers came to admit what had been plainly apparent, that the production of the 1/20,000 fire-control map with which we had become so familiar cannot be expected in time of war; this was announced by Changes No. 2 to A.R. 100-15, 1 September, 1933. To produce a single sheet of any standard map at any scale by field survey methods is a long job, such as would keep a topographical battalion busy for months. Nor need we delude ourselves that in the event of war in our own territory we could fall back upon a stock of existing maps. The areas which have been mapped to a scale of 1/20,000 or thereabouts form a negligible total, a fraction of 1 per cent of the whole, in fact; about one eighth of the country has been mapped at a scale of 1/62,500, a scale of little help in fire-control; the remainder of the country, that is, more than 85 per cent, has either been inadequately mapped or not mapped at all. There is, however a ray of sunshine in the fact that a large proportion of the country is covered by a close network of the U. S. Coast and Geodetic Survey precise control which is available when needed as a framework for future mapping.

That same Change No. 2 in Army Regulations 100-15 also declared that the use of the 1/20,000 map should not be permitted in training in the field. It would have been wise to restrict its use in the map-room also. For the habit of years is hard to shake off, and Leavenworth, Benning, and Sill continue to fight their campaigns on the 1/20,000 or the three-inch map. Instances are not difficult to find, but as a matter of politeness the single quotation which follows is taken from our own institution (1935-1936 course):

"GENERAL SITUATION The Blue Corps advanced west to invade Red territory. . . .

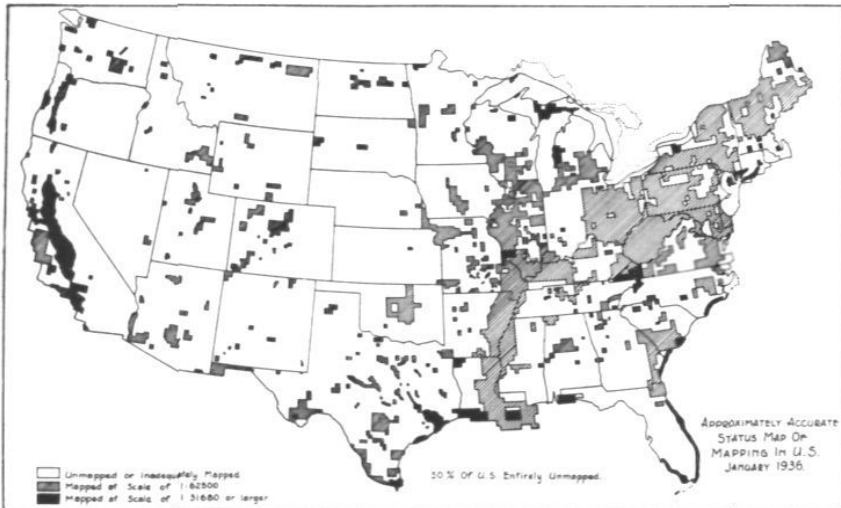
"SPECIAL SITUATION On 8 May the 1st Division marched west . . . and shortly before noon gained contact with hostile forces. . . . At 5:00 P. M. Brigadier General '1st Field Artillery Brigade' has the following information: . . . The Corps will attack early to-morrow morning, enveloping the hostile right. . . . Brigadier General '1st Field Artillery Brigade' formulated his plan of artillery support. . . . The following are extracts: . . . During the night: Harassing and interdiction fires in the area indicated on Annex No. 1 (1/21,120 map). A surprise concentration . . . to be fired at 10:00 P. M. on the important CP at house at (60.3-49.5) . . ."

Fortunate it was for the Blues (and the students) that the war fell upon the existing 1/21,120 maps. It is hardly necessary to point out that failing this map or a substitute of approximately equivalent accuracy the coordinated artillery support, the detailed concentrations, the map fires, could not be delivered. For this reason alone, without dwelling upon others equally cogent, the attack ordered by the Corps for the morrow following initial contact with the enemy could not possibly be made unless it departed most radically from the doctrines of our institutes of learning.

This leads to the unhappy but inescapable conclusion that either we must find practicable, equivalent substitutes for the defunct fire-control map, or else we must not only revise our Field Artillery technique, and consequently training, but we must also fundamentally overhaul the tactics and training of the combined arms. This contingent reaction upon tactics is of far-reaching significance and must not be overlooked.

Is it possible to avoid the latter of

MAPS FOR TOMORROW



these alternatives by developing substitutes for the fire-control map?

* * * * *

At the outset it must be self-evident that in order to obtain maps of country which is in the enemy's hands, or subject to his incursions, we must have recourse to aerial photography. This would be true even though our next campaign were fought between Chateau-Thierry and St. Mihiel, or even between South Mountain and Hanover; the amount of photography and labor of exploitation would be less than in the case of unmapped territory, but the photography would be necessary in order to bring existing maps up to date. Furthermore, as has been already stated, the slowness of field mapping methods debars their use.

Thus we are confronted with the limitations of aerial photo-surveying. Despite all of the goodwill in the world and the perfecting of airplanes and photographic devices, the Air Service is most sensitive to disturbing influences. Good weather is essential, and over a large part of our territory such weather is

the exception rather than the general case. There is the enemy, who will be most unpleasant to our flyers. We must reckon with the hazards of this type of photography—flying at high elevations on an even keel in a straight line despite the wind, while making regular exposures with the temperature possibly at forty or more degrees below zero, and with an oxygen tube decorating one's features. Skill in this work is much rarer than one might imagine. Lastly there are the human and mechanical elements incident to photography, cameras, shutters, developing, printing; all must satisfy exacting requirements. In a nutshell, although we seem to be completely dependent upon aerial photography as a foundation for map substitutes, it is no mean achievement to make the pictures. Fortunately the job, or, rather, the essential and most difficult part of it has only to be done once.

MOSAICS

Mosaics have become commonplace, and the Field Artillery School has developed

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methods of use which take every advantage of their possibilities. A mosaic is laid by piecing together two or more vertical photographs or obliques transformed to the vertical in the printing process. It is a map, for most purposes, of the terrain it depicts. Unfortunately the accuracy of each of its component pictures is impaired by variations in relief of the terrain; it is also affected by any tilt, that is, listing of the airplane to one side or the other, or tip, which is pitching fore or aft. These disturbances result in distorting or displacing parts of the image so that apparent relationships between the positions of objects are not true. Such errors may become cumulative through the length and breadth of the mosaic; they cannot be systematic or lend themselves to facile correction. Now, angular error is of particular significance to the artilleryman who may lay his battery by an azimuth determined from an observation on a nearby object; since the displacement on the mosaic of the image of such an object may cause an angular error in the azimuth read from it, there may result an important lateral displacement in the point of impact of the projectile.

The most pleasing mosaics are composed by matching detail at the edges of adjacent component pictures, yet because of the displacements mentioned this procedure is almost bound to occasion additional error by the cumulative displacement of successive pictures. Mosaics may, however, be controlled, that is, fitted to a framework of points whose true relative positions are known; this control may be surveyed on the ground unless the enemy objects, in which case it is possible to make use of a control obtained by aerial triangulation methods discussed later. Controlling a mosaic does not affect the inherent inaccuracies of the individual component pictures but it does greatly reduce the

cumulative displacement of the system of pictures as a whole. Necessarily it requires additional time; as a work of art this mosaic may be less pleasing than the uncontrolled mosaic because of poor matching of detail along the edges.

Strip mosaics have been composed at Fort Sill by matching the centers of adjacent pictures. Variations in flight altitude, tilt, tip, and other disturbing influences may prohibit exact coincidence of these centers, but within the limits of a few such pictures no appreciable displacement occurs in this process (except, of course, the displacements on each individual picture resulting from relief, tilt and tip) which nevertheless has definite limitations. These become particularly apparent when it is desired to extend the strips to the flanks. Because each strip is one picture wide and is composed without reference to its neighbors there is inevitably some sidelp or some gaps between strips, and some difference in alignment of identical features; furthermore the superimposed grids can hardly be made continuous. Each strip mosaic therefore pertains to a single narrow strip of terrain: coordination of the employment of larger artillery units involves serious difficulties. As an additional discouragement, the problem of the timely distribution of strip mosaics, or of their component pictures, to the appropriate infantry and artillery organizations is not simple.

Mosaics are excellent substitutes for tactical maps by which operations may be planned and executed. Thanks to enlarging devices and selective combinations of flight altitude and focal length they are elastic as to scale and size. The quality of the photographs must be good, of course. They have the virtue that doubt as to whether the map may be wrong never arises (except in the mind of the artilleryman who

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is interested in mathematical niceties as well as topographic fidelity. This doubt can be entirely removed if each mosaic bear a notation indicating its order of accuracy—for example, whether or not it is controlled, or whether the relative positions of any indicated points are accurate within plottable error). Being a true picture of the earth's surface the mosaic is easy to read; probably much easier than the conventional map which, after all, is a caricature rather than a faithful image. Indeed, it is reasonably probable that if the time and effort expended in learning to read a map were devoted to learning to read a mosaic there would be far fewer jokes on the fellow who mis-reads his map—and, in passing, what of the sponsors of a document of the highest importance which is susceptible of being misunderstood?

Though mosaics may fulfill the requirements of most of the troops, they fall short of those of the Field Artillery because not only of the errors in range and deflection resulting from the inevitable distortions and displacements which have been discussed, but also because of the absence of accurate data as to relative elevations. While reiterating the conviction that facility in the reading of mosaics can be acquired by anyone, it is admitted that the sense of relief is only a general impression and is not precise.

It is fitting here to recall the more or less generally known facts that by the use of stereoscopic devices it is possible to gain a greatly enhanced perception of relief over that which is possible from a single print, and that differences in elevation may be measured with a precision which often surpasses that of the conventional map. The working artilleryman, under pressure from higher headquarters and the supported troops, with rain and wind on his map and a

shelter-half for his office, is likely to have few opportunities and little taste for laboratory excursions of this sort. Yet somewhere up the scale there will be occasion to apply the principle in the examination of aerial photographs by a portable stereoscope and with the help of the elevations of a few critical points obtained with an observing instrument, whereby other elevations can be estimated with some degree of accuracy pending the arrival of more authoritative data.

To this end a practicable procedure suggests itself. It should first be remarked that stereoscopic examination can be made only of an area which is common to two different exposures; to ensure obtaining the optimum of 50% of the area of each of a series of pictures the photographs are commonly taken with 55% to 60% overlap between successive pictures. In the compilation of the mosaic the odd-numbered prints would be used, and upon completion the identification number would be inconspicuously marked on each component picture. The even-numbered prints, similarly marked, would be issued separately with each mosaic. To examine stereoscopically the detail of any area it would then be simple to select the individual even-numbered print adjacent to its odd-numbered element of the mosaic. Of course, the continuity of the series would break down at times, because of faulty individual pictures, but the principle holds.

There is little field left for the development of the mosaic. Its serious shortcomings and its unquestioned virtues have been pointed out. Room still remains for research in the realm of analysis of the single vertical photograph, the stereoscopic pair, and the high oblique photograph. But the inherent inaccuracies of the mosaic will persist.

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RADIAL LINE PLOT

The exploitation of aerial photographs by the graphical method known as the radial line plot is a standard procedure all over the world. It is the most rapid method for the cantilever extension of control, that is, the extension of control from a known initial network into territory where no other points exist to which it may be tied a very likely contingency in time of war. It is covered in detail in Training Regulations 190-27. The radial line plot has the advantage that displacements due to relief, tilt and tip are inappreciable provided that these disturbing factors are less than a reasonable maximum. It is prepared in the form of a transparent sheet upon which are intersected the points of the control extension.

Of course, to the Field Artilleryman interested in map firing the control and its accuracy are of intimate concern. Using the conventional map the orthodox practice is to find two or more points whose true positions are presumably accurately represented on the map geodetic points if possible—and to perform the Field Artillery survey operations using these as a foundation. Even on a very complete fire-control map (the article now denied us) such points are sparsely distributed, usually on high ground or otherwise conspicuous to the enemy as well as ourselves; the survey operations are correspondingly long and possibly unhealthy. In the absence of geodetic points, and for short traverses, the artilleryman occasionally resorts to such substitutes as important road-crossings, buildings, etc. or the tangent of a road or railroad; but he bears in mind that such expedients involve potential inaccuracies which may plague him throughout his survey.

By contrast, the control extension which is furnished by the radial line plot consists of a limitless number of points of

virtually identical accuracy, distributed over hill and over dale. The term "identical" rather than "absolute" accuracy must be used because this accuracy suffers in a measure from the failings common to the works of man. What, then, is the accuracy of this control extension? If there is by good fortune a point at the far end of the control extension to which the latter may be tied and then adjusted, the errors are probably negligible. Lacking such a point we are faced with the hazards attendant upon reaching from known to the unknown, possibly accumulating errors as we build forward. Here, for instance is the record of a typical aerial survey in which there was a cantilever extension of control; errors were computed on the assumption that a control which actually existed over all of the area and which was established by ground survey procedure, was correct; the control extension was by radial line plot:

Point	Distance from Initial Control (yards)	Longitudinal Displacement (Percentage of Distance from Initial Control)	Transverse Displacement (Percentage of Distance from Initial Control)
A	2,500	-0.56	-0.09
B	5,000	-0.49	+0.43
C	5,500	-0.49	-0.46
D	6,000	-0.30	-0.04
E	8,000	-0.18	
F	8,000	-0.38	-0.12
G	11,000	-0.31	+0.04
H	12,000	-0.17	-0.07
I	13,000	-0.29	-0.10
J	12,000	-0.28	+0.07
K	18,000	-0.31	-0.17
L	19,000	-0.17	-0.26
M	22,000	-0.13	-0.23
N	22,000	-0.23	-0.24
O	24,000	-0.07	-0.15
P	25,000	-0.23	-0.32
Q	26,000	-0.19	-0.20
R	28,000	+0.05	-0.13

With this table might be compared the following probable errors of artillery pieces, taken from the range tables: the piece might be assumed to

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be emplaced in the vicinity of the initial control:

	Range (yards)	Probable error in range (Percentage of range)	Probable error in deflection (Percentage of range)
75-mm. gun	5,000	.36	.06
	8,000	.42	.07
155-mm. Howitzer			
Zone V	8,000	.54	.05
Zone VII	12,000	.45	.07
155-mm. G.P.F.			
Normal Charge.....	12,000	.83	.07
Supercharge.....	17,000	.66	.08

Summary though it is, such a comparison indicates that *in general* the error of the extension of the control in the direction of range is less than the probable error of the piece, while in deflection it tends to exceed it. Another interesting point is that while in this particular case the displacement of points actually increased as the extension reached farther from initial control, the increase was less proportionately than was that of the corresponding distance. Other experience has shown that in general the displacement will not greatly exceed one-half of one per cent of the distance from the initial control. It should also be noted that in the case cited the *direction* of displacements was fairly consistent.

The map may be completed by filling in planimetric detail from the aerial photographs, fitting it to the control extension; this is a simple drafting job. The method is rapid, and herein is an important element of its appeal, for a plot of an area 20 by 20 miles can be reasonably well produced within 24 hours by three or four men after the photographs are received. But on such a map the artilleryman still notes the same serious omission, namely, hypsometric data, or, less technically, information as to elevations. Such data cannot easily be obtained by graphical methods.

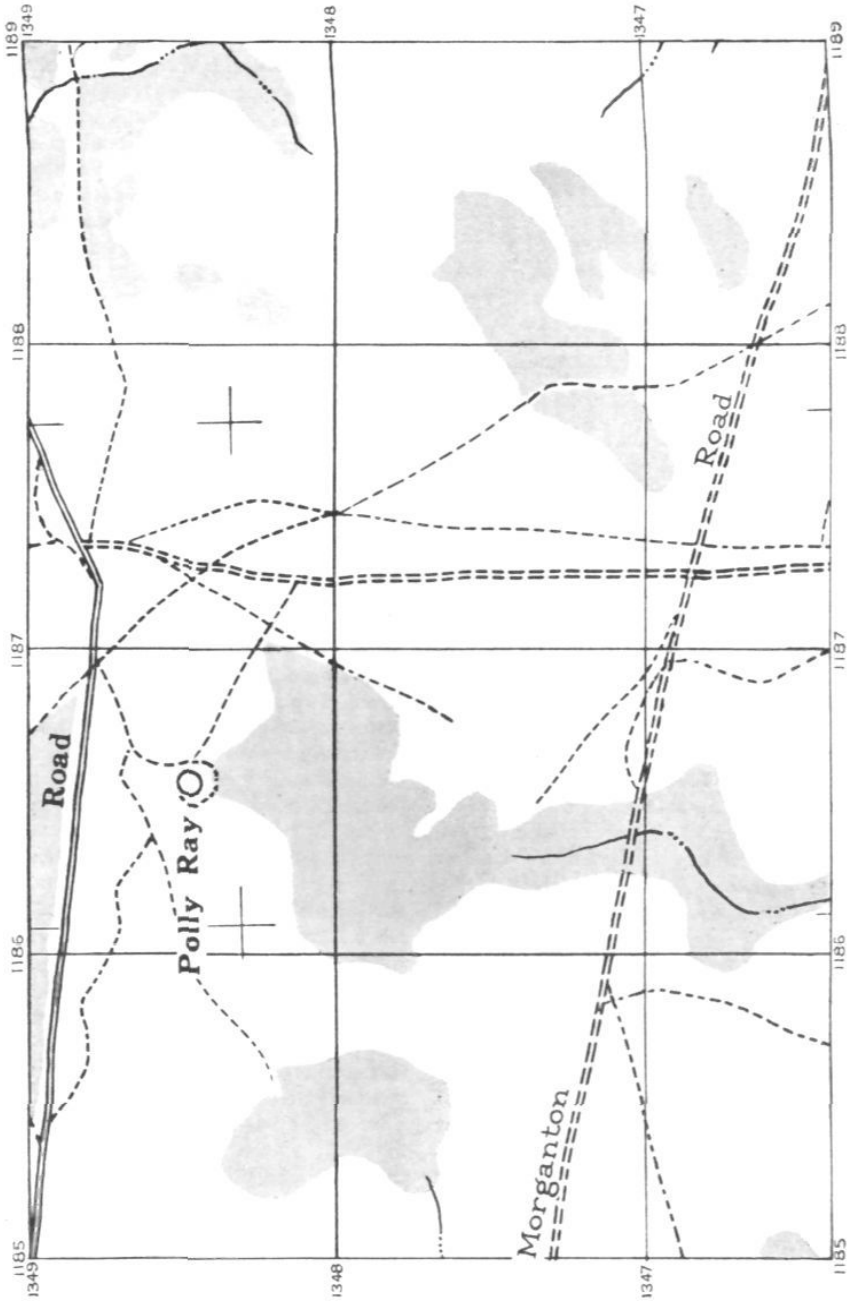
PHOTOGRAMMETRICAL DEVICES

Since the World War the science of stereophotogrammetry—stereoscopic measurement of photographs applied to surveying—has been steadily advanced by the continuous invention and perfecting of mechanical devices for such examination of aerial photographs. These devices include means for plotting maps simultaneously with the analysis of the information revealed by the stereoscope. They are mostly of foreign origin, but are now being seriously exploited in this country.

Without attempting to launch into proof, which is easily available in many standard texts, it may be asserted that photogrammetry is an exact science and that the stereoscopic examination of an area common to two different photographs of approximately the same scale is interpreted in the form of an accurate map showing both planimetric and hysometric data. The stereoscopic element of these devices in effect places each of the pair of human eyes in the relative positions of the camera lens at the instant that each of the photographs was taken; strange though it may seem at first thought, it can be demonstrated that a vivid stereoscopic perception of the terrain results, susceptible of most precise measurement in three dimensions by other elements.

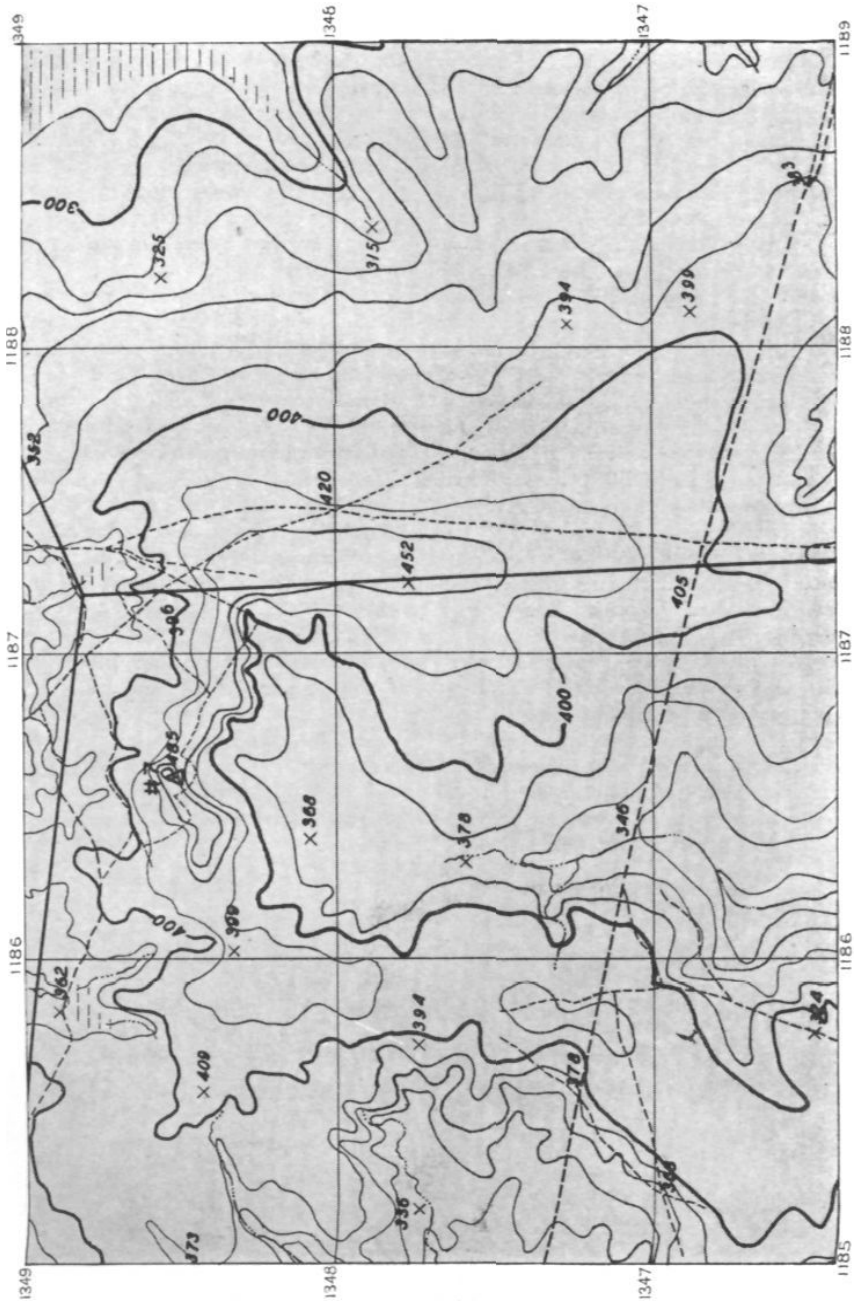
The ultimate accuracy of a map is its plottable error. But it is common knowledge that no map is uniformly accurate. It has been already mentioned that experience has taught the artilleryman who seeks precision to rely only upon a small proportion of the data shown on the conventional map—the geodetic points; he may resort to conspicuous buildings, crossroads, etc., but with misgivings. Of course he uses such data on elevations as he finds. In map-making by ground methods the procedure is to start with

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FIRST TEST—FORT BRAGG, N. C.—SCALE: 1/20,000—RADIAL LINE PLOT—1935

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SECOND TEST—SAME AREA—SAME SCALE—BY MULTIPLEX—1936

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a rigidly accurate framework or control and to build upon this control all of the other data—by measurement in the case of critical features, by sketching in the case of less important detail, by guesswork in the case of inaccessible areas or where speed and cost are to be considered. It is a rare map upon which the contours have been drawn by any more accurate method than interpolation and sketching. One sheet of a standard 1/62,500 map of Pennsylvania has been shown to have vertical inconsistencies as great as 160 feet; entire ravines were missing.

Now, by the very nature of the processes of photogrammetry the resultant maps have the following characteristics. Their value to the artilleryman is obvious:

(1) All points shown are of the same general order of accuracy. That is, every road junction, house, lone tree, which is indicated on the map is located with the same order of accuracy as the control itself. The uniform accuracy of the radial line plot is here carried down to the details. This is evidently true because the same photographs which are used to extend the control are replaced with the

same settings while the topographic detail is plotted from them. Less evident, but equally true is the fact that displacements due to relief, tilt, and tip do not occur.

(2) Contours are not sketched. They are plotted by tracing their course with a pointer held at their respective elevations on the spatial model evoked by the stereoscope.

(3) Therefore, given the same amount of control the map produced by stereophotogrammetry is much more accurate than the map produced by ground survey methods.

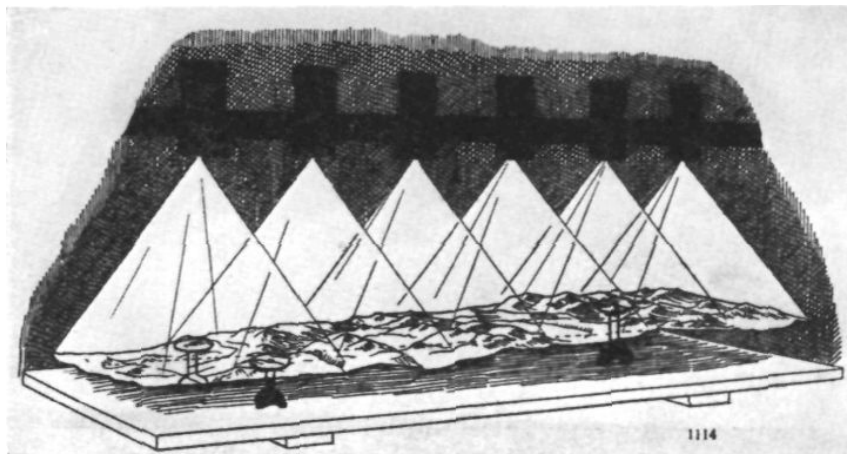
(4) This map can be produced more rapidly than by ground methods.

(5) As in the case of radial line plots, maps can be produced even though the terrain be inaccessible.

(6) The scale of the plot may be selected within a satisfactorily wide bracket.

(7) The quality of the photographs is of less importance than in the case of the mosaic. "Flat" pictures which can be read only with difficulty in good light can be used in the photomechanical devices.

If plottable accuracy cannot be attained, the net best solution is accuracy



STEREOSCOPIC MODEL UNDER THE MULTIPLEX AERO-PROJECTOR

—By Engineer Detachment, Wright Field

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such that relative positions of points *in the same region* are plottably exact, or their error is known and can be compensated. Therefore, when mapping enemy territory which is inaccessible and which has no control points identifiable on the photographs (territory which, of course, cannot be mapped at all by ground methods) the objective is the extension of control with such type of accuracy. The following is the record of a cantilever extension of control by stereophotogrammetry; as in the case of the radial-line tabulation, errors are computed on the assumption that the control which actually existed over all of the area, but was unknown to the photogrammetrists, was correct:

Point	Distance from Initial Control (yards)	Longitudinal Displacement (Percentage of Distance from Initial Control)	Transverse Displacement (Percentage of Distance from Initial Control)	Vertical Error (feet)
1	1,000	+0.50	+0.60	-1
2	4,000	+1.35	+0.50	+27
3	7,000	+0.29	-0.91	+7
4	7,000	+0.09	+0.33	+63
5	8,000	+0.30	-0.44	-8
6	12,000	-0.15	+0.12	+10
7	12,000	+0.17	+0.44	+19
8	16,000	-0.17	+0.52	-2
9	17,000	+0.11	+0.44	+40
10	19,000	-0.17	+0.06	+18
11	20,000	+0.02	+0.32	-6
12	21,000	+0.04	+0.20	+39
13	23,000	+0.17	+0.13	+12
14	23,000	+0.11	+0.02	+8
15	26,000		+0.05	+31
16	27,000	+0.20	-0.07	+38
17	28,000	-0.09	+0.05	-30
18	28,000	+0.01	+0.10	-33
19	28,000	+0.05	-1.07	-142
20	29,000	-0.03	-0.90	+1
21	30,000	+0.25	-0.17	+6
22	31,000	+0.03	+0.04	-38
23	31,000	0.02	+0.09	-32
24	33,000	+0.41	-0.10	-27
25	34,000	+0.16	-0.04	-63
26	34,000		-0.48	-13
27	36,000	+0.02	+0.10	-20
28	37,000	+0.17	-0.40	-39
29	40,000	+0.14	-0.09	-2
30	44,000	+0.04	-0.14	+91
31	47,000	+0.06	-0.08	+106

There are evidently a few "wild" positions among those listed, and there is a

lack of consistency in the directions of displacements. As a matter of fact, this lack of uniformity is largely ascribable to the ambitious attempt which was made in this case to adjust several flights—longitudinal and transverse—to each other. In general it can be said that the accuracy of the control extension is about equal to that of the radial-line plot which was quoted earlier; were the photomechanical plot made from a single flight, uninfluenced by the distortions necessary to effect adjustment, it is reasonably certain that it would be more accurate than the radial-line plot. Furthermore, such adjustment between flights *is* possible in stereophotogrammetry; with radial-line plots it is next to impossible.

It is unnecessary to emphasize the value to the Field Artilleryman of the data as to elevations which this process supplies.

A fair appraisal of the results quoted would admit that the random displacement errors and the few "wild" locations leave much to be desired, but would recognize that not only has this cantilever control been carried 25 miles but that since the development of the method is still in its infancy there is reasonable hope that these defects may be overcome.

Our Army is equipped at the present time with two types of stereophotogrammetric apparatus—the Aerocartograph and the Multiplex. The former is of foreign manufacture, the latter is being produced in this country; both are quite expensive, a set of equipment running seriously into five figures. The Aerocartograph is the more precise instrument, but its precision is bought at the price of the great length of time consumed in setting the pairs of positive picture-plates. For the best work with this machine one to three hours are required to set each plate-pair; and each plate-pair taken with the standard T-3A camera operating at 20,000

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feet altitude covers a net *effective* area of about 3½ miles (center picture) to 4½ miles (wing picture—it is discussed later) in width by 1¾ miles in length. After the control has been found satisfactory the detail must be plotted, involving half an hour to reset each plate pair, plus the time consumed in plotting.

The Multiplex can be operated with greater speed. It is with the Multiplex that the cantilever control extension which has been cited was performed. It employs the principle of the anaglyph. Positive plates are made from each aerial negative and inserted in projectors so mounted and adjustable that they may be brought (by cut and try) to occupy the same relative positions as did the camera when it made the exposures; the device can accommodate six or eight projectors, vertical or oblique. The images are then projected downwards, the first in red, the second in blue, the third in red, and so on; when viewed through spectacles of which the lenses are a red and a blue color filter, a stereoscopic impression of remarkable fidelity is received. This three-dimensional model of the earth's surface is fitted by adjustment to the control which is materialized in the form of points whose positions in three dimensions are reproduced to the exact scale of the model. This control may be obtained by ground methods or by radial line plot; a cantilever extension may be performed by the successive building forward of the models as was done in the case which has been quoted. It is difficult to estimate the time required to extend a control and produce a map since this depends upon the number of flights involved, number of Multiplexes available, and number of operators. As a round figure it can be said that if there are no limitations as to personnel, working three shifts per day, and adequate instruments, a map twenty miles deep

into enemy territory should be distributed in from ten to fourteen days after the photographic positives were in the hands of the photogrammetrists; or certainly the first sheets.

Photogrammetry is a comparatively new science; the various types of photomechanical apparatus are still newer. Skilled operators are not plentiful; to train one requires many months. But it would be shortsighted to predict that these conditions will circumscribe future developments.

The maps which are thus produced may be gridded and issued in uniform sheets; if time is available they may bear as much detail as the conventional map, and if used as such, advantage may be taken of the accuracy of their planimetry. Another important use, particularly when time limitations abridge drafting operations in their production, is in the location of positions (gun, target, O.P.) by restitution from vertical photographs. The procedure is similar to the tracing-paper standard method of resection. The scale of the photograph, or its date, is immaterial. Points are selected around, say, the gun position which are identifiable on both the photograph and the map, and rays are drawn on the photograph from the gun through these other points. The gun position is then resected on to the map by causing these rays to pass through the corresponding points on the map, and pricking through the origin. Still greater accuracy can be obtained by resecting from two adjacent verticals upon which the gun appears.

In this manner the accurate relative positions of gun and target can be located on the map; a large fraction of the artillery survey operations is rendered unnecessary.

CAMERAS

Appreciating the limited opportunities for satisfactory photography in

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war time, and striving to make aerial triangulation as strong as possible, the Air Corps and the Engineer Corps turned their attention towards means of extending the field of view of the camera, paralleling developments in other countries. This involved camera design, research for lenses free from distortion, etc. The eventual result is the present T-3A camera, which is in reality five cameras rigidly connected, one pointed vertically downwards, surrounded by four others, each tilted to about 45°. These Siamese quintuplets have a 6-inch focal length, thus producing photographs at a scale of about twice the flight altitude in feet; for example, photographs taken at 10,000 feet are at 1/20,000 scale. Each oblique chamber has its individually calibrated printer by means of which the four oblique negatives are transformed to the horizontal plane of the vertical chamber. The pictures are then assembled, calibrated trimmers being used, and the familiar composite picture in the form of a maltese cross is produced. The assembling is not necessary in the case of positives for the photomechanical devices. These laboratory operations constitute a serious time-factor; each negative must be identified and indexed, each positive print produced separately in its appropriate printer.

The fore and aft chambers are not required by the photomechanical machines so that there is a tendency to revert to an earlier three-lens camera: in fact, a recently produced German camera has a single lens with 92° coverage.

Because of the requirement that each exposure overlap the preceding one by more than 50% either for radialline plot or stereoscopic examination, the *net effective length* of each picture is less than one-half its actual length which (as does the width) covers approximately as many linear miles as there are thousands of feet in the flight altitude. Similarly a serious

reduction in the *net effective width* results from the necessity of photographing adjacent strips with a sidelap of from 50% to 60% in order to ensure adjustment between them.

* * *

At this point it is well to recapitulate the processes which have been discussed and to consider their potentialities in affording possible solutions to the problem which confronts us: the timely and adequate supply of satisfactory substitutes for fire-control maps in war time.

(1) *Single Vertical*. A faithful picture of a small area. Legibility varies with the quality of the photography, method of reproduction, and scale. Inherent errors of scale and azimuth impair its value for field artillery map-firing. Two overlapping photographs may be examined stereoscopically. Adequate distribution such that appropriate photomaps reach infantry platoon and artillery battery and battalion commanders constitutes a difficult problem.

(2) *Mosaic*. A faithful picture of a larger area. Legibility varies with the quality of photography, method of reproduction, and scale. May be examined stereoscopically with other appropriate prints. Ineradicable errors of scale and azimuth inherent in component pictures impair its value for field artillery map-firing.

(a) *Uncontrolled Mosaic*. Additional errors of scale and azimuth are introduced in operation of laying. Rapidly produced (a few hours). May be gridded and cut into uniform quadrangles which can be used in juxtaposition. A suitable substitute for the map for most purposes EXCEPT FIELD ARTILLERY MAP FIRING.

(b) *Controlled Mosaic*. Additional errors in scale and azimuth introduced in operation of laying are of less importance. Operation of laying requires more time: for a small mosaic of unmapped

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territory a radial-line plot is a prerequisite; if of more than a few miles in width a stereophotogrammetric control extension is necessary, *in which case the production of the mosaic takes about as much time as the photogrammetric map, and is less accurate.* May be gridded and cut into uniform quadrangles which can be used in juxtaposition. Depending upon scale and legibility, of value as a firing chart where observations are possible for calibrating and verification.

(c) *Strip Mosaic.* Probable accuracy less than that of fully controlled mosaic. Rapidly laid. May be gridded, but difficult to use in juxtaposition with other strips. Distribution of component photomaps to appropriate artillery and infantry commanders constitutes a difficult problem. Value as firing chart similar to that of controlled mosaic, but for more limited area.

(3) *Radial-Line Plot.* Shows no hypsometric data. Rapidly executed. Planimetry filled in by interpolation. Advisable to plot at mean scale of photographs; enemy reaction and other factors will fix probable *maximum* scale at 1/40,000. For field artillery use should be enlarged to 1/20,000 which procedure is contrary to satisfactory practice. Can extend horizontal control (cantilever) up to at least ten miles with displacement errors of less than 0.50% of the distance, the displacement preponderating in the direction of flight rather than transversely.

(4) *Stereophotogrammetrical Plot.* Can extend vertical and horizontal control (cantilever) and plot detail. Multiplex is reasonably portable, operation relatively rapid. Room for belief that accuracy will be greater than radialline plot and that errors, if any, can be made uniform. All planimetry has accuracy of control extension. Can be gridded and issued in sheets which can be used in juxtaposition.

Can be used as maps, or in combination with photographs (restitution). Can plot at large scale and reduce to 1/20,000.

Do these processes offer a solution to our problem?

* * * * *

At once a dozen questions leap to our minds. What sort of war can we visualize? Where will it be fought? How will the enemy be equipped? and so on.

Think of the German Army as it swept through Belgium and France in 1914 at the rate of 250 miles a month. Its artillery assuredly did an efficient job, yet had no fire-control maps. Good tactical maps were available, but until the fighting crystallized into trench warfare artillery fire was conducted by observation. As has been stated earlier, the fire-control map was engendered by the intensification of the defense; targets must temporarily be stationary.

Wars in which we may be involved can be expected to fall into one or more of the following classifications:

(1) A sudden invasion of our own territory without warning. In such an unlikely contingency it is a fair presumption that we would descend upon the Standard Oil Company with gratitude for the completeness of their road maps; for with these we would have to content ourselves for the time being unless the enemy were kind enough to select a mapped area for his activities.

(2) An expedition into enemy territory, mapped or unmapped. In such a case the effort would be planned, not impulsive. Our cavalry and infantry divisions would be preceded by a systematic photography by the Air Corps. Upon such photography, tied to an energetic extension of ground control by the Engineers when the opportunity arrived, the future map substitutes would be based.

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(3) An invasion of our own territory preceded by adequate warning. Here again the theatre of operations would be fairly well designated well in advance, and the production of map substitutes would follow the photography along the lines indicated in (2), but with more freedom of action.

Thus, in the case of a planned expedition or of a defense against an anticipated invasion we should be able to count upon the performance of the basic photography before our troops enter the area. The photographs of the probable theatre of operations would be filed, but initially it is unlikely that any large scale map-substitutes would be produced from them until the area of active operations were more closely defined. This photography may seem like a large order, but, by way of a yardstick, the whole of our Meuse-Argonne battlefield (25 by 40 miles) could be covered with a single loading of one camera; the Peninsula campaign and Grant's campaign from the Wilderness to Petersburg could each be covered in one loading by two airplanes. The photographic mission makes no great demands in materiel; the hazards are those of weather, enemy, and the human factor, which have previously been mentioned. It should also be understood that this photography must be high-altitude in order to avoid enemy interference and thus secure uniform coverage and good quality pictures, and to obtain at the same time a reasonably large coverage per picture. The altitude to be realized cannot now be fixed; it will probably be at least 20,000 feet, and might be higher. At such height a photographic plane might pass unnoticed, particularly if a few ships flew at a lower altitude as red herrings; in any event the photographic mission could well be accomplished before the airplane could be reached by a pursuit ship from the ground.

Since this high-altitude photographic mission, if properly executed, will not require repetition during the course of the campaign, and because of the dependence of the ground troops, particularly the Field Artillery, upon the successful outcome, the Air Corps should devote to it its most experienced personnel and the maximum of cooperative effort. It should have priority over all missions.

In considering a possible program for the production of map substitutes it should be postulated that military mapping operations should be of a progressive nature; that is, the data on hand should be used to furnish some sort of expedient to meet the immediate situation while providing suitable and adequate material for continuing improvement upon each successive expedient as time permits.

The first map-substitute to appear will probably be a lithographic reproduction of a mosaic, in many sheets, for use as a tactical map; it will be made up from the high-altitude pictures amplified by such pertinent data from other sources as may be available. It will be uncontrolled; time will not permit otherwise. It must be gridded, of course. The grid will be only approximately accurate and the scale probably not less than 1/40,000. At the outset the war will enter the phase of rapid movement, small units in contact, mechanized forces chasing each other hither and yon, fleeting targets, terrain features snatched by alert junior commanders. The artilleryman must rely principally upon direct observation, his own survey operations—and these will require considerable coordination as forces join hands—and such information as can be gleaned from an occasional airplane photograph. Fire will be conducted by time-honored procedures in rapid preparation and prompt execution. Mechanized hosts notwithstanding, it is unlikely

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for reasons of expense, experience, and exhaustion that this rapid movement phase will endure—it might recur, of course—and the day will eventually arrive when the mechanized and motorized forces run out of breath, and the commanders of the various echelons—covering forces, main bodies, and so forth—can sit down opposite the enemy and can estimate the general location of the next battlefield.

At this moment the appropriate positive plates will be prepared and handed to the Engineers for use in the preparation of maps by stereophotogrammetry. For small areas, or for particularly urgent needs a radial-line plot can be started simultaneously, using a set of prints. These plots must be based upon such control as can be identified on the photographs, and to this end accessible triangulation and traverse stations will have been made visible by white panels, prior to the photography, of course. In the case of an invasion of foreign territory, or a sudden incursion into our own, no such paneling may be possible; we must then base our maps upon control behind our own lines and make a cantilever extension into enemy territory without a tie, or with such ties as fortune may favor us. Satisfactory operation of stereophotogrammetric apparatus demands that stations of the initial control be distributed in conformity with definite and somewhat inelastic requirements as to number and relative locations. Such panels as appear on the photographs and meet the requirements can form part of this control; the remainder of it must be located, subsequently to the photography, of course, under the direction of the photogrammetrists. This is far from being a summary performance, and since the inaccuracy of a cantilever control extension increases to some extent with the distance from the initial control, with

the corollary that the initial control should be pushed up as close as possible behind our prospective front line, the Engineers will be confronted with deciding how close to the enemy the necessary ground survey operations can be performed with acceptable accuracy and requisite speed.

To revert to the marking of available stations prior to the photography, this paneling will be carried well into questionable territory. The panels need not be very densely distributed, but any single panel may become priceless in furnishing a tie for the control extension.

Thus there will be produced by Multiplex a series of sheets of the probable area of the impending operations, at the scale of 1/20,000, with contours or frequent spot heights, an accurate grid, and the principal roads, trails, streams and other features which are recognizable on aerial photographs or by the ground troops. These sheets, which could be called "Battle Maps" rather than by their ponderous experimental name of "Fire Control Data Sheets" already familiar to many artillerymen, can be used as firing charts or as maps; they can be used with vertical photographs to find positions by restitution.

Since it is unlikely that the first of these Battle Maps will be in the hands of the troops in less than from ten to fourteen days after the order to produce them is given, the field artilleryman must depend in the interim upon his eyes, such firing charts as he can improvise, his survey, and the information furnished by his tactical mosaic. There is, however, one more item on the program of map substitutes which will help to supply his needs at this time. Prior to, and during battle it is one of the functions of the Air Corps to supply photographs of the enemy activities taken at somewhat lower altitudes and, because of longer focal length of the designated cameras,

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at larger scale. Performed systematically when conditions permit, the results can be made up into gridded mosaics of small areas, controlled by a radial-line plot, or issued separately so that they can be consulted individually or made up into strip mosaics by the field artilleryman; the mosaics or prints will be issued in lithographed form, naturally, and within twelve hours after the return of the airplane.

There is a widespread belief that it is essential that the infantryman and the artilleryman use the same map. The Battle Map meets the needs of the artilleryman more closely than do the mosaics which he will have anyhow; the mosaics will be in the hands of the doughboy before the Battle Map appears, and will probably meet his needs equally as well, if not better. To add to his burdens in the heat of battle by issuing the Battle Map and any accessories thereto would be cruel and unusual punishment. Provided that there is a reasonable coordination between the grids of the mosaics and that of the Battle Map, the infantryman can call for fire on a target reported on a mosaic, and the artilleryman should have no difficulty in restituting such target on the Battle Map.

Because the cantilever control extension will inevitably have some inaccuracy, and because it is highly probable that despite our efforts and hopes we will find no distant control points to which to tie it, steps must be taken to verify and improve the Battle Map as the troops go forward. Further more, it is undeniable that the work of the artillery and infantry will be systematized and coordinated in notably greater measure as a uniform grid system becomes available. The grid depends upon the existence of a basic control, true or improvised; of course, independent grids may be extemporized at fire direction centers, but it is unnecessary to

expatiate upon their shortcomings. It follows therefore that the basic control must be carried forward by ground methods step by step as our troops advance to, and beyond, the line of contact—a problem for the Engineers. To this control the initial control of the Battle Map will be tied. As the Battle Map is used its accuracy will be tested and correction factors obtained by the artillery for the use of the Engineers in correcting later editions. Thus not only is close cooperation between the Field Artillery and Engineers essential, with prompt exchange of needed information, but it seems evident that the Field Artillery must be endowed with its own survey personnel for which the necessity has already been recognized in some foreign armies.

* * * *

The defection of the 1/20,000 fire-control map has forced upon us the alternative of devising substitutes or revamping our technique, our tactics, and our training. Of these alternatives the first is the least disturbing. The timely and adequate supply of satisfactory map substitutes in war may be accomplished progressively by the program which has been outlined; the procedures are not chimerical for concrete results have been obtained. Variations of the types of map substitutes discussed, and other related types will have their uses, and will appear as the demand is recognized.

The need of the infantry and the artillery is so urgent as to demand first priority of the agencies charged with solving this problem. The program calls for peace-time training involving constant repetition and improvement until all participants can play their parts efficiently and smoothly. Without practice it cannot hope to succeed, for war will make no allowances for misdirected effort or for good intentions. The time may be short.

BOOK REVIEW

CHEMICALS IN WAR. A Treatise on Chemical Warfare. By Augustin M. Prentiss. Ph.D., Lt. Col. CWS, U. S. Army. Published by McGraw-Hill Book Co., Inc., 330 W. 42d St., New York. \$7.50.

If you wish to find whether a treatise has covered a subject, consult the listed bibliography. This work has 702 pages of text, 30 pages of world-wide bibliography. It is difficult to imagine a question on the subject, ingenuous or technical, whose answer cannot be found within the pages of this interesting, and copiously illustrated book.

One can give but a hasty and inconclusive summary of the meaty contents, a mere scratching of the surface to disclose some point of particular interest to the inquirer. Here are formulas, well-diagrammed, of the agents; definitions, most complete; history of development and use in the World War; principles of tactical and technical employment; military organization for chemical combat; the chemical technique and tactics of the using arms.

Our readers will look for the chapter on employment by the artillery. They will find 82 pages on this subject, with 38 pictures, several of them in three-color; and numerous tables, with many illustrations, with dimensions and cross-sections, of chemical shell used by our own and foreign armies.

Did you know, for instance, that toward the end of the War the Germans greatly increased the effectiveness of their Yellow Cross shell by fitting it with a time-fuze for air burst?

Did you know that the relative gas casualties for the whole World War were, for the various armies, German and French 3.5 percent. British (in France) 8.1 percent, and American, 26.8 percent? (Although the Americans sustained only 2 percent gas *deaths*, as against about 4 percent for the others.)

Did you know that in 1864, 50 years before the World War, a British writer advocated chemical warfare as being so merciful, yet effective, that its widespread and unlimited use would eventually do away with war? Said he: "It were improbable that any congress of nations could agree on any code regulating means of destruction; but if it did, it were useless; for science becomes more powerful as she concentrates her forces in the hands of units, so that a nation could only act by the absolute and individual assent of each of her representatives. . . ."

A very able and unusually lengthy review of "Chemicals in War" appeared in a recent issue of *Time*.

The book includes chapters on the protection of civil populations and the international situation, prepared by Major George J. B. Fisher, CWS, U. S. Army.



The late Sergeant August Quint, 1st FA Band, left \$2,000 for the education of the orphans of Army personnel, particularly those of enlisted men.

Motor Convoys in the Second Army Maneuvers

BY CAPTAIN W. F. MILLICE, FA

THE motorization program which is being carried out in the army is providing trucks for at least the supply organizations of most of the units of the army (regular and national guard). Some of the experiences of the Sixth Motor Transport Battalion (Prov), during the Second Army Maneuvers in Michigan, may be a help to those whose experience has been with dismounted or animal-drawn units.

The mobilization of over 20,000 troops in the Allegan, Michigan, area presented a transportation problem. Civilian traffic is fairly heavy in this area. Speed was mandatory, since mobilization time was deducted from maneuver time, and the participating National Guard from Illinois, Michigan, and Wisconsin was authorized only two weeks of active duty.

The national guard units having motor equipment were concentrated in their bivouac areas by convoy of their own vehicles. Part of the remaining units came by train. About 7,000 men and officers from Illinois and Wisconsin crossed Lake Michigan by boat.

The first problem of the Sixth Motor Transport Battalion (Prov) was to transport these 7,000 men and officers, together with their personal and some organization baggage, to their respective bivouac areas.

The provisional battalion was included in the plans of G-4, VI Corps, to provide transportation for mobilization and demobilization as well as furnishing transportation for mobile reserves during the maneuvers. The battalion was composed of six companies, and each company, organized by a regular army battalion stationed in the 6th Corps Area,

had less than one month's preliminary training at its home station or summer camp before reporting for service with the battalion. The training points were scattered in five stations throughout the corps area. The vehicles were 1½-ton Chevrolet and Dodge trucks loaned by the CCC organization of the corps area. Training, by the parent regular army battalions, was especially difficult for the following reasons: All parent organizations were either dismounted or horse-drawn units which had either no motor vehicles or had had only a few motor vehicles in their service organizations, and these for less than a year. Those having small motor sections were required to operate them during the maneuvers as well as furnish the personnel to operate the provisional organization. All the battalions had to fill their normal summer training requirements while conducting the additional training. The vehicles used by the battalion were 2 to 4 years old and had received hard usage, evidently over poor roads, in the conservation program. The repair of these vehicles to fit them to carry personnel was a difficult task.

The Sixth Motor Transport Battalion (Prov), with an initial strength of over 350 men and about 300 trucks, was assembled at Fennville, Michigan, at 7:00 AM, 7 August. The truck companies arrived by convoy from their home stations, some marching over 400 miles. To most of the drivers this march was the only real convoy on which they had ever driven. The officers who were to command the companies during the maneuvers (DOL officers in the 6th Corps Area) assumed command of units in

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which all of the enlisted personnel were strangers. The one exception was Lt. Plapp, who retained command of the company he organized.

The Motor Transport Officer, VI Corps, had laid out a servicing schedule for all vehicles, including a check of the parts which might cause an accident. No attempt could be made at a thorough technical inspection and correction of all faults since the schedule called for all vehicles to roll on their first run before 3:00 AM, 7 August. A set of general convoy instructions was issued. This was necessary, since at various times several companies were to operate in one convoy and their preliminary training had not been uniform.

Between 6:00 PM, 7 August, and 10:30 AM, 9 August, this provisional battalion, with the short training period mentioned above, operated an average of over 85 miles per truck loaded and over 95 miles per truck empty. About half of the operation occurred during hours of darkness with the roads not only congested with the normal week-end traffic but further crowded with incoming troop convoys in their own vehicles, and by curious spectators. The loads hauled from the docks at Grand Haven and South Haven and the armory at Grand Rapids, were of the types mentioned above. Accidents—two; one caused by a passenger insisting on a driver's compliance with his order after the driver had politely informed him that he (the driver) had instructions to take orders from no one except the convoy personnel (the two government trucks damaged in this accident returned to Fennville park under their own power but had to undergo repair before they could be returned to service); the second accident was brushing of fenders of a government truck with a private car in a congested area. Total injuries to persons—none. Total damage to property—only that mentioned above.

The schedule, during the period mentioned, called for maintaining an average of 25 miles per hour from the loading point to the unloading point. An hour was allotted at each end of each run for loading and unloading. In some cases time was saved on the schedule unloading in the division bivouac areas but little or no time was saved in the congested dock areas. The fast average time on the road was made possible by corps order giving the convoys of this battalion priority on all roads within corps transfer points during this period. Some idea of the intensive schedule maintained may be gained from the following: At one time the schedule called for the refueling of 98 vehicles, feeding personnel, and leaving on the next run, in 32 minutes. The schedule was maintained.

All of the personnel had hot meals during this period from one of the two provisional messes, except 17 men who carried lunches on a special long run. This is believed to be one of the factors that enabled the men to operate their vehicles successfully over this period with no sleep.

After concentrations were made in the original bivouac areas the troops had two days of intensive training. The battalion was then called upon to move certain dismounted units to their forward areas for the maneuver. During the maneuver the battalion was used to motorize reserves as the turn in the action called for such movements.

The battalion participated in the movement of the various units to Camp Custer, Michigan, and in the demobilization transported the units and baggage to railheads. During demobilization about fifty more trucks were added to the battalion, and 15 much-needed officers.

The following points, some new, some old, which were encountered are listed below:

1. Passengers should know that they have no authority over convoy personnel.

MOTOR CONVOYS IN THE SECOND ARMY MANEUVERS

Requests should be made to convoy commanders.

2. No matter how necessary it may seem at the time, never split a convoy to load or unload.

3. Requests for passenger discipline and loading suggestions should be made in advance by convoy commanders. Troop commanders should carry out convoy commanders' suggestions unless they can, at the time the suggestion is made, see a good reason for not doing so.

4. Allow about 50 percent more time to load than to unload.

5. Safe yardage between vehicles, peace conditions including civilian traffic, not less than three times the speed in miles per hour. (25 miles per hour—at least 75 yards distance.)

6. Part of the training of all units should be in night driving over all types of roads, with and without lights. This was particularly evident to the author, who has served with motorized units which had less difficulty in night maneuver.

7. A light vehicle should be furnished to each platoon of ten trucks. This battalion had one with 400 trucks.

8. The training of this battalion would have been better and more uniform had it been possible to conduct the training at a central place under the command of experienced convoy officers.

9. Few of the officers ordered to duty with this battalion had had any previous convoy experience. Convoy schools are suggested for both officers and noncommissioned officers. This training to be primarily operation, with some mechanical instruction.

10. The speed of a convoy is not the top speed of any one vehicle but is a variable quantity, depending on several things: Type of vehicle, age of vehicle,

condition of vehicle, load, road, traffic military, traffic civilian, urgency of the mission, number of vehicles in the column, training and experience of the convoy personnel, light, weather, and many other things. This battalion operated as many as 169 vehicles in one column, in congested areas, success being due in large measure, however, to the priority on all roads mentioned above. Checks on schedule were made by corps military police at corps transfer points reporting the passing of convoys by number and time to Sgt. Dorsey at Fennville G-4 office by telephone.

11. Local and state police were of valuable assistance when available. Policemen with one car or motorcycle per 20 convoy vehicles with two or three spares to jump the column and control traffic at arterial crossings is recommended. Those with column to keep other traffic out of column. This will clear the road to other traffic at an earlier time than if column is entered. Material assistance is given in cities by local police at principal crossings.

12. Refueling by the following methods was tried:

- (a) Gasoline tanker with 3 to 5 outlets similar to those used at a filling station.
- (b) Gasoline tanker equipped with 5-gallon, large-spigot cans, and two funnels per can.
- (c) Fifty-gallon drums with pumps, cans, and funnels.
- (d) Roadside filling stations.
- (e) Refueling on city streets and in park by all of the above methods.

Note: Method (b) was by far the fastest and most successful of all methods tried.

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MAJOR GENERAL HENRY W. BUTNER, U. S. ARMY, 1875-1937

Henry W. Butner

The Field Artillery Association announces, with deep regret, the death, at Washington, D. C., March 13th, 1937, of its late Vice-President, Major General Henry W. Butner, United States Army.

General Butner was born at Pinnacle, North Carolina, on April 6, 1875. He was appointed to the United States Military Academy from that State on June 20, 1894. Upon graduation from West Point in April, 1898, he was commissioned a second lieutenant of Artillery.

General Butner was promoted to first lieutenant of Artillery on February 2, 1901; to captain on September 23, 1901; to major of Field Artillery on July 1, 1916; to lieutenant colonel on May 15, 1917; to colonel (temporary) on August 5, 1917; and to brigadier general (temporary) on October 1, 1918. On July 15, 1919, he reverted to his regular rank of lieutenant colonel. He was promoted to colonel, Regular Army, on September 28, 1919; to brigadier general, on March 7, 1930; and to major general, on February 1, 1936.

Upon graduation from the Military Academy. General Butner was assigned to duty with the 3d Artillery, and joined Battery "E" at Fort Point, San Francisco, California, on May 29, 1898. He remained on duty at Fort Point until December 8, of the same year, when he was transferred to the Presidio of San Francisco, California, and on January 28, 1899, to Alcatraz Island, California. During the spring of 1899 he served at Fort Baker, California, and in June of that year he was transferred to Battery "F." 3d Artillery. On July 1, 1899, he was assigned to Fort Riley, Kansas, for duty with the light battery of the 3d Artillery.

General Butner was transferred to the 6th Battery, Field Artillery, on July 1, 1900, and continued on duty at Fort Riley, Kansas, until December 4, 1900, when he was placed in charge of a recruit detachment and ordered with his command to Cuba. Upon his return to the United States on February 5, 1901, he was ordered to Fort Riley and continued on duty with the 6th Battery. He was transferred to Fort Columbus, New York, on October 24, 1901, where he commanded the 122d Company, Coast Artillery, until October 4, 1902, when he was transferred, with his command, to Key West Barracks, Florida. On July 13, 1905. General Butner was ordered to the Staff College, Fort Leavenworth, Kansas, from which he was graduated on July 26, 1906. He served as Camp Inspector at Fort Riley, Kansas, until September 29, 1906, when he was transferred to Fort Flagler, Washington. General Butner transferred to the Field Artillery in 1907, and on July 19, 1907, he joined the 2d Field Artillery at Fort D. A. Russell (now Fort Warren), Wyoming, as regimental adjutant. On February 10, 1919, he sailed with his regiment for the Philippine Islands, for station at Fort McKinley. He continued his service at Fort McKinley, Camp Gregg, Camp Stotsenburg and Manila, until April 14, 1911.

Upon General Butner's return to the United States in May, 1911, he was assigned to duty with the 2d Field Artillery at Vancouver Barracks, Washington, where he commanded Battery F, until September 10, 1911. He attended the School of Fire at Fort Sill, Oklahoma, until February 25, 1912, and was then assigned to duty as Quartermaster,

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Military Prison at Fort Leavenworth, where he remained until December 11, 1912. He was then transferred to Fort Riley, Kansas, and commanded Battery D at that station until April 20, 1914, when he was detailed to command a battery at Brownsville, Texas. He served at Brownsville, Texas, from April, 1914, to August 14, 1914; at Leon Springs, Texas, until November 13, 1914; at Brownsville, Texas, until May 17, 1915; at Laredo, Texas, until August 6, 1915; at Nogales, Arizona, until October 28, 1915; at Douglas, Arizona, until November 25, 1915; at Nogales, Arizona, until December 10, 1915; and at Douglas, Arizona, until November 2, 1916.

In November, 1916, General Butner was ordered to Hawaii, and upon his arrival there he was stationed at Schofield Barracks, remaining there until December 7, 1917. Upon his return to the United States on December 14, 1917, he was stationed at Fort Sill, Oklahoma, and served with the 16th Field Artillery until May 10, 1918.

General Butner sailed for France with the 16th Field Artillery on May 21, 1918. While in France he participated in operations on the Vesle Front, August 5-17, 1918; St. Mihiel, September 2-13, 1918; Meuse-Argonne, October 1-November 9, 1918. On October 1, 1918, he was placed in command of the 1st Field Artillery Brigade, which organization he commanded until November 12, 1918. He was ordered to Coblenz Bridgehead, arriving there on December 15, 1918. He was stationed in Germany until May 26, 1919, when he returned to the United States.

On his return to the United States General Butner was detailed as a student officer. Army War College, Washington, D. C., and after graduating in June, 1920, he was transferred to the Field Artillery School, Fort Sill, Oklahoma, for duty as Assistant Commandant. On July 1, 1922, he was made Commandant. Field Artillery School, and remained as such until January

3, 1923, when he again became Assistant Commandant of the same school. On July 3, 1924, he was transferred to Fort Bragg, North Carolina, and assigned to command the 5th Field Artillery. He continued in command of this regiment until August 15, 1925, when he was ordered to the Philippine Islands for duty. Arriving at Camp Stotsenburg, Philippine Islands, on December 15, 1925, he was assigned to command the 24th Field Artillery, Philippine Scouts. He continued in command of this regiment until December 5, 1927.

General Butner was ordered back to the United States, and in February, 1928, was assigned to duty as President. Field Artillery Board, Fort Bragg, North Carolina, and in command of the 13th Field Artillery Brigade. On March 29, 1930, he was transferred to the Air Corps Tactical School, Langley Field, Virginia, and remained there until April 26, 1930. He attended the Coast Artillery School, Fort Monroe, Virginia, from April, 1930, to May 24, 1930, and was then assigned to duty as Commanding Officer, Fort Eustis, Virginia, to August 4, 1930.

He was ordered to Hawaii to command the 11th Field Artillery Brigade at Schofield Barracks on October 24, 1930, and remained there until October 4, 1932. Returning to the United States on October 10, 1932, he was placed in command of the 3d Field Artillery Brigade at Fort Lewis, Washington, where he served until August 1, 1934. Upon completion of that detail he was assigned to duty as Commandant, Field Artillery School, Fort Sill, Oklahoma, where he remained until June, 1936. During most of that period he also commanded the 4th Field Artillery Brigade. In July, 1936, General Butner sailed for Panama to command the Panama Canal Department. He was relieved of this duty, and assigned to the Army Group, Washington, D. C., February 10, 1937. General Butner is on the General Staff Corps Eligible List.

FIELD ARTILLERYMEN DECORATED

General Butner was awarded the Distinguished Service Medal, the citation for which is as follows:

"For exceptionally meritorious and conspicuous services. He commanded, with marked distinction, the 1st Field Artillery Brigade from August 18 to November 11, 1918, displaying at all times keen tactical ability, initiative, and loyal devotion to duty. By his high military attainments and sound judgment he proved to be a material factor in the successes achieved by the division whose advances he supported."

General Butner was awarded the Silver Star citation by the United States for distinguished conduct during operations at Mouzen, and subsequent advance on Sedan, November 5-7, 1918. He was also awarded the French Croix de Guerre, with Palm.

He is survived by a brother, Mr. Arthur L. Butner, 1090 Arbor Road, Winston-Salem, N. C.

As President of The Field Artillery Board, and as Commandant and Assistant Commandant of The Field Artillery School, General Butner exercised an influence over the development of field artillery which was widely recognized. Among artillerists he was an acknowledged master. Officers of the arm who have witnessed his firing of a service problem still speak of it. Perhaps, to be remembered in this manner would have been General Butner's greatest satisfaction.

His personality evoked the recognition of his superiors, the devotion of his subordinates, and the strong attachment of his friends, on duty and off. He was expert with rod and gun, fond of all the outdoors. Modest and retiring of nature, he brought shyness almost to a fault, yet was so genial and friendly, so much a man's man, that a host of field artillerymen will sorrow that "Bill Nye" Butner is gone.

Field Artillerymen Decorated

The Field Artillery of the present will not suffer by comparison with that of the past, so long as among its personnel are men of the caliber of Private William Eubank, 11th Field Artillery Brigade, and Private Ersel W. Baker, 2d Ammunition Train, their citations for award of The Soldier's Medal reading, respectively:

"William D. Eubank, private, headquarters battery, 11th field artillery brigade, U. S. Army. For heroism displayed at Haleiwa Beach, Oahu, Territory of Hawaii, July 25, 1936. Pvt. Eubank, together with three comrades, were endeavoring to install an antenna for a radio. In so doing the antenna wire came in contact with a portion of an electric wire which was exposed, thereby causing an electric shock to two of the comrades, one of whom died instantly. Seeing the predicament of the other comrade, Pvt. Eubank, with no thought of

his own danger, wadded up his sweater for insulation and succeeded in pulling the wire from the stricken man's body. He then applied artificial respiration and thereby saved his life."

He is on duty at Schofield Barracks. T. H.

"Ersel W. Baker, private, 2d ammunition train, U. S. Army. For heroism displayed in rescuing a comrade from drowning in Quannah Parker Lake, in the Wichita Forest Preserve, Kansas, June 23, 1936. Hearing cries for help, Pvt. Baker, with utter disregard of his own safety, jumped into the water, fully clothed, and swam to the point in the lake where the drowning man went down, dived beneath the surface of the water, succeeded in rescuing him and bringing him safely to shore where he administered artificial respiration."

He is on duty at Fort Sill, Okla.

MAN, HORSE, THE FIELD ARTILLERY



"MASTER"

Lt. Col. A. V. Arnold, M. F. H., "Ruth Hamilton," ch mare, 15—2½, 10 yrs., by "Alexander Hamilton" out of "Splitit."—In right foreground. "Pilgrim," 6 yrs., from Arapahoe Hunt, Denver, Col., imported English stock. Scene—South Chatto Ridge, N. W., to Mission Ridge, in background.



"HOUNDS ARRIVE"

L. to R., Capt. David Larr, on "Domineer"; Capt. E. W. Searby, on "Gaunt"; Lt. Col. Arnold, on "Ruth Hamilton"; Capt. W. A. Samouce, on "Bumper Lass"; Capt. Hugh Cort, on "Chesterfield." Scene: Medicine Bluff 1. White hound in center, "Boss," 6 yrs., half English, half Oklahoma coyote hound.

AND DOG

SCHOOL HUNT



"PACK IN"

L. to R., Major R. L. Coe, Cav., on "Highland Chief." Samouce, Searby, Larr, Arnold, Cort. Scene—Apache Gate north to Welsh Hill, in background.



"HACKING"

L. to R., Larr, Cort, Arnold, Searby, Samouce. Scene—South at White Wolf Bridge. Leading hound is "Bobbs," leader and dean of the drag pack. In 8th season with hunt, breeding unknown. Mute, but infallible.

The Defensive-Offensive Maneuver

BY COLONEL RALPH TALBOT, JR., FA

EDITORIAL NOTE: *Under the title, "Defensive-Offensive Combinations and Flank Maneuvers in Our Next War," the following article was delivered as a lecture at the Command and General Staff School, Fort Leavenworth, Kansas, to a recent class. Its substance then was mimeographed for distribution. A few of the 50-odd slides which accompanied the talk are reproduced herewith. Believing it would interest our readers to leave it in the original form, we have tried to preserve the force of the narration by editing these notes (for oral delivery) as little as possible.*

1. INTRODUCTION. — *a. Origin.*—This talk was originally prepared for delivery before an "Officer Group" of a neighboring city in conformity with a request that the subject be "The trend of thought at the Command and General Staff School and its probable influence upon our future methods and practices."

Subsequently, when decision was made to include this lecture in the Resident Course, it was modified somewhat to adapt it for delivery before the Regular Classes.

b. The Subject.—The idea which I propose to develop in this lecture is indicated in its title. The views on this subject which I am to lay before you today are offered as thoughts to be mulled over in the future as time, opportunity, and your interest may dictate.

2. MY SYLLOGISM.—By way of orientation, this syllogism is presented for your consideration.

THE PREMISES

1. *In the past:*
 - a. Many decisive victories have resulted from astute defensive-offensive combination and flank maneuvers by inferior forces against superior ones.
 - b. Such maneuvers have more truly exemplified adroit generalship and the will to win than have purely frontal maneuvers.
2. *In the future:*
 - a. Such combinations (through clever exploitation of the enormously increased efficacy of modern transport and the power of modern defense) will increasingly facilitate the massing of relative combat superiority on a decisive front.
 - b. Only through such combinations may that economy of force essential to early decisive action on our part be insured.

THE CONCLUSION.

A MASTERY OF DEFENSIVE-OFFENSIVE COMBINATIONS AND FLANK MANEUVER coupled with the will to win are prerequisite attributes for our future military leaders.

- 3. DEVELOPMENT OF SUBJECT.**—In the development of the subject I propose to:

- (1) Establish premise one through illustrations drawn from four great battles: Cannae, Waterloo, Chancellorsville, and the Marne.

THE DEFENSIVE-OFFENSIVE MANEUVER

- (2) Predicate premise two upon certain lessons of history coupled with a critical analysis of our post-war tactical doctrine.
- (3) Base my conclusions upon facts developed under the above premises.

4. CANNAE.—"A Dark Day for the White Race." Cannae is the *first* of the four great battles through which I hope to establish premise one.

a. The Opposing Commanders.—Examine photographs of the ancient busts of the opposing commanders [lantern slides omitted]. On the right is Hannibal. "The first born of the lion's brood." The eldest son of the brilliant Carthaginian soldier-dictator, Hamilcar.

Like Alexander and Frederick the Great, born on the battlefield and cradled in war. Distinguished from youth for his high intelligence, resolution and moral courage. "His character descended to us throughout the ages was pure, beyond the power of his enemies to stain." Elected commander of the "Armies in Spain" at 28 years of age. The last general to lead an African soldiery to victory over a great European race.

Beside him Varro, "The Bull." A plebeian. The son of a butcher. Rose from the ranks. The idol of his men. His principal traits of character indicated in his face. Hot-headed, impetuous, brutal. Deliberately baited twice by Hannibal just prior to Cannae. Burning to avenge the taunt of battle, twice contemptuously refused. At Cannae, charging with blind fury when Hannibal waved the red rag.

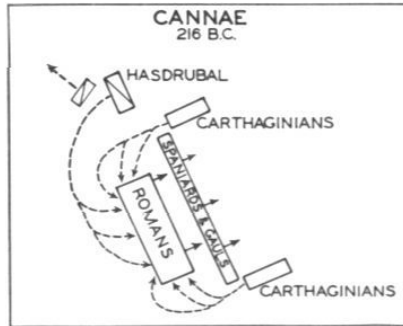
b. The Battle.—This battle has been hung before your eyes on this screen throughout your entire course as a classical example of "an irresistible general assault." While Cannae undoubtedly ended as such, should it be properly so classified? Was it

conceived by Hannibal as an offensive battle, pure and simple? No! Distinctly not!

If such modern classification may be applied to the formal array of these two primitive armies, Hannibal's Cannae clearly falls within our present-day category of a defensive-offensive maneuver, "an active defense," or if I may coin a descriptive phrase, "a delayed offensive."

Hannibal was outnumbered two to one. Not only did he *not* assume the offensive initially, but (on the contrary) he *deliberately* surrendered the initiative to Varro. He elected to receive the onslaught of the Romans with a view to a "delayed offensive" as a counteroffensive stroke.

Of exceptional interest to us is an analysis of Hannibal's method of employing the several combat elements composing his army. Where were his best infantry? His trained and dependable regulars? Where were his secondary troops? His partially trained and lightly armed territorials?



We find his heavy Carthaginian infantry (his principal shock troops) held initially in reserve in rear of the flank; his secondary troops (the Spaniards and Gauls) opposed to, and absorbing, the Roman main effort. These irregulars, inadequately armed, equipped, organized and disciplined

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for the main test of battle, were held competent to (and actually did) contain and neutralize the main Roman combat mass of many times their strength. Upon these secondary troops Hannibal focused the entire attention and combat effort of the invincible Roman legions. Finally when this great Roman mass, slow, inflexible, and inarticulated, had blindly entered the lion's mouth, Hannibal sprung into its great jaws.

c. Lessons of Cannae.—Reclassify Cannae in your mind:

(1) Recall it *not* only as a predetermined double envelopment, but as "An adroit and flexible Defensive-Offensive combination and Flank Maneuver" by an astute and determined leader possessing the Will to Win!

(2) Regard Hannibal's masterly dispositions of his forces as "A perfect exemplification of the principle of the Economy of Force."

(3) His personal direction of the maneuver of his weak Center as "A

To the era of that great military genius, Napoleon, who "as a general, courted maneuver; as an emperor, espoused mass."

In the same frame, we see a famous British soldier, Wellington. His military reputation dimmed by the brilliancy of his spectacular contemporary, Cold, calculating, austere, "The only general who always whipped the French." Let us further compare those two great contemporaries, born in the same year: Napoleon exemplifying the principle of the offensive; Wellington standing as the great exponent of the defensive-offensive principle in battle. Both imbued to a superlative degree with the "Will to Win." Napoleon, employing the principle of the offensive, conquered most of Europe. Wellington, employing the principle of active defense, fought successfully seven years in the Peninsula against greatly superior French forces. During this period he defeated successively many of Napoleon's most brilliant marshals. Later climaxing his career at Waterloo, Wellington, the great exponent of active defense, defeated Napoleon, the great exponent of the offensive.

In Wellington's own words, his plans of action remained like "a harness of rope, repairable by merely tying a knot." His opponents became a "harness of embossed leather, a break necessitating elaborate repair."

b. The Battle.—(1) Recall the strategic deployment just preceding Waterloo.

The French, centrally disposed, preparatory to carrying out Napoleon's "maneuver from a central position," designed to crush successively Blucher and Wellington.

(2) The following day, Ney at grips with Wellington at Quatre Bras; Blucher in retreat eastward before



classic on the Location of the Commander in Battle."

5. WATERLOO.—"Pray God for Night or Blucher."—We now leave behind us the sword and bow and follow the March of Time forward to the early days of modern firearms.

THE DEFENSIVE-OFFENSIVE MANEUVER

Grouchy. Centrally located near Ligny, Napoleon, worn with disease; the "will to win" gone; too weary to exploit his advantageous situation; retiring for the night; deferring until tomorrow his attack against Wellington's left flank.

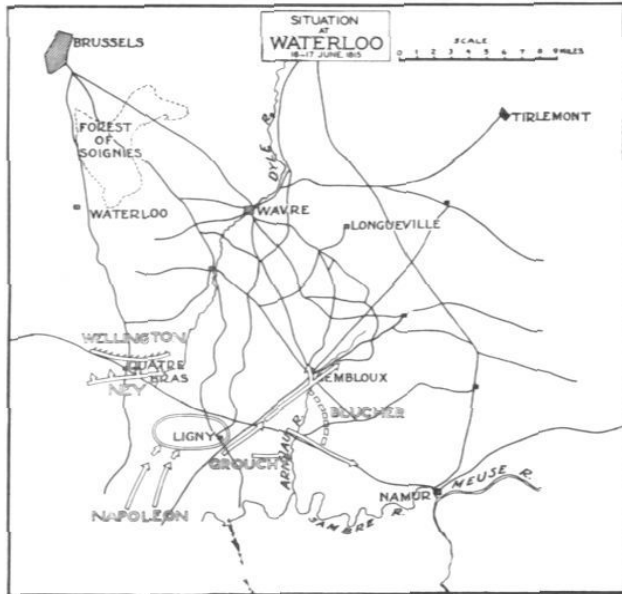
(3) Lastly, Waterloo itself. Wellington, a stone wall against which French assault wave after wave was futilely dashed. Napoleon's Imperial Guards launched in a last desperate attack. Blucher's leading corps hurling themselves against the exposed right flank of Napoleon's forces.

(4) What lessons may we draw from Waterloo?

(a) First. Wellington is seen utilizing his favorite plan of battle, "A Defensive-Offensive Combination and Flank Maneuver." Not to be left holding the bag by his allies, he refused to accept decisive battle until personally assured of Blucher's cooperation. To have stood alone at Quatre Bras would have been to play into the hands of Napoleon; probably would have encompassed Wellington's decisive defeat. However, at Waterloo, Wellington, coolly calculating the odds in Blucher's intervention prior to nightfall as worth the risk, has come to bay. He is ready to fight it out on this basis.

(b) Second. As did Hannibal at Cannae, Wellington employed his unstable and heterogeneous Allies, the

Dutch and Belgians, as well as his less dependable British units, statically and defensively in prepared positions to absorb the French frontal attacks. His veteran British troops he held in reserve initially to meet the crucial test of the

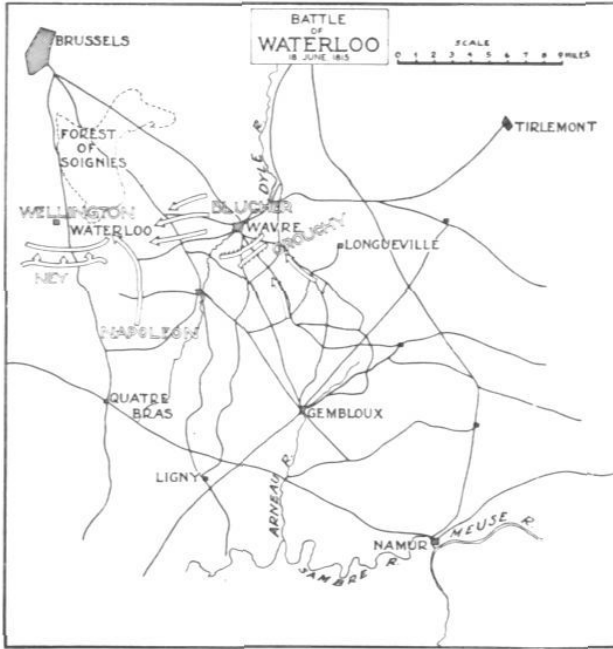


day.
(c) Third. Again emulating Hannibal, we see him personally supervising a vital front; that is, his hard-pressed and vulnerable center and left.

Can Wellington be accused of an absence of the offensive spirit? A lack of aggressiveness? Would the nickname "The Iron Duke" have been given to a timid or temporizing leader?

Certain historians have said in disparagement of Wellington that but for Blucher's intervention, Wellington would have suffered decisive defeat at Waterloo. An apt answer is that but for the verbal agreement between Wellington and Blucher, made during Wellington's visit to Blucher on the

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who turned a potential crushing hostile wide envelopment of their own forces into a great victory.

Lee, like Hamilton, distinguished for his high intelligence, his resolution, his moral courage; a character of rare purity and strength.

Jackson, a zealot. The American Cromwell. Of unconquerable spirit, and savage determination.

Compare a blind and stupid adherence to a slogan, to the adroit generalship of

night preceding Waterloo, there probably would have been no Waterloo.

6. CHANCELLORSVILLE.—
 "When Jackson fell, I lost my Right Arm"—now for our third step forward in point of time: To the infancy of the breechloading rifle. More gratifying yet, to the battlefields of our own country. We feel strongly that if our army is to develop an American doctrine rather than bodily to adopt that of some other nation, we should, wherever practicable, utilize as historic illustrations our *American* campaigns and our *American* battles. Especially should this be true when we find in our own military history classical examples of the type of action desired. For my purposes today we have such a battle. Chancellorsville, like Cannae, is generally erroneously rated a purely offensive battle. Actually it is a classic in Defensive-Offensive Combination and Flank Maneuver.

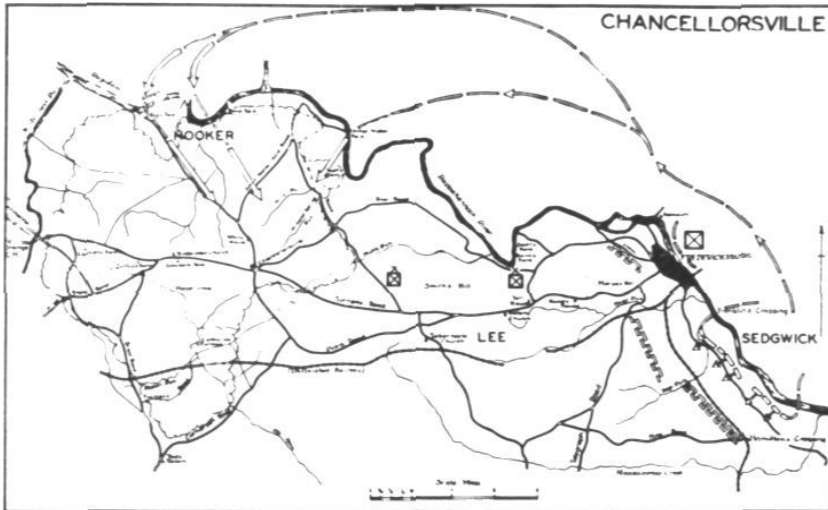
a. *Two Great Leaders.*—First, look at the two great Confederate Generals

these two great defensive-offensive fighters. Who can accuse them of a lack of aggressiveness? An absence of the offensive spirit! A lack of the "Will to Win!" On the contrary, it is of interest to note that in Lee's one great defeat (Gettysburg) he fought a purely offensive battle, attacking frontally, repeatedly and blindly, against an unbreakable Union line.

b. *The Battle.*—Lee, after two years' fighting against heavy odds, stood at bay (alert and ominous) centrally located between two Federal masses, Sedgwick to his front; Hooker maneuvering towards his rear. Was Lee daunted? Did he lose his head and dash impulsively at his nearest opponent? Did he sneak furtively from the field?

c. *Lessons of Chancellorsville.*—He did not! With cool calculation he emulated the two great captains I have already named. Assuming a defensive attitude, he deliberately placed part of

THE DEFENSIVE-OFFENSIVE MANEUVER



SITUATION, 29-30 APRIL, 1863

his troops in Hooker's path, entrusting to his great lieutenant, Jackson, the world-famous counteroffensive against Hooker's right flank. As did both Hannibal and Wellington before him, he reserved to himself the difficult and delicate task of commanding the weak defensive front. With a burst of fireworks and rebel yells, Lee completely deceived a force five times his strength. He completely immobilized them; paralyzed their offensive spirit. Meanwhile, Jackson, followed by the flower of the Confederacy's fighting men, marched rapidly to deliver the coup de grace. What finer ideal for American generalship may we enshrine in our hearts than this? What more effective tactics may we utilize in our next battle against superior forces?

7. THE MARNE.—"Pulling the Chestnuts out of the Fire."—My fourth and final example brings us to the World War—the reign of the machine gun; that incomparable weapon of defense and neutralization.

a. *Influence of Four Generals.*—On the German side, we see the great Schlieffen

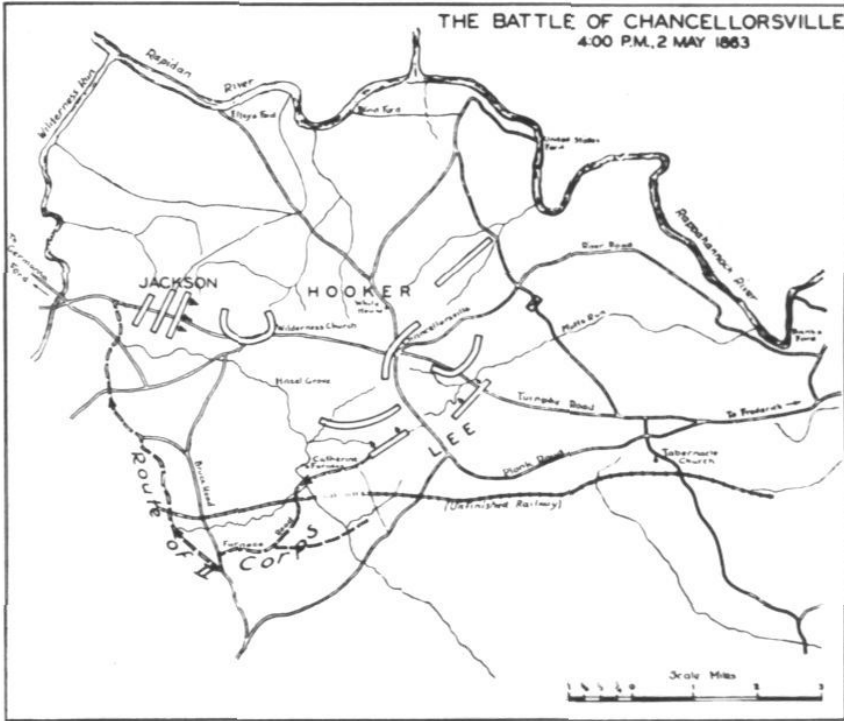
postulating wide frontages and weak forces as defensive foils against an impulsive opponent while massing a maximum combat power for the wide and deep envelopment of an exposed and vulnerable flank. Opposite him, his successor, Moltke the younger, who let slip the chance for a great victory through his espousal of the age-old fallacy of "opposing strength to strength," "mass to mass."

On the French side, Joffre. Resolute, imperturbable. A skilled technician handicapped by a limited tactical experience and background. Misled initially by the specious though plausible theories of Gilbert & Grandmaison. The Varro of the Frontiers.

In eclipse beside him, the acute though ineffectual and impotent Michel. A student of Hannibal, Wellington, and Lee. His sound defensive-offensive conception initially discarded by Joffre for the glittering fetish of the attack.

b. *The Battle.*—(1) Take another look at our old friend, Plan XVII [lantern slide omitted]. Recall the four piecemeal frontal attacks launched in

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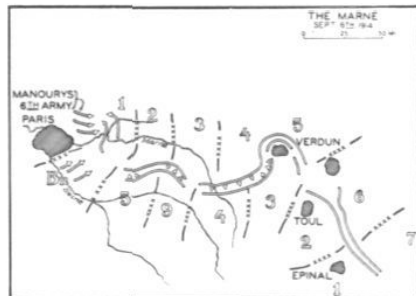


conformity thereto. Four successive and ineffectual offensive blows, struck all the way from the Swiss Border to the line of the Sambre. Streams of French blood reddening successively the waters of the Moselle, the Meuse, and the Sambre.

(2) Remember Joffre (awakening to the fallacy of adherence to the blind fetish of frontal attack which in two short weeks brought near disaster to France) switching to a defensive-offensive maneuver, strikingly similar to the despised Michel concept.

(3) Finally, the culmination of Joffre's great Defensive-Offensive Combination and Flank Maneuver espoused in desperation by him after the Sambre, the Battle of the Marne. See Maunoury's Sixth Army as the spearhead of the counteroffensive thrust. The British

flinching, irresolute, in the open gateway between the German First and Second Armies. Note the tremendous potentialities of a situation where, lacking the divine spark of Hannibal, Wellington, and Lee, Joffre let the opportunity for a



decisive victory on the Ourcq slip from his hand.

The lessons to be drawn from the

THE DEFENSIVE-OFFENSIVE MANEUVER

Campaign of the Marne are much the same as those I have three times impressed.

1. *The fallacy of "Toujours L'Attaque."*
2. *The futility of opposing "Strength to Strength."*
3. *The failure to employ an "Economy of Forces."*

(What if Joffre on 25 August had conceived clearly and boldly (as might one of the three great captains I have already named to you) of a decisive counteroffensive blow northeast of Paris? He might then have assembled on the Ourcq a homogeneous and powerful striking force. Not that heterogeneous assemblage of disorganized and demoralized active elements and untrained and ineffective reserve divisions, so hastily thrown together to form the French Sixth Army.)

4. *The lack of decisive leadership at a critical point.*

With his British ally reluctant to attack; with Gallieni (commanding the defenses of Paris) questioning Joffre's supreme authority; and with Maunoury (a mediocre general) confused as to command and control. Joffre might well have exercised more decisive leadership in this area.

If only Maunoury had been a Jackson, a Sir John French, a Blucher; or Joffre a Hannibal, the war might well have been won at the Ourcq.

8. PREMISE TWO.—This concludes my discussion of Premise One. I will now undertake to establish the logic of the thesis set up in Premise Two.

9. THE AFTERMATH OF 1914.—"The Rut of Stabilization." Every officer knows that the general conception of maneuver held throughout our service today is substantially the same as that held at the close of the World War. They know that this conception is based primarily upon fighting on the Western Front where (of necessity) most engagements were direct frontal actions

launched *from* stabilization *against* stabilization. There were *no* flanks, Maneuver was impossible. Like two great stags with horns interlocked, the opposing armies pushed and shoved (back and forth) until the weaker collapsed, almost dragging his exhausted opponent down to a similar fate.

10. THE DOCTRINE OF THE OFFENSIVE.—*a. Our Postulates of the Attack.*—To counteract the malign and stultifying influence of "Stabilization"; to eradicate the impressions brought about by four years of repulsed frontal attacks as well as to revive the thought of maneuver, our best military minds and our leading commanders became ardent and militant postulates of the doctrine of the offensive. In turn, lesser minds and smaller men (lacking the capacity for differentiation between the two precepts "The Will to Win" and "The Attack at all Hazards") sought easy and ready means of instilling the "Doctrine of the Offensive" in their subordinates.

They followed blindly (as did the French in 1914) the line of least resistance by preaching "Always the Attack." Almost invariably, they selected as a vehicle for the exemplification of the Spirit of the Offensive, exercises in attack in which Blue was given overwhelming superiority over Red in numbers; in armament; or in terrain.

Under such circumstances, even the "Timid Soul" himself would unhesitatingly attack with dash and impetuosity.

b. David and Goliath.—Suppose that one of the apostles of this creed had drawn a situation in attack giving Red that physical preponderance over Blue depicted in this mythical battle between David and Goliath. What would their students have done? Where would their offensive spirit have been? I know! So do you! Yet (as has already been established) some of the World's greatest victories from that of David over Goliath down, have been

staged under such an academically impossible setting.

c. *The Poor Relation*.—As a consequence, Defense (dwarfed to Lilliputian stature) was like the proverbial Poor Relation, long forced to eke out a miserable and half-starved existence. A crumb from the table of our military intelligencia was thrown to this despised outcast only when absolutely imperative in order to keep life in his wretched body sufficiently long to permit him again to be dragged out and mauled mercilessly by the attacker.

11. THE MISAPPREHENSION AS TO DEFENSIVE MANEUVER.—Thus, through ignorance, indifference, and misapprehension, the impression has become general outside of this school and throughout our service that the *defender cannot* possess the "Spirit of the Offensive." That he *cannot* possess "Aggressiveness." That by the very assumption of a defensive attitude (*even temporarily*) he *irretrievably* surrenders all initiative; loses *all* mobility; *all* capacity for positive action.

What is worse, our service has actually gone so far as to deem the ostrich a prototype of the defender (head stuck in the sand and tail in the air) blindly waiting to be panned at will by the attacker.

How stupid; how fallacious; how vicious is such misconception.

12. THE DEFENSIVE-OFFENSIVE MANEUVER.—Rather shall we attempt to inject into our officers and men that attitude towards defense exemplified in the unconquerable spirit, the menacing ferocity, and the savage determination to re seize the initiative, apparent in the attitude of the tiger, crouching at bay before his pursuers.

Perhaps a more apt and applicable illustration of the concept of defensive-offensive maneuver which I seek to impress may be drawn from Roman antiquity and the Roman arena.

See the alert, and elusive Retarius with his net and trident opposed to the heavily armed and armored Mirmillo.

At the propitious moment, the net (our modern defensive echelons) was cleverly cast in the path of the rushing swordsman. The latter was enmeshed, entangled and immobilized sufficiently long for the Retarius swiftly to leap in and drive home his deadly trident.

Only through such tactics may we:

(1) Exploit to the fullest the tremendous potentialities for neutralization possessed by modern defense and modern fire.

(2) Profit from the services of this powerful ally (mobile defense) so providentially placed at our disposal.

(3) Capitalize on the manifest and manifold advantages of defensive-offensive combinations.

13. OUR NATIONAL MILITARY POLICY.—Before proceeding further let us see what facts and factors make a mastery of defensive-offensive maneuver as well as finesse in defensive-offensive combinations, prerequisite attributes for our future military leaders.

a. *Call a Spade a Spade*.—Recall our national military policy. Consider briefly the military problem which will confront the United States (insofar as our own troops are concerned) in the next war. Let us, as professional soldiers, have the courage to look military facts squarely in the face: Frankly call "A Spade, A Spade."

b. *A Pertinent Question*.—Let me ask one question (which most of you have heard me express before), "CAN WE, IN OUR NEXT MAJOR WAR, ASSUME THE OFFENSIVE INITIALLY?"

The answer, stark and inescapable, is written on this chart. [Lantern slide omitted.]

Note the relative military strength of the world's leading powers. Observe our position, number 17, on this list.

THE DEFENSIVE-OFFENSIVE MANEUVER

Even a cursory glance at the chart is sufficient to justify an emphatic "NO!" to my question.

Palpably our means will be too limited to permit us the luxury of an irresistible and overwhelming attack even against secondary powers. Obviously only through a careful "Economy of Force": a judicious employment of "Defensive-Offensive Combinations"; and a skillful exploitation of the enormously increased power of modern defense may we hope to build up a striking force capable of decisive action.

Moreover our national military policy is note and unquestionably will *continue* to be (at least throughout the military careers of all gathered in this room today) a "Defensive-Offensive" policy; or "An Active Defense on a National Scale."

This military policy (as immutably fixed in the public mind as are the basic provisions of our Constitution), considered in connection with our relatively *weak* defensive forces and our great potential strength, means just this:

14. THE PROBLEM PRESENTED.—*a. Our Initial Task.*—Our initial task undoubtedly will be to act as a national covering force pending the mobilization of our resources in personnel, in material, and in supply.

Confronted, on our own or foreign soil, at the outset by forces *superior* in numbers, armament, equipment, and training, our initial objective undoubtedly will be to expedite the formation of a great offensive mass by containing relatively *large* hostile forces with relatively few of our own.

Only by holding them in check with our limited immediately available forces, may we hope to gain the necessary time for the assemblage of a counteroffensive mass with which to accomplish decisive results.

To this end, we all should resist to our utmost that ill-advised but inevitable

pressure which will be exerted by certain politicians, by uninformed public opinion, and by certain elements of the press, to force a premature and rash offensive by our unprepared military forces. For us (as educated soldiers) to attempt to justify such a premature offensive would be blind; disloyal.

We must have sufficient courage and loyalty to Flag and Country to admit our limitations.

b. A Lesson from History.—Let us again take a lesson from history. Recall the past performances of troops possessing different degrees of training and experience. History has proved repeatedly and conclusively (too clearly and too often to necessitate elaboration by me) that only *well-trained, well-disciplined, and well-led troops* are capable of effective or expeditious maneuver under that decentralization of command and control incident to warfare of movement. As a corollary, less-trained and inexperienced troops (valuable within their limitations) cannot be relied upon under the conditions which will be encountered in warfare of maneuver.

Consequently we must be prepared to utilize to *maximum* advantage in *maneuver* and for *decisive* action our precious cadres of highly trained and effective troops (regulars and guardsmen). At the same time we must *exploit to the utmost of their capabilities* in secondary and static missions the hastily improvised and *partially trained* units which will constitute the mass of our national army.

c. The Passing of the Initiative.—We must not anesthetize our reason, stultify our effort, nor weaken our "Will to Win" through the fallacious and deceptive idea that the *initiative rests irretrievably with the attacker*. This axiom should be taken with a grain of salt. While true within limits,

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there is one *great reservation*. Once the attacker has committed his mass, he has (*momentarily at least*) "shot his wad."

In the hiatus of the arrow's flight the initiative passes to, or at least may be seized by, the defender.

If the defender stands immobile, passively awaiting his fate, the arrow will undoubtedly find its mark. On the other hand if the defender sidesteps, the arrow may fall relatively harmlessly in space. Moreover, Blue cannot, with impunity, recover this arrow. *It is spent*. Blue must look to his quiver for another. If the quiver is empty so much the worse for him!

d. Place these among your souvenirs.—I suggest that you place these thoughts among your souvenirs:

Inferiority in Personnel, Materiel, and Training may be overcome by:

- (1) Skillful Defensive-Offensive Combinations and Maneuvers:
 - (a) Static Action for Neutralization.
 - (b) Counteroffensive Action for Decision.
- (2) Economy of Force:
 - (a) Less-effective troops as Defensive Foils.
 - (b) More-effective troops for Decisive Maneuver.

(3) Able Leadership:

(a) On the Critical Defensive Front.

(b) At the Point of Decision.

(4) The "Will to Win."

15. CONCLUSIONS:

"So fleet the Works of Men back to The Earth Again;

Ancient and Holy Things fade like a Dream."

We believe that we cannot too often or too strongly impress the lessons of history; those lessons so readily lost and forgotten.

Consequently, in closing, I charge you to stamp indelibly in your memories:

a. Hannibal at Cannae: Driving his sword behind the shoulder of the rushing bull.

b. Wellington at Waterloo: Absorbing (pending Blucher's arrival) the onward rush of his impetuous opponent.

c. Lee at Chancellorsville: Snatching victory from the jaws of defeat; while Hooker (the sacred fire of resolution and the Will to Win gone) let victory slip from his nerveless grasp.

d. Joffre at the Marne: Discarding his blind offensive tactics of the frontiers, and turning back the German tide by a Defensive-Offensive Combination and Flank Maneuver along the Ourcq.



Courtesy U. S. Army Recruiting Publicity Bureau

An Adventure in Gunnery

BY CAPTAIN C. P. NICHOLAS, FA

A FEW years ago, many of the second lieutenants were accepting their initial commissions in a patronizing manner. Fortunes were to be made outside the Army; and in some circles, it was fashionable to look on a commission as a kind of gentleman's occupation, useful during the transitional period while the young man looked about to decide which one of several ten thousand dollar jobs he would accept.

In those fancy days, it was even good form to choose a branch of service that would best equip the embryo for his future civilian vocation. Artillery was frowned upon, as being entirely too specialized; its rare engineering was considered too remote from any other thought on earth to be of any particular use.

With the latter philosophy, regardless of its morals. I wish to quarrel on purely academic grounds. The science of gunnery is so closely knit with a thousand other sciences, that it is possible to draw parallels without number; but, rather than attempt a convincing tabulation. I am going to relate one adventure, which illustrated the universal affiliations of gunnery in a manner so striking that I am still astonished, more than two years after the *res gestae*.

A merchant in Newburgh, New York, conducted a public contest as part of his advertising program. Offering as bait one new Ford V-8 Sedan, he opened the contest with considerable publicity in the large glass show window of his own department store. While a fascinated crowd watched from the sidewalk, he set up a wooden pedestal, of square horizontal cross section, and placed

thereon a glass candy bowl, almost spherical, and of roughly two gallons capacity. Next, he introduced into the show window a high city official, and four or five bank employees, each carrying a money bag filled with loose pennies. While each bank employee possibly knew the number of pennies in his own bag, none knew the total. The high city official poured from the bags at random, emptying their contents into the candy bowl until it overflowed. Next, with a yard-stick, he scraped the overflowing heap of pennies level. Then he covered the bowl with cellophane, tied a bright red ribbon around the throat of the bowl, and sealed the knot. Finally, he made his exit, leaving the floor strewn with pennies and several partially empty bags. The window was then cleared of all personnel and the opaque back door was shut, and locked—to remain locked for one month.

The question was: "How many pennies are there in the bowl?" The rules were: (1) Each customer of the store was to be entitled to one guess for every fifty-cent purchase made during the ensuing month; (2) the customer making the most nearly correct guess should win the Ford; and (3) in case of a tie, all contestants agreed to abide by the decision of the judges.

Normally, I should not have given the contest a second thought. Like any human of normal experience, I felt that perhaps some individual, in spite of the merchant's evident honesty, might learn the number of pennies in an unwarranted manner; or that—barring such unfair circumstances—my chance would be one in thousands.

But my indifference was to be shattered by the innocently kind activities

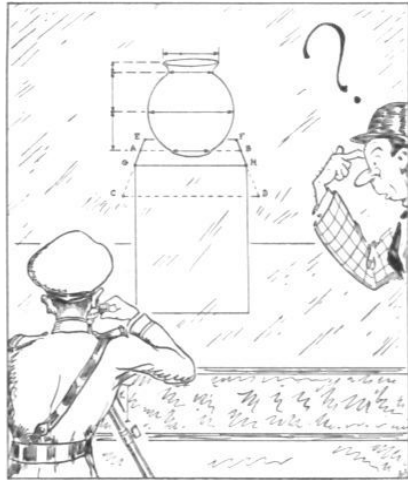
of my wife who, without premeditation, shopped in the department store at an alarming rate. My function in connection with the shopping was to drive her from West Point to Newburgh, wait for her in the car, and be generally useful.

A man cannot be completely idle, even at such an Herculean task as attending patiently while his wife shops within. I used to gaze at the bowl of pennies, and boast to myself that, if I wanted to take the trouble, I could come close to the number, I told this to no one except my wife; it was unconsciously my way of letting her know that, after all, my intellect was superior to my job as mere chauffeur. She would agree, and suggest that we have an ice cream soda.

The significant part of all this was that after two weeks I had assembled nearly thirty blank guessing tickets, which (my child being too young to appreciate such pretty bits of colored paper) were awarded me after each shopping tour.

During one of my afternoons, the fact that I possessed thirty tickets kept haunting me. The bowl of pennies kept haunting me too; it seemed to stare impertinently through its plate glass prison wall, to challenge me. Moreover, I was always beset with the knowledge that, for some reason or other, the problem confronting me was entirely familiar; there seemed to be every reason why I should be able to solve it. I now know why; the problem was in the minutest detail simply a problem in prepared fire.

Exactly how I reasoned at the time, I do not remember; but the fact is that when my wife emerged from the department store some forty minutes later, she discovered me surrounded by a curious and skeptical crowd on the sidewalk. I had the string of an improvised B. C. ruler in my teeth, was squinting with one eye, and had my handkerchief pocket stuffed with sheets



of paper whereon I had recorded some very interesting data.

Obviously my purpose in this strange performance was to determine the sine qua non of any intelligent guess—that is, the volume of the bowl. The illustration shows at a glance what my surveying operations had consisted of. The top of the pedestal being a square, I had lined in the two parallel edges EG and FH, and made pencil marks on the plate glass window at C and D. Evidently, the distance CD equals the distance AB. By measuring CD, I determined that the line AB was just twelve inches long. This gave me a known base line, directly beneath the center of the bowl.

Next, using the B. C. ruler, I measured the angular width of AB. By the mil relation, I was now prepared to determine the linear dimension of any line lying in a vertical plane through AB, simply by reading its angular dimension with the B. C. ruler. Accordingly, I made observations on the critical dimensions of the bowl (shown by dimension symbols in the illustration). This done, I had in my handkerchief pocket the data necessary to reproduce

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the cross section of the bowl on a drawing board at home.

From an artillery point of view, my operations so far had consisted of locating certain points in an inaccessible region. If you will accept the plate glass window as being analogous to the enemy's outpost line of resistance, you will also accept critical points on the bowl as being important enemy installations, now definitely located with respect to the prominent point A. My next step, accordingly, was to return home to my CP and plot the points on a firing chart.

My first impression had been that the problem before me would never warrant the exercise of any precision to speak of. But when I drew the cross section on my drawing board at home, and began computing the volume, I found that small errors in the dimensions produced large errors in the volume. To appreciate this fact without resorting to much arithmetic, let the reader imagine the bowl to be made of sheet copper, just the thickness of a penny. Assuming a radius of about five inches, the surface of the bowl would contain about three hundred square inches. Start cutting pennies out of three hundred square inches of copper, and you will gather a considerable number. It is conceivable that pennies might fall within the bowl in such manner as to *line* the interior surface with pennies; hence, a radial error by so small an amount as a penny's thickness would be a fairly disastrous error. This dismal meditation not only forced me to the conclusion that my measurements would have to be fairly precise; it brought forcibly home the conclusion that I must reckon carefully with the thickness of the glass shell. And this was a major problem, since only the exterior dimensions were susceptible of instrumental observation. Likewise, I was obliged to realize that no loosely approximate computation of the volume was tolerable; in other words, it would

not suffice to assume a spherical shape, and use a spherical formula for computing the volume, if the bowl was not actually spherical. And upon careful investigation, I learned that the bowl—even in the region of its belly—was by no means spherical.

The mathematics of computing a volume of revolution, with a known cross section, is theoretically simple, but practically laborious and as dull as the inventory of a hardware store. To such an operation I was committed, and the long hours I spent on it are not pleasant to my memory, nor would they interest my reader, so I will sum the whole thing up by saying that when the time came to compute the volume, I did it. Meanwhile, I needed accurate dimensions.

For a few days, I suffered from indecision. The probability of winning the Ford seemed small; much labor lay ahead; I had made an ass of myself on the streets of Newburgh; and my friends at West Point were having no end of fun at my expense.

My indecision left me one morning during a chance conversation with a brother officer, who shall be called "K." K was a very close friend, and an engineer. It is natural for the artillery to tie in its surveying processes with those of the engineers; and when I discovered that K had three times as many tickets as I had, I suggested that we pool our resources on even terms.

This brazen offer he accepted graciously. To make the picture clearer, I must add that K is a man of outstanding brilliance (save for the exception noted above); his character is such that scoffing and derision serve only to inspire him with contempt for the smallness of human understanding and to spur him on to achievement.

The alliance having been formed, there was no turning back. One afternoon, we loaded our automobile with a French aiming circle, a camera, a tape, and other surveying impedimenta.

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Arrayed in mufti, we set out on reconnaissance, and by two p. m. had established our OP on the sidewalk in front of the department store window. This operation proved prejudicial to the smooth flow of Newburgh traffic, but, ignoring the guffaws and expressions of alarm from bystanders, we surveyed and photographed serenely.

Our operations were essentially those I had performed on my first reconnaissance, the important difference being in the degree of precision. We secured many observations on every critical dimension of the bowl, and at the end of our labors were glad to discover that the deviations from the mean of many aiming circle readings were small. The camera furnished us with two or three very clear single horizontal photographs of the bowl. These were later enlarged to a scale of roughly one to one, and from them we were able to reconstitute the outline of the bowl on a one to one drawing at home. The first step in this process was to plot the critical dimensions on the drawing board, to a scale of one to one. Next, we cut the photographs along the outline of the bowl, and selected a picture that was very slightly smaller than one to one. Placing this in its proper position on the drawing board, we traced through all the critical points a curve parallel to the photographic outline.

We then determined two quantities:

(a) The most probable external volume of the bowl.

(b) The probable error.

The most serious problem now confronting us was the determination of the volume of glass in the shell. No method of solution was evident. Hence, we borrowed glass bowls of every size and description, and began investigating to determine the mean thickness of glass in a lot of bowls that did not directly interest us. We immersed them in water, and determined volumes by displacement; we weighed empty bowls, and determined

volumes by weight; by sundry means we found out that bowls of certain capacities will in general have shells of certain thicknesses. We reduced these findings to a tabular law, and by interpolation predicted the most probable thickness of the shell of *the* bowl. The volume of this hypothetical shell we then subtracted from the previously computed external volume. We now had two new quantities:

(a) The most probable internal volume.

(b) The probable error (larger than before, because of the grossness of our determination of the thickness of the glass).

Once you have located a target within certain limits, you are confronted with two new problems; first, computing the firing data; and second, determining the number of rounds required. The principal functions needed to solve these problems are the elevation corresponding to the range, and the probable error at that range.

In the case of our bowl of pennies, the target was the bowl, and the gun was the bag of pennies. Having no range table, our next problem was to make one. To this end, we borrowed (on memorandum receipt) exactly ten thousand pennies from the First National Bank of Highland Falls, N. Y., having first been required to promise that we would return them, not loose, but correctly wrapped in coin wrappers.

In the process of our subsequent experiments, we discovered many fascinating facts about the state of the nation's currency. First of all, we learned that you might break your back if you attempt to lift one hundred dollars worth of pennies all at once. Next, we found that your hands will turn green, and will smell like blood, after handling pennies in the raw. We also learned that, in the neighborhood of New York, every dollar's worth of pennies will contain 0.031 Canadian pennies, 0.009 Indian

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pennies, and 0.017 slugs. By way of interest on the loan, we eventually returned real pennies in place of the slugs.

K and I, and our wives, made a thorough study of the subject of common cents. Employing vessels of various shapes and sizes, we poured pennies night after night, and tabulated the results. We discovered that a woman cannot pour as many pennies into a bowl as a man can, the difference being about three per cent. There is a logical explanation of this apparently senseless phenomenon; a woman, because of her inferior strength, cannot hold a heavy bag of pennies over a bowl with the confident firmness that characterizes her husband. There is a ballistic difference, or she pours pennies with a reduced charge.

We found that by holding the bag aloft and pouring rapidly, we could materially increase the number of pennies that eventually rested in the bowl. We found that by shaking the bowl, we could cause the pennies to settle, and allow room for nearly twenty percent more. We knew, however, that the high city official had not shaken the bowl, and we had watched his manner of pouring pennies. Our final tests, accordingly, were made to duplicate as nearly as possible his public pouring of pennies nearly three weeks earlier. By repeated trials, with a vessel of approximately the shape and size of the one used in the contest, we determined the constants needed for our problem. The dispersion was astonishing: the smallest number of pennies to fill the bowl was about 9,200—the largest number about 9,900. Upon dividing the arithmetical mean of all the numbers by the known interior volume of the bowl we were using, we ascertained that the mean number of pennies per cubic inch of space was 20.48. By similar tests on smaller vessels, we further ascertained that the factor was practically a constant

for bowls all the way down the scale until we reached the teacup; in the region below the tea-cup, the figure grew smaller.

Applying our constant to the computed interior volume of the bowl in the window, we finally determined 9,558 to be the most probable number of pennies in the bowl.

We were now confronted with the appalling uncertainty of this figure, as the probable error in determining the volume was considerable and as the dispersion in the penny pouring was huge. Briefly, the probable error of our determination, expressed in pennies, was about two hundred. To be fairly certain of hitting the actual number, we needed roughly nine hundred blank guessing tickets. We were sadly lacking in ammunition.

Hence, we went about proselyting. Advertising the fact that we had approached the problem in a scientific manner, and held reasonable hopes of winning, we offered to accept anyone's blank tickets, enter our own numbers thereon, and distribute them at random among our own tickets. In return for this privilege, we agreed to pay fifty dollars cash for whose-ticket-soever should win the Ford for us. As a result of this campaign the tickets accumulated in such quantity that we were able to show that our probability of guessing the exact number was twenty-three percent.

At this point, we committed what was perhaps a blunder. Throughout the campaign, we had been derided by a band of faithless skeptics, and one of these had gone so far as to bet that we would come within five pennies of the correct number on none of our tickets. His bet was too attractive to resist, for he definitely wagered a case of a certain fluid manufactured in Scotland against one bottle of a fluid manufactured in Kentucky. We did not realize, at that time, that 80,000 guesses were to be entered

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in the contest, and that at least one of them was practically certain to hit *the* number. Since the rule was that the *most nearly correct* guess should win, we had felt right along that we had better be sure to come close in any event. Moreover, we felt that winning the Ford was, somehow or other, too much to hope for seriously; and we had been offered side bets in addition to the one already described. If we played to come close, we were sure to show a profit.

There were two possible ways of distributing our numbers: First, to pack them tight on both sides of the center of impact; second, to spread them out, keeping them dense in the twenty-five percent zone, and letting them stretch in the sixteen, seven, and two percent zones. Under the latter system, the probability of a direct hit was only slightly reduced, while the probability of coming within five was increased from twenty-three percent to more than ninety percent. We chose the latter system; and, having entered our numbers accordingly, turned our tickets over to the department store just five minutes before the deadline at the end of the month.

The day of the grand reckoning found us busy in the afternoon, so that we arrived in Newburgh too late for the ceremony of counting. When we drove up to the department store, and nervously parked at the curb, the crowd had long since dispersed. In place of the bowl of pennies which had occupied the window for four weeks stood a lonely easel; and on that easel rested a placard bearing a lonely number—9664. With palpitating hearts and trembling hands we thumbed through our list of numbers: and then we burst into a shout of rejoicing, for 9664 was one of our numbers. It deviated from our mean of 9558 by less than one probable error; and had we packed our numbers tight on both sides of the center of impact, we

should have included it by a good margin.

After we had calmed down sufficiently to enter the department store, we learned that three other contestants were tied with us on the number 9664. We learned other facts; the great genius of chance had sown the guesses of thousands up and down the scale on both sides of the true number, in the same way that he sows the seed of artillery fire in an orderly pattern about the center of impact. Most of these guesses were idle guesses, or at best intelligent estimates: yet, every number between 9,000 and 10,000 had been hit at least once, and those in the vicinity of the true number had been hit several times.

The ruling of the judges was that the four tying parties should engage in a duplicate of the original contest, to a reduced scale, the following Saturday afternoon.

Confronted with this proposition, we felt that somehow the odds were for us. We were in possession of a perfected system; we knew that 20.48 pennies would come to rest within a cubic inch. On the other hand, we knew that we should have to work rapidly and that the aiming circle would be out of the question, since the next contest was to be held in a small sales room within the store.

Since the impending situation was clearly one in which only limited time would be available for reconnaissance, we realized that careful staff organization and training were essential. Our first step was to increase the staff. For a stated fee, to be paid in case of victory, we retained the services of another friend—an artillery officer who shall be called "G." His functions were to operate the slide rule and to guard all computations against mistakes. We conducted an RSOP on each of six successive nights, with the result that by Friday night we were able, within a period of twenty minutes, to compute

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the volume of any reasonably sized bowl. Our error was usually less than two percent.

So, on Saturday afternoon, in the presence of a multitude of shoppers, we went into action armed with a slide rule, a drawing board, instruments, pencils, and a BC ruler. The proprietor of the department store produced a small bowl (above the region of a teacup), filled it with pennies until they heaped up in a cone, and placed it carefully within a glass cabinet. He announced that the contest would close thirty minutes later.

We finished our work in seventeen minutes, and then checked.

We have heard that one of our competitors had completely investigated the glass bowl market in Newburgh, and that as soon as the contest bowl was produced, his wife recognized the type, left the store, purchased a duplicate by inspection, filled it with pennies in the correct manner, and brought him back an answer.

His guess was 1120; ours was 1175. Each of the other two contestants guessed a number in the neighborhood of one thousand.

At the end of thirty minutes, the penny counters went into action, counted up to 1100, and paused. They then continued slowly, up to 1120, very slowly to 1130, then to 1140, and finally stopped at 1150 to the cent. The Ford was ours by three pennies.

The rest of the story is nothing but a simple narrative of financial transactions.

The ticket which had borne the number 9664 having been donated under our contract terms, we paid the donor fifty dollars. We paid G his fee for slide rule services rendered. We collected several bets, including one case of a fluid manufactured in Scotland. And, finally, we sold the Ford V-8 as a new car, declared ourselves a dividend of two hundred and sixty-five dollars each, and closed the corporation.

While the winning of the Ford was a personally gratifying climax to this campaign it bears—as I see it—no philosophical significance whatsoever. Had we lost the Ford, I should be the last person in the world to admit that there had been anything incorrect in our efforts to win it. Our processes were inevitable—we had very little choice in the matter. There was a target to be fired on, so we located it and computed the data. We determined the ammunition requirements, and made every effort to secure the necessary number of rounds. Our main worry was the fact that our ammunition supply was not sufficient to guarantee complete destruction. On the other hand, the supply was sufficient for neutralization, so that when the concentration finally came down it was only logical that there should be reasonably good effect. While winning the Ford was by no means the inevitable outcome, it is definitely appropriate to include it as an expectation in "reasonably good effect."

Motto: "Every poison has its antidote."

Brigadier General George Grunert, U. S. Army, recently "starred," was private, corporal, sergeant, and quartermaster sergeant of Battery B, 2d Artillery, from September 28, 1898, until commissioned in Cavalry April 28, 1901.

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Above—
Charles W. Kessler,
Harvard '37. *Burr
Scholarship for
outstanding scholar
athlete.*



Center—
James J. Gaffney,
Harvard, '37. *Football
Captain.*

Below—
Joseph F. Nee,
Harvard, '38.



DESIGN FOR FIELD ARTILLERY RESERVE OFFICER MODELS 1937, 1938

Scarlet Guidons With the Crimson

BY A. R. GINSBURGH, CAPTAIN, JAGD (FA)

WITH the growing participation of the undergraduates, the continued interest of the alumni, the hearty support of President Conant and the faculty, and the recognized leadership of its instructors, the field artillery ROTC unit at Harvard is enjoying its most successful year.

Military training at Harvard is voluntary. No enrollment or recruiting campaigns of any kind are made. Men principally are attracted to the ROTC by their interest in national defense and by the reputation that the courses and instructors enjoy among the undergraduates. Of the growing interest in ROTC work at Harvard, the best evidence is a fifty percent increase in enrollment in the last two years.

That the attraction of the course is genuine perhaps is best illustrated by the type of undergraduate who voluntarily has enrolled in the course. The list of senior cadets reads like a Who's Who at Harvard and includes athletes and students who give every promise of developing into excellent reserve officers.

The outstanding scholar-athlete at Harvard this year, whose accomplishment has been rewarded by the Burr Scholarship, is Charles W. Kessler, the cadet major of the ROTC and star guard on the football team. The cadet captain of the battery, James J. Gaffney, doubles as captain of the football team. He is also the student president. For his lieutenants he has H. M. Adlis, a fellow football player, M. H. Dale, captain of the 150-pound crew. P. Killiam, Jr., editor of Harvard's famed *Lampoon*, and R. M. Walsh, Jr., Harvard's leading pitcher.

To list all the cadets, many of whom give promise of taking similarly conspicuous roles in undergraduates life would be beyond the scope of this article. A few of special interest to the field artillery are the scions of polo and field artillery families. In polo, there are the Dillinghams and Skiddy von Stade. Field artillery families are represented by W. E. Jenkins, Jr., N. Miles, and E. St. J. Greble.

John Roosevelt, the President's youngest son, took ROTC work as an elective last year.

Of special interest not only to the field artillery but to the whole army is Cadet J. F. Nee, football linesman. He is the son of George H. Nee, formerly of the 21st Infantry, who at Santiago, in 1898, won the Medal of Honor, and at Calamba, Laguna Province, Luzon, the Philippine Islands, in 1899, was awarded a Silver Star for gallantry in action. It took a somewhat similar trait of courage for the younger Nee, who, in his first year of college football and an unknown substitute of 18, worked up to a regular starting position on the Varsity football team on the eve of the important Yale game.

The Harvard polo team of 1936, coached by Captain Charles D. Palmer, FA, one of the ROTC instructors, after defeating Yale, its traditional rival, in the semifinals, rode over the West Point cadets to win the intercollegiate polo championship. Practically all of the playing ponies have been presented to the unit by graduates. A "present," in this case, means a sale to the government at one dollar.

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WADSWORTH HOUSE, BUILT 1726, OCCUPIED BY THE COLLEGE PRESIDENTS FROM WADSWORTH TO EVERETT, AND IN JULY, 1775, BY WASHINGTON

The interest of the alumni of Harvard in the ROTC is best illustrated perhaps in the names of the committee appointed by the President and the Board of Overseers to supervise the study of military science. These men serve voluntarily, and despite their many varied activities show a wholehearted interest in the unit and its problems. The mere mention of their names recalls their contribution to many phases of American Life and especially to National Defense. The committee consists of Charles F. Perkins, Charles Francis Adams, Jr., Charles P. Curtis, Thomas G. Frothingham, J. William Kilbreth, Edward J. Logan, Langdon P. Marvin, John Parkinson, Charles B. Pike, Richard S. Russell, John H. Sherburne, Theodore L. Storer, and, until his recent demise, the late Pierpont L. Stackpole, since 1917 a member of the Field Artillery Association.

The most substantial tribute to the quality of the courses and the caliber of instruction in the unit is offered in the attitude of the President and the faculty of arts and sciences toward the ROTC curriculum. A course in the Department of Military Science and Tactics counts as much toward graduation as a course in physics, mathematics, or English. A student may take up to twenty-five percent of the credits necessary for graduation in the ROTC.

While the B.A. at Harvard still retains its traditional significance, it in a steadily increasing number of cases now represents also "bachelor of artillery." Six of the recent graduates of the unit are serving at Fort Bragg, North Carolina, for a year under the provisions of the Thomason Act.

The ROTC plant at Harvard is not all that is to be desired and the absence of a riding hall is a serious

PRAISE

handicap in training during the severe New England winters. What is lacking physically perhaps is somewhat furnished sentimentally. ROTC headquarters and class rooms are located in the Wadsworth House, which was occupied by George Washington when he took command of the Army in 1775. Nearby in Massachusetts Hall, which after the Battle of Lexington, served as a barracks for the harassed Continentals.

In 1919, when the field artillery unit was established at Harvard, the *Boston Transcript* editorially remarked:

"This new ROTC plan is the sensible and efficient way of using the present to prepare for the future—sensible because

it does not interfere with the primary status of the university as an institution of higher learning, and efficient because it promises to turn out officers possessing a broad foundation of general knowledge and with the practical training modern warfare demands. The course makes no appeal to the student who seeks the easiest way to a college diploma. At best the process of becoming an army officer is serious business. Only by the hardest kind of work can a man become an officer and a college graduate at one and at the same time."

These remarks equally apply to the Harvard ROTC of 1937.



Praise

BY LT. COL. J. E. LEWIS, FA

"THE higher you go in the animal scale the more effective is PRAISE as a medium of accomplishment."*

Praise is defined as: Commendation of the worth or excellence of a person or thing; or to express warm approbation of. It is always understood to be genuine and sincere in contradistinction to flattery.

The Bible is one of the earliest records of its use and praise of Israel's God Jehovah is the keynote of the Old Testament. In the Psalms it rises to formal expression and becomes literature.

Accepting for convenience of discussion the allegorical version of the Creation we find that man was given dominion over the animals. But in the practical application of this grant it was found that most of the animals resented

and resisted man's efforts at domination. Many in the service can, from personal experience, testify that the equine species still does.

Man, in his struggle upward to an erect posture and the ability to fly, learned that praise of his animal servants was often more efficacious than force as a means of teaching, training, and exploiting them.

In the handling of horses and to a limited extent only of his hybrid half-brother, the mule, it was learned ages ago that praise conveyed by the use of gentle tones and caresses or patting with the hand was very effective. What experienced horse-show or cross-country rider has not steadied or calmed his mount in this way?

Of all the animals the dog has become man's best friend and by ages of close association with him has acquired many of his mental processes. The marked success in domestication was

*From "The Doctor Looks at Love and Life"—
Joseph Collins.

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due largely to the judicious use of praise of which the dog is most greedy.

This success has been two-sided though. The dog learned probably back in the days when he dwelt in caves with his Neanderthal master, that if he greeted him affectionately, and then lay down in front of him and gazed up admiringly at him, it improved the quality and quantity of his next meal.

Even the psychic, selfish, self-centered, and ungrateful *cat* responds to praise.

While no positive record exists of the first use of praise on man, no doubt it was first tried by an amative male concerning the beautiful eyes of his desired mate, though she may have had prehensile toes and worn her fur coat winter and summer.

Military commanders early learned that the bravery, initiative, and reliability of their subordinates could be improved by many different forms of praise. This soon took the form of public citation and decoration. Napoleon stated he "could conquer the world with bits of ribbon," meaning decorations for his army. Its judicious use has raised a command in two years from the slough of mediocrity to superiority.

As armies became nations in arms the use of propaganda became extensive in peace and war, and as civilization reached the industrial stage organization became

more complex in all lines of human endeavor. Leaders were obliged further to enlarge the scope of responsibility and authority of their subordinates, and praise in the form of personal commendation, testimonials at dinners, or other public occasions, promotion and financial rewards for the different degrees of excellence, became the rule. In fact it is the keynote of an organization employing high-pressure salesmanship methods in training or morale building. It should be largely used in such services as the regular army, where unity of purpose and doctrine is greatly to be desired.

With men whose duties are command or executive in character there is a tendency always to criticize; to see the hole in the doughnut rather than its quality and quantity; to postpone the needed words of appreciation until that date when we buy lilies to place before unseeing eyes.

While we do not urge praise where it is not merited, it might well be realized that the hole in the doughnut can be materially reduced by appreciation of the pastry in the ring. And while on occasions the use of the sand box is imperative, an exhortation once made to a tactless staff officer: "Habitually reach for the oil can instead of the sand box" was essentially correct.



Faster than we can record his honors (January-February issue), Colonel of Field Artillery Reserve Paul V. McNutt acquires new ones. Latest—High Commissioner of Philippines. . . . Field Artillery Song, scored for band, orchestra, and voice, is published by Shapiro, Bernstein and Co., Broadway at 51st. N. Y. C. . . . War Department Chess Team wins Metropolitan Chess Tournament, and nominated for new executive president of chess association of Washington is the War Department team captain, Earl W. Kunkle, of the office of the Chief of Field Artillery.

The Wind Readers

BY VOORHEIS RICHESON

EDITORIAL NOTE: *Through the courtesy of the U. S. Army Recruiting Publicity Bureau, we reproduce extracts from an article by Voorheis Richeson, "Army Weather Forecasters," which appeared in the March, 1937 issue of "Recruiting News." The illustrations also were loaned to us by the Bureau. The article discussed the work of the meteorological service of the Signal Corps, in general. Only so much of it as mentions the processes probably to be employed by the new Field Artillery metro sections, appears here.*

are made. The outside man, in telephonic communication with the man at the plotting board, releases his balloon on a signal from the inside. As the balloon rises the outside man keeps his theodolite

UPPER air observations, which show wind directions and speed at various elevations, require the cooperation of two men. One is outside with a pilot balloon and theodolite and the other inside with a plotting board and watch. Twice each day (at the Fort Monmouth station) upper air observations



OUTSIDE MAN AND—



—INSIDE MAN

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trained on it. Ten seconds before a minute elapses the man inside calls "Warning!" The outside man then adjusts his theodolite to bring the image of the balloon behind the intersection of cross hairs, where he keeps it. At the end of the minute the inside man calls "Read!" The outside man reports the azimuth and angle of elevation of the balloon as shown by the scales of the theodolite. The inside man makes a dot on the plotting board to represent the position of the balloon with reference to its starting point. This process is repeated at minute intervals until readings have been made at the desired number of elevations. The balloon, incidentally, is filled with hydrogen gas under a specified pressure so that its rate of ascent is controlled and its elevation therefore known at the end of each minute. This knowledge enables the inside man at the plotting board to select his elevation line arbitrarily in advance of the report from the outside man. Then he places a dot on the board east, west, north, or south of the starting point, or on intermediate azimuths, and distant from the center, depending upon the speed of the wind at the various levels. Later, when the observations have been concluded, he is enabled by the location of the points on his board to compute wind direction and speed at each elevation covered by the observation, and to note the wind shifts as altitude is gained. Such observations, it will be readily recognized, are of incalculable value to aviators.

So far the routine duties of an observer at a field meteorological station have been briefly discussed. It is not at all unusual, however, for an observer to be placed on special duty with an artillery command during target practice. There he has not only to take upper air observations, but to interpret those observations to suit the artilleryman's peculiar needs. He must convert the wind direction and speed at various elevations into what the artilleryman calls ballistic winds. From the layman's viewpoint, the problem is complicated in the extreme, but the Signal Corps observer, as a result of his training and by the aid of formulas, simply takes the matter in his stride and thinks nothing of it. The net result, of course, is to inform the artillerymen what effect the winds "as is" will have on his projectiles. The result is arrived at by a consideration of the movements of air currents in the path of the projectile; this path, known as a trajectory, is in the form of a parabola, and represents the course of the projectile from muzzle to target or striking point. The computations involved are based upon the percentage of its flight time that the projectile will spend at various elevations during its trip from muzzle to target. Once he has a report on his "ballistic wind," the artilleryman knows how much to elevate and deflect the muzzle of his piece to insure the projectile's arrival at the desired point. It is assumed, of course, that everyone understands that the artilleryman's success rarely if ever depends solely upon aiming his gun at the object he hopes to hit.



Brand new colonel of field artillery is John Thomas Kennedy, Medal of Honor, Distinguished Service Medal, Silver Star, and Purple Heart. He was severely wounded in 1909 while in action against hostile Moros. Then a 2d Lieutenant, 6th Cavalry, "he entered, with a few enlisted men, the mouth of a cave occupied by a desperate enemy, this act having been ordered after he had volunteered several times."

Forks and Fallacies

BY CAPTAIN JOHN R. CULLETON, FA

“THE fork is a unit of range change used in conduct of fire” (FAB 161, 1936).

"Fork. An instrument or implement consisting of a handle with a shank terminating in two or more prongs or tines. A barbed point: A choice of alternatives, a dilemma" (Extracted from Webster's Unabridged Dictionary).

Ever since the fork, along with other curious items of nomenclature and technique, was transplanted from foreign military documents to those of our own service, some artillerymen have questioned which definition was most exact.

The fork in our present regulations has two fairly distinct uses. It is the unit of range change employed in precision fire in the initial adjustment of fire on a target. It is the unit of range change employed in the exact adjustment of fire on a target during fire for effect. These two uses are not completely independent. The use of any particular unit in one case however, does not compel its use in the other.

Let us consider the desirable characteristics in a unit employed in initially ranging on a target: The unit should be simple and easy to handle in the mental arithmetic involved in the adjustment of fire. It is desirable that the unit be some function of the errors which may be expected to be introduced by the various methods of computation of data. Lastly, and of least importance, it is a convenience, if the unit employed in adjustment is the same as the unit employed during fire for effect.

The first characteristic is completely absent from the fork. The fork varies in size with the range, the caliber of piece, the projectile, fuze and charge. It is

expressed in mils and tenths and is not easily multiplied, added, subtracted or subdivided. As a result, an approximation rather than the fork itself is used during adjustment. In lateral fire, where combined range and deflection changes must be made, the use of the fork necessitates an additional step in the initial computations (finding the relationship between F and c and from that the corrected value of s) which takes time and adds a possibility of error. The fork then is not as desirable a unit as c judged merely from convenience in handling.

Mere convenience is of secondary importance. The unit employed in initial adjustment should bear more relationship to the initial errors to be expected in the computation of data. It is obvious that it is impossible to find a unit that completely possesses this characteristic. The exact initial error in data in any particular problem is indeterminable. Even if the probable error in computing data under the particular conditions of the problem could be obtained, the process of obtaining it would involve time and offer possibility of error. Some rough relationship between the initial error and the initial range bound is desirable. An initial change of one, two or four c 's has been found through decades of experience to bear a satisfactory relationship to the initial errors for bracket adjustment.

The use of multiples of F for the initial range bound in precision fire leads to obvious absurdities. Thus at range 4000 with estimated data, when firing a French 75-mm. gun, shell Mark I. normal charge, fuze short, an initial range

change of 368 yards must be made. Under the same conditions when firing a 155-mm. How. (Charge IV) a change of 704 yards must be made. If increased accuracy and decreased time of flight are desired with 155-mm. How., and Charge VI is used, a change of 256 yards must be made. It is apparent that the initial errors in data in these three cases are nearly the same. The location of the first round with respect to the target must correspond closely to the initial error in data. Yet our present rules for conduct of fire compel an initial range bound in one case nearly three times as great as that required in another. The above discussion leads to the conclusion that an initial range change in multiples of c will bear a more logical relation to initial range errors than the present rule. For guns which have large probable errors and which are habitually fired at long ranges, where initial errors in data are likely to be large, such as the 155-mm. GPF, initial changes of two, four, or eight c 's might logically be made. For all other materiel, changes of one, two or four c 's, as at present in bracket adjustment, seem to be indicated.

The third consideration which governs our choice of unit for initial range bound, relationship to unit used in exact adjustment of center of impact on the target, is not possessed by either F or c . The F used during adjustment is an approximation of the true F , and present regulations call for the true value of F being obtained for the trial elevation after fire for effect has started. Bracketing the target in multiples of c and going to fire for effect at the center of a one- c bracket and looking up the true value of F at that time require no additional steps over the present system. For heavy materiel a two- c final bracket might well be accepted.

From every angle the use of c rather than F for initial ranging on the target seems justified. The use of F or some

fraction of F for finally adjusting the center of impact on the target is of course in accord with the theories of dispersion and error. If the rule of thumb at present used in the service is to be continued, a column in the range table containing the value of $1/12 F$ (to the nearest tenth of a mil) might well be substituted for the present column of values of F .

The use of F in exactly adjusting the center of impact on the target cannot successfully be disputed. The present rule of thumb for employing F is open to question however. It requires the trial elevation to be changed by units of $1/12$ of a fork, or $1/3$ of a probable error, after six rounds at a common elevation have been sensed. An adjusted range so obtained is surprisingly close to the theoretical center of impact of an infinite number of rounds fired at the trial elevation, from which the same percentage of overs, shorts, and targets are obtained as from the six rounds in question. Six is a very finite number, however, and adjusted ranges based on six rounds obtained by any method are subject to considerable error. All field artillery dogma is to the effect that data should not be refined beyond the combined accuracy of all the factors by which the data are computed. The absolute error of any particular adjusted range is, of course, indeterminable. The probable error in an adjustment can be obtained from the methods employed and the basic probable error of the piece at the range and with the ammunition used. A change in data in units much smaller than the probable error of the adjustment does not appear to be justified.

By the Theory of Error the probable error of the arithmetical mean of a series of measurements of a quantity is the probable error of each measurement over the square root of the number of measurements.

FORKS AND FALLACIES

$$e_n = \frac{e}{\sqrt{n}}$$

e equals the probable error on one measurement.

e_n equals the probable error of the mean of n measurements.

Thus it appears that nine determinations are necessary to obtain a probable error in the mean of one-third the probable error of one determination.

In unilateral artillery observation, where the arithmetical mean cannot be determined, but merely the relation of each shot to a common point (the target), the results are of course more inaccurate. The theoretical determination of the accuracy of a series of measurements where only the direction of the measurements from a common point is known would be a very pretty problem in the Theory of Errors. Fortunately it is beyond the scope of this article. Practically it would be influenced by the dimensions of the objects used as a target. For our purposes it could easily be obtained by having flank or bilateral observation for a few hundred precision problems. If the regiments of Field Artillery, the FA School and the FA Board should establish such observation for one firing season, sufficient data could be obtained to make definite determination of the accuracy of the results obtained under present regulations.

In the absence of research of this nature, it can only be said that our present regulations compel smaller changes during fire for effect than those justified by the accuracy of the available data. Thus the smallest changes possible after the fourth series of six rounds of fire for effect is $1/48$ of a fork or $1/12$ of a probable error. To obtain an adjustment with a probable error of $1/12$ of the basic probable error of the piece would require the determination of the mean range of 144 rounds. The probable error of 24 measurements of a quantity is e over the

square root of 24, or $1/5$ of a probable error even when the arithmetical mean can be obtained.

Pending more information on the problem it is the writer's opinion that the following is a more sensible rule: Start fire for effect in series of three at the center of a one- c bracket (two c 's for heavy materiel). If sensings are all in the same direction move $1/2 F$ in the indicated direction and fire again. When sensings in opposite directions are obtained at any elevation, fire a second series of three rounds at that elevation. If two consecutive series give three sensings of over at the greater elevation and three of short at the lesser, consider all six rounds as having been fired at the mid elevation. When six rounds have been fired at one elevation, obtain the adjusted elevation in the following manner: When number of overs and shorts are equal or differ by one—no change. When number of sensings in one direction exceed those in the other by more than one and not more than three—move one probable error, or $1/4 F$ in the proper direction. When number of sensings in one direction exceed those in the other by more than three move two probable errors, or $1/2 F$ in the proper direction. If in the last case six rounds have previously been fired at that elevation, split the bracket thus determined. In determining difference between overs and shorts disregard target shots.

When two groups of six fired one probable error apart give an opposite preponderance of sensings, go to the mid elevation (range change made is $1/8 F$) and fire twelve rounds. For most purposes the center of impact could be considered as being adjusted on the target at this time. If more accuracy is desired the same procedure could be followed. After each series of twelve, adjust the range in the proper direction by one-half the range change made when series of twelve were started. (Thus the range change made is $1/16 F$.) When

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two consecutive series of twelve give an opposite preponderance of sensings, go to the mid elevation and consider center of impact adjusted on the target.

The following table indicates the application of this rule and of the present rule, for the first series of six rounds for effect, in all possible cases where the number of overs are equal to or greater than the shorts. Trial elevation 100, Fork

Mere convenience and simplicity is of secondary importance.

The main virtue of the suggested rule is that it does not permit minor changes in elevation based on insufficient data. The fact that the present rule requires changes as small as 1/12 or 1/24 of a Fork, based on the sensing of six or twelve rounds, gives the impression that the final adjusted elevations have no

Case No.:	1	2	3	4	5	6
	+	+	+	+	+	+
	+	+	+	+	or	+ [+] or [-]
	+	+	+	+	T	[+] [+] + [-] [+]
	+	+	+ or	T	[+] [+]	+ [-] [-]
	+	+ or	T [+]	T	[+] [-]	- [T] [-]
	+	T [+]	T [-]	T	[-] [T]	- [T] [T]
	T	T [-]	T [T]	T	[-] [T]	- [T] [T]
(Adj. El. Present rule)	98.7	99	99.2	99.5	99.8	100
(Adj. El. Suggested rule)	98.5	98.5	99.2	99.2	100	100

equals 3.

It can be seen that the two rules give substantially the same adjusted elevations. The new rule requires larger corrections than the old when there is an appreciable difference between the number of overs and shorts. This is in accord with the standard field artillery practice of making changes in data surely large enough promptly to bracket the target.

The proposed rule has two distinct advantages: First the calculations required are simpler. Nothing more complicated than finding the value of 1/2 or 1/4 of F or splitting the bracket last determined is required. To be sure, any field artillery officer should have no difficulty in making the calculations under the present rule. However, the officer conducting fire is inevitably under considerable pressure and making the calculations required (such as 5/48 of 7.6) often causes delay and error.

greater error than the smallest change that can be made. This is not true. K's and VE's obtained from as few as six rounds are applied blindly in transfers of fire. As a matter of fact they may be very inaccurate, and large errors may result in the zones employed for unobserved fires. The proposed rule would permit changes of 1/8, 1/16, and 1/32 of the value of F after the firing of at least twelve, twenty-four, or thirty-six rounds, respectively.

No claim is made that the proposed rule is perfect or that a better one cannot be evolved. It is believed that the two ideas underlying it are sound. First, that the time-honored artillery practice of splitting the bracket last obtained can be followed just as logically during fire for effect as during adjustment. Second, that a great number of rounds are necessary before minor changes in range can be justified.

Lines to a Wheel Horse

BY B. M. BARROWS

*The Stable Sergeant's head is low, His heart is filled
with pain,
Old Barney's gone on his last, long hike And he
won't be back again.
Covered with rust and mold and dust Is the harness
Barney wore,
And the Stable Police with the push brooms Will
sweep his stall no more.*

Oh, he came from the Osage Country, up near the Kansas Line.
Where the ceaseless winds of the prairie are rich with a scent of pine;
With a U. S. brand on his shoulder that all the world could see
He took his place in a near wheel trace in the Field Artillery.

He took his place in a near wheel trace and who of us can say
That he never earned his daily share of GI oats and hay?
In summer's heat or driving rain, in winter's cold and snow
His section never turned a wheel that Barney didn't go.

His section never turned a wheel that Barney wasn't there
To do his bit in the harness, his part of the load to share;
From the desert south of the Rio Grande to Flanders' flaming hell,
He helped to put the guns in place, and he did his job full well.

A rookie, whose name on the payroll hadn't scarcely dried,
Said, "What the hell? He's just a horse," the day that Barney died:
And though it's true he was just a horse, there's much more to be said,
And I'm sorry I've waited to say it till after Barney's dead:

In all the years that Barney served, he was never heard to ask
For aught but a chance to give his all no matter what the task;
He never said to the horse ahead, "You pull my load for me.
'Cause my head's about to detonate from last night's drunken spree."

Not once in all the toil-filled years did Barney ever curse
And say, "Let's lynch the mess sarge—his chow is getting worse."
He never complained to the top-kick, or showed by word or deed
He thought he should be promoted from the wheel to the swing or lead.

And though there was ne'er a service-stripe to mark the years he gave,
He trod the path with head held high that led him to the grave;
The Final Statement he received when the rays of the setting sun
Marked the end of his day, was a conscience-clear and a pride in the job well done.

*There's an empty space and a vacant trace At the
wheel of Section Four,
And the Stable Sergeant looks away When passing
the stable door;
The nights are long and the days seem wrong. And
heavy the air with gloom,
And the soldiers say at the break of day, "Wish
Barney was here to groom."*

Field Artillery in the Maneuvers

BY LIEUT. COL. A. R. HARRIS, FA

IN a recent army maneuver that the writer had the good fortune to attend, two battles seemed to take place simultaneously. One was the Infantry Battle. The other was the Artillery Battle. In the Infantry Battle all was action, movement and excitement. Rifles cracked, machine guns spluttered. Tanks dashed across fields. Airplanes droned overhead. Umpires rushed about controlling by means of large flags the action of the front-line infantry units. "War" correspondents and cameramen were busy getting copy and pictures for the "folks back home." Everyone was on his toes and playing the game for all he was worth. It was all most interesting. One thing, however, was lacking. Here was a battle going on, with all the modern improvements, and yet the arm which in the last war had become so powerful as to earn the title, "The King of Battles" was conspicuous by its absence. No artillery shells were making the "doughboys" hug the ground. Of course no one really expected the artillery to fire shells,—but it did not seem quite right to leave this powerful arm out of the reckoning altogether.

Undoubtedly the umpires took the artillery into account in a general way. They, of course, knew which side had the "preponderance" of artillery fire power. They could and did use this information to control the maneuver to a certain extent. But no one in the infantry battle knew at any specified time exactly what the field artillery was doing at that particular time, or what its effect was on the infantry front lines.

A mile or so in rear of all this infantry activity could be found the artillery,

sedately going through the routine of simulating artillery firing. Observation posts were organized and the cannoneers went through the routine of laying and loading. Here there was very little action or excitement—in striking contrast with the other battle a few thousand yards to the front.

To all external appearances there was very little connection between the artillery and the friendly infantry which was operating so enthusiastically up front. An artillery umpire would depart for the front occasionally with a "pocketful of concentrations," but when he got there he had no way of showing the effect of these concentrations *on the ground* so that the infantry would know what was happening or why they were being penalized. Also it took him quite a while to get to the front, so some of the concentrations had been fired before he got there—or in other words wasted as far as their effect on the maneuver was concerned.

There were artillery liaison parties with the infantry commanders, of course. Occasionally a request for fire would be given them by the infantrymen. However, as no *visible reaction* on the battle field ever resulted from these requests, they were transmitted less and less frequently. As time went on, the poor liaison officers found themselves tolerated by their doughboy brothers-in-arms but not regarded as of any great importance, or of any particular value in solving the problems immediately at hand. The infantry-artillery team theory, which looked so beautiful in the classroom, was in danger of atrophying from nonuse in the actual maneuver.

FIELD ARTILLERY IN THE MANEUVERS

At the critiques naturally the subject of the effect of artillery fire is given a wide berth. No good would come out of bringing up that subject. It is much better to mention it casually—very casually—in passing, then quickly take up something more tangible, from which concrete lessons can be deduced.

After listening to a few critiques the poor field artilleryman will feel infinitely discouraged. The heroic part he played in the "war" is ignored. His branch is seldom mentioned and all in all he feels as if he might just as well have been left at home.

The annual army maneuvers are expensive. But if they teach practical lessons to our more or less theoretical military establishment they are worth many times their cost to the taxpayer. However, therein lies the danger. These lessons must be based on solid foundations. And any field laboratory test or experiment which leaves the *effect of field artillery fire* out of the picture is bound to arrive at erroneous conclusions. The whole argument then becomes based on a wrong major premise. Any general in the last war who thought he could accomplish anything on the field of battle without employing field artillery, found this out to his sorrow.

As time goes on these maneuvers are bound to become more and more important. The deductions drawn from them as to organization, armament, and equipment will undoubtedly have more and more influence on the decisions of the general staff. This is as it should be. The problem from the field artillery viewpoint then becomes one of showing on the maneuver field the *effect of the field artillery fire*. The action at the front is where the attention of all will be focused. This is the action that will be discussed at the critiques. About the only time anything else will be mentioned is

when something in the rear breaks down or fails to function. Unless the *effect of field artillery* fire is brought into the picture at the front lines, the field artillery may well become the "forgotten man" of the army.

This condition will undoubtedly have an injurious effect on the field artillery. But the real sufferer will be the poor doughboy on the field of battle when he calls for artillery support and it isn't there. And anything that is bad for the infantry is bad for the whole army, and anything that is bad for the army is bad for the whole nation.

So it seems that the field artillery—unless its importance is to be underestimated—must solve the problem of showing the effect of its fire at the business end of the projectile; that is, at the points of contact of the opposing forces. This is where all the attention is focused.

The following simple scheme is suggested as a solution to this problem. When the liaison officer goes forward, he will take with him a group of flagmen. Each of these has a distinctive flag of some sort. When a flagman goes to a certain spot and waves his flag, the action indicates that the fire of a battery is falling in a 200-yard square (or any other size previously agreed upon) of which he is at the center. Three flagmen waving their flags would indicate the fire of a battalion of three batteries.

Let us take a look at how this would work out in practice:

The 1st Infantry is attacking with its 1st Battalion in the front line. At 8:00 AM the battalion commander sees some hostile machine guns at (6.84-5.75) holding up the advance. He turns to his artillery liaison officer.

"Machine guns over there (pointing to 6.84-5.75), holding up my advance. Request neutralization by artillery fire."

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The liaison officer immediately transmits this message to his battalion commander by telephone or radio, and at 8:05 AM receives the following message from his own battalion, S-3:

"Battalion (3 batteries) will fire concentration on point (6.84-5.75) from 8:20 to 8:25. Send out flagmen to indicate fire."

The liaison officer then gives the following order:

"Corporal B, take two flagmen with you to that point (indicating 6.84-5.75). Form a triangle with that point as a center about 75 yards from each of you, and wave your flags from 8:20 to 8:25. If an umpire wants to check your position and time, show him this slip," handing Corporal B a slip of paper on which is written:

No. of Btrys	3
Location	6.84-5.75
Time	8:20-8:25

"Return here at 8:25."

While this fire is being arranged or indicated, other requests for fire are made by the infantry battalion commander, and flagmen are sent out by the liaison officer *if directed* by his own battalion. In this way the *effect of the fire* of the artillery battalion is shown continuously at the front.

Now the whole picture changes. The umpires can actually see *on the ground* where and when the *artillery fire* is falling. They can easily evaluate its effect, and can make decisions accordingly. They no longer hesitate to bring up the subject of the *effect of field artillery fire*. The subject has ceased to be theoretical. It has become very concrete. They welcome it because they all feel that heretofore something very important has been left out of the set-up.

And in the case of the liaison officer, what a change has occurred in his status! Heretofore he has been tolerated, but as he has had nothing to give, he has been

ignored for the most part. Now he has become one of the most important cogs in the military machine. The old Infantry-Field Artillery team will now function. The liaison officer will soon become, as he should be, one of the most important members of the battalion commander's staff. The liaison detail will have all the practice it would get in a real battle.

The question now arises: "Can this be done in the time you have indicated?" Let us examine for a moment the distances the flagmen have to go. Let us take 500 yards as the average distance the liaison officer is behind the front lines. The location of the concentrations will average perhaps 300 yards beyond the front lines. Therefore the flagmen will have about 800 yards to walk. At the regulation rate of march they can do this in less than 10 minutes. So on the average the infantry commander can get his concentrations *on the ground* 20 minutes after he has asked for them. This is really not too slow; anything faster might tend to give wrong impressions that the artillery would find difficulty in living up to.

While one concentration is being fired the liaison officer is arranging for one, two, three or even four others. He has at his disposal, say, 15 flagmen, who are now down at the front getting an idea of what the war is all about, instead of aimlessly opening and closing the breechblock all day long. Maybe experience will show that each liaison officer needs 30 instead of 15 flagmen. If so, well and good. The battalion can provide them from the cannoneers at the batteries. They can be alternated daily with the other men at the guns. In this manner the men themselves will get a better idea of how the infantry-artillery team works, and exactly how the artillery fire fits into the general scheme. It should prove interesting and instructive to all.

COMMENT

The liaison officer will, of course, send out flagmen to represent concentrations other than those requested by the infantry,—such, for example, as observed fires from the artillery OP. In fact, he may send, when ordered, sufficient flagmen to represent all the batteries in the division. What a control over the artillery this device would give to the division commander!

The foregoing account is not in any manner meant to represent an exhaustive study of the subject. Experience may suggest many changes. For example, an advanced control station for flagmen might be advisable. A resourceful battalion staff will undoubtedly add many improvements and innovations. A dozen or more concentrations might be arranged and the necessary flagmen sent out. These concentrations would be fired on signal from the battalion commander relayed through the liaison officer. In this manner fire could be delivered almost instantly.

The author claims the following advantages for this system of indicating

artillery fire on the ground:

1. That the fires delivered in maneuver will tend more and more to approximate in method and intensity those delivered in actual warfare.

2. That the liaison detachments will have the same kind of problems to solve as in actual warfare.

3. That the battalion staffs will function more and more as they would in actual warfare.

4. That the field artillery - infantry teamwork will get a big impetus.

5. That all concerned will get valuable practice in target designation.

6. In short, that this system will tend to bring out and emphasize the problems that the field artillery will be called upon to solve in actual battle. In this way any deductions made from the experiences of the maneuvers will be based on solid foundations.

There may be other and better schemes for bringing the artillery into the picture in the army maneuvers. Here at least is a suggestion.

COMMENT

BY LT. COL. JOHN KELIHER, FA

I have discussed the subject matter with Lt. Col. A. R. Harris and agree that the effects of field artillery fire should be simulated in some manner so that the attacking and defending forces on maneuvers can see on the ground the capabilities of artillery fire, at least with respect to its promptness and accuracy. It has been my experience that, lacking some method by which the infantry is apprised of the effect of artillery fire, the maneuvering troops, and the umpires, in general make decisions based on false assumptions, and carry out those decisions with consequent detriment to the field training of the troops engaged.

At Colonel Harris's request I tested the proposed umpire system based on the map problem in Chapter 5, *Digest of Field Artillery Developments* (1936). This is selected because it is available to all officers, and on terrain sufficient to test the system.

If we select the liaison officer as the officer in charge of the personnel designated to simulate the numbered concentrations, and time the movements of a group of five enlisted men equipped with flags sent out by him to designate the concentrations to be fired by Battery A, we find that, considering the time schedule and the distance between the centers of the concentrations, the time between concentrations is not sufficient to permit the group to get in place for the next one. However, if *three* groups are sent out to designate the position of Battery A, and furnished a time schedule, they will be able to simulate the fire of all concentrations except those to be fired on call. For each battery the liaison officer will have to compute the number of groups necessary.

For fires by the 2d Bn 1st FA, and one Btry 3d FA in the zone of the 1st Bn 1st FA, I believe one area umpire with three

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groups and in communication with the 1st Bn 1st FA by wire or radio (preferably both) can designate these fires better than if the group were sent out by the liaison officer, due to the distances to be covered. As an alternate method, the area umpire can be charged with the task of sending out groups to simulate all fires in the normal zone of the 1st Bn 1st FA. He should be in communication by radio or wire with the 1st Bn 1st FA and be furnished an overlay of fires and a time schedule. Any change in the schedule of supporting fires can be

readily communicated to him. He can take position in the center of the area to be fired on. This system, of course, requires extra equipment, wire, and personnel to operate, but I believe that it will be justified by the added interest of all participants and the consideration of the effect of artillery fire both in the maneuver and the subsequent critique, with a consequent increase in tactical efficiency.

JOHN KELIHER.

Lieutenant Colonel, FA.

Reserve Regiment Awards Trophy to ROTC Unit

BY CAPTAIN WALTER J. GARDNER, FA-Res.

THE fifteenth annual mess of the officers of the 341st Field Artillery, Col. Leo J. Crosby commanding, was held at the Blackstone Hotel in Omaha, January 23rd. Fifty reserve officers who attended were hosts

to eighteen Regular Army officers and civilian guests from Omaha and Lincoln. Highlight of the evening was the informal presentation of a trophy to the Field Artillery ROTC unit at the University of Nebraska. The trophy,



RESERVE REGIMENT AWARDS TROPHY

which is pictured opposite, consists of a silver cup upon which are two insignia of the university ROTC and the great seal of the United States in gold, together with the inscription, "Honor Battery Trophy, Field Artillery, University of Nebraska ROTC. Awarded for excellence in Scholarship, Attendance, Military Science." The cup is flanked by silver fieldpieces, six inches in length, on bases which have silver plates upon which are mounted gold regimental insignia and cross cannons of the 341st and 342d Field Artillery regiments. A silver plate on the base of the trophy is inscribed, "Presented by the officers of 341st FA Res. and 342d

FA Res." The trophy is thirty inches high, two feet wide, and a foot in depth. It will be presented annually, and remain on display in the new Field Artillery building. The presenting of this trophy is part of a determined effort on the part of Reserve officers in Nebraska to promote friendly relations with the University students who are preparing for commissions in the Reserve Corps.

In addition to this trophy, these two reserve regiments have presented battery-competition cups to the First Battalion, Fourth Field Artillery, and the Third Battalion, Eightieth Field Artillery, their sometime neighbors.



The March number of the United States Army Recruiting News carries picture (herewith) and story of Staff Sergeant Lee Stone, Battery F, 80th FA, Ft. Des Moines, handing corporal's warrant to his son, same outfit, at parade of 3d Bn, 80th FA.

Colonel C. C. Haffner, Jr., 124th FA, claims we stopped too soon last issue recounting accomplishments of his regiment. They led the 33d Division in January with 92.4% in attendance, while their Special Battalion was Honor battalion with 95.5%, and their Medical Detachment the Honor company with 100%.

When Warriors Dream

BY COLONEL ALLEN J. GREER, FA

IMAGINATION

"It is imagination that controls the human race."—*Napoleon's Observations*.

ON MANY occasions Napoleon attributed the success of his campaigns to the rapidity and vividness of his imagination. By imagination he did not consider the word as defined in the dictionary—"the power or process of forming ideal constructions from images, concepts, and feelings, with relative freedom from objective restraint." On the contrary he meant the constructive or disciplined imagination that has been the basis of all great scientific discoveries and advances in human progress. It is the ability to classify facts and arrange them in orderly sequence; to view mentally from all angles the whole situation as it actually exists, and the consequences that would probably follow from different actions that might be taken. Wellington's terse and simple definition of military imagination—"guessing what was going on on the other side of the hill"—certainly falls short of the type of imagination that Napoleon possessed.

The essential characteristics of imagination as a military term, in contrast with the ordinary conception of the word, is that it must be based on realities, and not on fanciful images or desires. There must be no day dreams or fantasies, which are marks of excessive imagination, and from which many delusions are derived. That Napoleon's brilliant but realistic imagination, which conceived his wonderful early campaigns, developed and tended to become visionary, has

been shown by his own statements and the writings of those closely in contact with him. Wellington said that Napoleon had in his own character the elements that caused his downfall, and there can be but little doubt that his failures were due very largely to the overexercise of the very qualities and faculties on which his success was founded.

The examples which follow show that Napoleon and other prominent leaders have allowed their imaginations at times to become undisciplined and unrestrained, causing them to view the situation from false angles, which frequently led to disaster.

II

"I have fought sixty battles and well!—I learned nothing but what I knew when I fought the first."

—*Napoleon's Observations*.

Napoleon's first Italian Campaigns still remain models of brilliant conception, accurate calculation, bold execution, and successful accomplishment. None of his later campaigns exceeded them in these respects. His imagination "presented to him with the rapidity of lightning all the various phases" of the situation and he viewed everything in the most realistic manner. Be fore he fought a battle he always made sure of his communications, and he never neglected to calculate carefully what should be done in case of defeat as well as what would be the results of victory.

His conduct of operations had revolutionized warfare, and it was during this campaign that he first realized he was destined for a great place in history. In latter life he said: "That

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evening after the battle of Lodi, I first became aware that I was an exceptional man; from then I date the awakening of an ambition to do the great things which hitherto had existed only as the fantasies of a dream."

The glamor of the Orient has always appealed to the imagination of the Western mind, and Napoleon, a reader of Plutarch, found in Alexander's conquests inspiration for deeds of his own. He urged upon the Directory the plan for the Egyptian Expedition with himself in command. Analytical calculation must have shown that with England hostile, and controlling the sea routes, the lines of communication with France could not be maintained, and failure must ultimately follow. Although the plan was visionary, yet his activity and care in preparing it, and his skillful tactical handling of the troops in battle, made it successful temporarily. France failed but Napoleon gained. Even so he played with ephemeral ideas, although he did not allow them to interfere with his practical arrangements. At the time he said: "After the victory of the Pyramids and the possession of Cairo, I willingly resigned myself to every brilliant dream." Before St. Jean d'Acre he remarked to Bourrienne: "I shall arrive at Constantinople with large masses of soldiery. I shall overturn the Turkish Empire and found in the East a new and grand empire, which will fix my place in the record of posterity. Perhaps I shall return to Paris by Adrianople, or by Vienna, after having annihilated the House of Austria." The words of a youthful visionary yet repeated in almost the same terms in later life as recorded by Segur: "Had I taken possession of Acre I should have worn a turban; I should have put my army into wide trousers. I would no longer have exposed it except in the last extremity; I should have made it my sacred battalion, my immortals! I should

have finished the war against the Turks with Arabs, Greeks, and Armenians. Instead of a battle in Moravia, I should have won a battle on the Issus, created myself Emperor of the East, and returned to Paris by way of Constantinople.' These last words were accompanied by a smile, seemingly to imply that he was yielding to an impulse which carried him away on the wings of some youthful dream of his conquering imagination."

The reputation he acquired by the Egyptian venture, and the unbounded enthusiasm of the people after his return, brought dreams of power and induced him to undertake the scheme of overthrowing the Directory and establishing his own authority. Following the great success of the Marengo Campaign the horizon of his vision widened and it was but a step to be declared First Consul for life, and then to reach the pinnacle of his ambitions and rule as Emperor of the French. He was a practical dreamer and his imagination added fuel to his ambition which was never static, but grew as it was stimulated by his continued successes. After Austerlitz nearly all of Europe was unified under a Bonaparte family dynasty. Russia he considered as Asiatic, and England as detached from Europe. His brother Joseph was placed on the throne of Spain; Louis on that of Holland; Jerome on that of Westphalia; his brother-in-law, Murat, became king of Naples, while he himself with the iron crown of Lombardy on his head, Emperor of the French, and a king of kings, had become the greatest monarch of modern times. Had he made an unprejudiced estimate he must have realized that none of his family, whom he had made into rulers, had the ability successfully to govern or help him in his ambitious schemes. His dreams were beginning to outsoar the limits of his ability to

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control or France to support.

Not only in war was his brilliant imagination displayed. His mind embraced the largest questions and the smallest details. As a statesman, although "the child of the Revolution," he ended chaos and established law and order in France, straightening out the disordered finances; he instituted the code of laws that still are in force in most of Europe, Central and South America; he acquired as a result of his conquests great numbers of works of art, and sending these to Paris, established that city as the center of art and culture; his public works and monuments are today objects of interest, utility, and admiration in France and other countries. The multitude of his enterprises, and the great number of projects he had in mind, of which he told at St. Helena, display the vast capacity of his vivid imagination and volcanic activity.

Napoleon's Russian Campaign is the first in which he deserted facts for a belief in his destiny, and where he showed a lack of clarity of vision or a reasoned calculation of the actual factors of the situation. Lauriston, Duroc, and Caulaincourt, who had been on missions to the Russian Court, strongly advised against invasion of the Tsar's domain. Jomini makes Napoleon say: "Fifteen years of uninterrupted success had made me overconfident in my own resources. I saw the obstacles, but I did not attach to them sufficient importance." It is not altogether surprising that he should at times have thought of himself as infallible, for he was aware that many so considered him. Segur says: "Most of us gave ourselves up to a conviction of his infallibility and executed orders of the day without looking beyond, without any care for the morrow, sure of victory if we obeyed." Small wonder Napoleon should say: "How impossible! I do not know the word."

Just after crossing the Russian frontier Napoleon stated: "In less than two months time Russia will be suing for peace," and as this corresponded to his wishes, he based his plans on this premise. So obsessed was he with the idea that the campaign would be short and decisive that he neglected to observe many precautions that should have been taken. Adequate depots were not established along the long line of communications. Winter clothing, heavy socks, and boots were not obtained for the men; no winter shoeing was provided for the animals, and sufficient transportation was not secured. Napoleon said: "It is the winter that has been our undoing. We are victims of the climate," but this was not the case.

He continually desired to bring on battle, knowing his superiority to the Russians in training, discipline, leadership, and especially in his artillery, believing a decisive defeat of the Russians would force them to an early peace. On the eve of Borodino he issued a proclamation to his army, which really expressed his own wishes: "Soldiers—this is the battle you have longed for. Victory now depends on you: it must be ours. It will bring us abundance, good winter quarters, and a quick return home." After the battle he still pictured the Russian nobles and the Tsar suing for peace, and the information from Murat always revived his cheerfulness, for Napoleon wanted to believe what Murat told him of the Russian army disbanding and the Cossacks deserting. Jomini makes him say: "As one easily persuades himself into believing what he most desires, I still hoped that the Emperor Alexander would take advantage of the present occasion to enter into negotiations." Caulaincourt also says: "He was always eager to believe in his Star, and that Russia, wearied of war, would seize any occasion to bring the struggle

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to an end." Imbued with these hopes he delayed too long his departure from the almost destroyed city of Moscow, and winter with its fatal toll was on him. Later Napoleon said: "I thought I should be able to make peace, and that the Russians were anxious for it. I was deceived and I deceived myself."

In his campaigns of 1813 and 1814, there were many occasions when Napoleon did not show the clearness of perception and reasoning power that he had done formerly. He grew impatient of contradiction or explanation, and was not told of things he ought to have known. When Marshal MacDonald in November, 1813, reported to the Emperor the loss of an immense convoy of much-needed ammunition and arms, Napoleon said: "No, you are deceived, this cannot be true," then ordered him to look at dates of the dispatches and said: "You see the thing is impossible," and so refused to accept the facts, and cherished his delusions, although the report was true.

Marmont has also related that in the campaign of France in 1814, it became almost impossible to report any facts which were unfavorable, as the Emperor would storm at the bearer and refuse to believe them. This formed a marked contrast to his former habits, when he always demanded the strict truth from his subordinates, even though it might be far from desirable. In many instances this resulted in faulty plans, as they were based on false premises. What a different Napoleon this was from the Revolutionary general who ceaselessly sought information of the enemy, and who, when he went to sleep left word not to awaken him in case favorable news was received, but to do so immediately if ill tidings came, so that he might take the necessary steps to counteract them!

The final Campaign of Waterloo saw a different leader than in the days when

Napoleon had marched his victorious armies through Europe. Physically, the symptoms of his future fatal malady were already beginning. At St. Helena he said: "It is very certain that during the events of 1815 I relinquished the anticipation of ultimate success. I lost my first confidence * * * perhaps in my own eyes, in my imagination, the spell that hung over my miraculous career was lost." Yet his conception of the campaign and his strategic plans exhibited all his former genius. When he was supposed to be in Paris, he fell like a thunderbolt at the head of his guard on Charleroi. The combinations and calculations by which his columns arrived at the appointed places at the correct time were masterpieces of logistics. Perhaps due to his physical weakness, his plan for the battle of Waterloo showed little of his former imaginative tactical vision, his precise calculation of details, his boldness and tireless energy.

Perhaps a further statement of certain traits of character of Wellington, in contrast to those of Napoleon should be given. Of him it was said: "He never trusted to chance, he had no Napoleonic belief in his star; on the contrary he was convinced that careful preparation and attention to detail were the secrets of successful action. Fortescue says: "Wellington's real gift was transcendent common sense, the rare power (shared also by Marlborough) of seeing things as they are, which whether it be granted to soldier, statesman, or artist, signifies genius." Brett also wrote: "Wellington was not clever, * * * He did not see far, but within the limits of his vision, he saw things as they are more clearly than other men."

Yet such realists can never reach the heights to which the brilliant imagination of Napoleon carried him. As

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long as this imagination drew inspiration from facts and realities, victory and glory were his reward, only when his assumed premises were misinterpretations of true factors, did his plans and judgment become faulty, and Fortune desert him. Even so his deeds have placed him among the warrior demigods of all time.

III McCLELLAN

"The first qualification in a general-in-chief is a cool head—that is, a head which receives just impressions and estimates things and objects at their real value."—*Napoleon's Maxims.*

American history affords a striking example where the undisciplined and ill-directed imagination of an army commander created a fabric of delusions which paralyzed his initiative, magnified his caution, robbed him of an opportunity for a decisive victory, and ruined his military career.

When General McClellan was brought to Washington and assigned to command of the Army of the Potomac, he was hailed as "the Young Napoleon" by the populace, and he received a deference from the Administration that undoubtedly made him lose his balance and increase his already well developed self-admiration.

McClellan had nothing resembling an intelligence service in his army, which could have obtained with little difficulty quite accurate information of the Confederate army, its strength, condition, and location, and instead he depended on a civilian detective agency. With this he apparently dealt directly, and the fantastic data it furnished him formed the basis for the exaggerated overestimates of the strength of the enemy's forces which he reported to the War Department and the President.

It is exceedingly doubtful if McClellan at first really believed the reports of the

strength of the Confederate army. In fact he almost certainly did not do so, for his cautious nature would not have permitted him to have embarked on his Peninsula campaign had he thought the enemy considerably outnumbered him. At Antietam he estimated Lee's force at 120,000. Probably the best authority, Ropes, places it at less than 40,000. A probable explanation is that McClellan was acting a part, trying to play on the fears of the Administration so as to receive the reinforcements he wanted, and ended by being the victim of his own imagination and deceiving himself.

Never was Fortune so generous in opportunities offered to any commander during the Civil War as she was to McClellan on September 18, 1862. If McClellan had analyzed the information available, and had he possessed the imagination to view the situation as it really existed and the opportunity that was offered, with the will to seize it, the Army of Northern Virginia could have been destroyed, and the Civil War ended in a few months. On the previous day the bloody Battle of Antietam had been fought. Lee's army of originally less than 40,000 had lost 13 guns, 39 colors, and more than 6,000 prisoners, and with difficulty had repulsed the assault of the Federals, who had lost neither guns nor colors. Lee, with less than 32,000 effectives, waited all day of the 18th for the attack that never came. His back was to the Potomac, over which a poor ford was the only crossing. McClellan had over 80,000 men that he could have brought into action, and greatly superior artillery in a commanding position, yet he did not attack, and allowed Lee to withdraw across the river that night and retreat to Virginia.

McClellan has written: "At that critical juncture, I should have had a narrow view of the country had I been

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willing to hazard another battle with less than an absolute assurance of success." Instead of a will to conquer he had conjured up the image of disaster, and totally failed to display the qualification Napoleon said a general should possess—a cool head "which receives just impressions and estimates things and objects at their real value."

Since the imaginative qualities of Napoleon and Wellington have been portrayed, a comparison between McClellan who failed, and Grant who succeeded, seems appropriate. McClellan had brilliancy of intellect and vividness of imagination, but lacked Napoleon's analytical judgment, realistic vision, his daring and indomitable will. Grant seems to have been entirely without imagination of the fantastic type. He was rather slow mentally, and none of his plans showed brilliancy. Like Wellington, he did not see far, but he looked at the practical side of a problem, and one of the qualities of his greatness was to take a complex situation, see its simple elements and reduce it to them. His unflinching determination prevented him from ever admitting defeat to himself. His first attempts on Vicksburg, the battles of the Wilderness and Spottsylvania, he pictured as temporary reverses only. He resorted to other measures, sometimes faulty, but usually practical, and his persistence won where others, less determined, failed. Grant illustrates the popular conception of the strong, silent man, although Lloyd George's trite statement is perhaps true: "The strongest men of history have never been silent. One of the strongest—Napoleon—could on occasion even be garrulous."

IV VON MOLTKE

"In war one has to deal with probabilities, and the most probable is that the enemy will do the right thing."

—*Von Moltke.*

During the Franco-Prussian War there occurred a decidedly peculiar case of the

misuse of imagination by Von Moltke himself, a most logical soldier, whose genius consisted in the capacity for hard work.

The French Army of the Rhine under Bazaine, in position on both sides of the Moselle around Metz, had commenced to withdraw through that city toward Verdun on August 14, 1870, but this retreat had been interrupted by the Battle of Colombey, which occurred on that day.

Reports being vague at General Headquarters concerning the French, Von Moltke, instead of forming a mental picture of the situation by analyzing information already received, or which could easily have been obtained by reconnaissance, reasoned what he would do were he in the enemy's position, and blinded himself to actualities. He calculated that the French should, and therefore, would withdraw to the north and west, while in fact they were really remaining stationary around Metz. On the 15th he informed Prince Frederick Charles, commanding the Second Army: "The French have been thrown back completely on Metz, and it is probable that by now they are already in full retreat on Verdun." "The Red Prince" leaped to the conclusion that this was the case, and issued orders stating: "The French army has begun its retreat toward the Meuse." Had he used his cavalry division to reconnoiter, he would have found out his mistake, but as Von Moltke said he "reasoned only by his imagination," and not only allowed his army to become separated from the main German forces, but went further with the dispersion and ordered his different corps to march by well-separated routes.

Concerning this situation Von Schlieffen ironically remarked: "It is however, wrong to think that reports in war from the cavalry are of any importance

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or even desired. The higher leader generally makes himself a picture of friend and foe for whose delineation personal desires do the principal work. Should reports coincide with these wishes, they are laid aside with complaisance. Should they contradict them, they are considered entirely false and justify the final conclusion that the cavalry had once more failed entirely."

In compliance with Army orders Von Alvensleben's corps crossed the Moselle, and on the 16th moved westward on two roads, encountering the greatly superior forces of the enemy at Vionville. He immediately attacked, and the leadership of the Germans, with the fighting qualities of their troops, prevented what might have been a disaster. As it was, the initiative of a subordinate had redeemed the errors of his superiors, ended the French efforts to retreat, and pinned their forces to Metz, which was bound sooner or later to surrender.

So persistent was the belief of General Headquarters that the French army was retreating to the north and west that even on August 18th, when the main body was encountered in a prepared position around St Privat, all preliminary arrangements for the Battle of Gravelotte, which took place that day were made with this idea. Von der Goltz says: "Even later on, long after the commencement of the battle and when the firing had extended further and further to the north, as far as St. Privat la Montagne and beyond it, more than one voice was heard to declare that, as a matter of fact, the enemy had been overtaken in the act of marching away, and that we had come in contact with his left flank."

While it is of course exceedingly difficult to see through the "fog of War" and know what the truth really is, yet the conviction remains strongly that Von Moltke based his estimates more

on preconceived ideas of what the enemy reasonably should do, than on the evidence that came to him of what really he was doing. While such reasoning offers safety, yet the most famous victories of history have occurred when great commanders—such as Hannibal at Cannae, Frederick at Leuthen, Napoleon at Austerlitz and Jena, Lee at Chancellorsville, Hindenberg at Tannenberg, and Moltke himself at Sedan—divined their enemy's blunders, and acting immediately and vigorously, gained the victory which opportunity offered and imagination inspired.

V

CONCLUSION

"If I am ready to deal with any situation, it is because I have foreseen what might have happened."—*Napoleon*.

To produce a great general there must be a combination of intellect, strength of character, energy, and circumstances. Imagination is an essential part of the intellectual element. The greatest soldiers throughout the ages have possessed all these qualities, prominent among them being imagination. The more vivid the imagination, and the rapidity with which it views the situation, the greater the soldier will be.

Every military commander, from the corporal to the general-in-chief, is called upon to use his imagination within his respective sphere. An "Estimate of the Situation" is an exercise of the imagination, with certain known factors as a base for calculation. But in weighing these, reasoning imagination, not fancy, must be used. As Cromwell said: "It is necessary at all times to look at facts." The knowledge of the enemy and his actions is always limited, and it is from these fragmentary bits of information that deductions must be drawn and decision reached. The commander with the

TALKING SHOP

clearest vision, in other words the most active and correctly trained imagination, will see more truly and completely all angles of the situation, reach the best decision, and most probably be successful.

Among the few geniuses in war that the ages have produced are Hannibal,

Caesar, Genghis Khan, Tamerlane, Gustavus Adolphus, Frederick the Great, and Napoleon. In all of them imagination was a dominant characteristic, and Carlyle could have said of all as he did of the last: "There was an eye to see in this man and a soul to dare and do."



Talking Shop

Over in this corner is the huddle where the conversation is climaxed with, "Why don't you write that up for *The Journal*?" Contributions should be brief. Those received will be acknowledged, and printed when space permits.

Interoffice Radios

With the help of the radio section, Headquarters Battery, 3d Field Artillery Brigade, there has been installed in this battery a local communication system which has proved efficient in every way. The power plant is a second-hand radio receiver. A microphone is part of the desk equipment of the battery commander, the first sergeant, and the supply sergeant. There is one-way communication from the orderly room to loudspeakers in each squadron. By this means individuals may be called to the orderly room, uniform for formations announced, and the like. The cost depends about evenly on spare parts available and the ingenuity of the designer. For instance, in the system described, the amount of wire used has been cut down by combining the mike circuit from BC and Sup Sgt desks with the remote-control circuit. (The latter enables either BC or Sup Sgt to turn on the operating current.) This is made possible by a resistor connected in the mike circuit across a relay.

Broadcast stations may be tuned in

on the system, and we find first call for Reveille and barracks-police period are good times for this.

—H. E. ROBINETTE,
First Sergeant,
Headquarters Battery.

The Problem of the Two Projectiles

Problem: A projectile is fired from a gun horizontally. At the same instant, a similar projectile falls vertically from the height of the muzzle. Do the two projectiles reach the same level at the same time?

Solution: If true, the *vertical* forces acting on the projectiles and the vertical velocities of the projectiles at any level must be the same.

The trajectories of the two projectiles are as shown in the figure.



Let r_d = the resistance of the air for the dropped projectile at any given level.

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r_f = the resistance of the air for the fired projectile, at the same level.

A = the angle of inclination of the fired trajectory, with respect to the horizontal, at the given level.

v_d = the velocity of the dropped projectile at the level.

v_f = the velocity of the fired projectile at the level.

v_{fy} = the vertical component of the velocity of the fired projectile.

w = the weight of either projectile.

Then the vertical resultants of the forces on the two projectiles are:

Dropped = $r_d - w$

Fired = $r_f \sin A - w$

Therefore $r_d - w = r_f \sin A - w$

$$\text{And } r_d = r_f \sin A \text{ or } \frac{r_d}{r_f} = \sin A$$

Similarly equating the vertical velocity components.

$$v_d = v_f \sin A \text{ or } \frac{v_d}{v_f} = \sin A$$

$$\text{Therefore } \frac{r_d}{r_f} = \frac{v_d}{v_f} \text{ or } \frac{r_d}{v_d} = \frac{r_f}{v_f}, \text{ a}$$

relation which can be generally true only when the resistance of the air is directly proportional to the velocity, which we know is not true practically.

Therefore, the problem is solved in the negative. The dropped projectile would reach the level first.



New Deputy Adjutant General of New Jersey is noted horseman and exwagonsoldier Lt. Col. Donald W. McGowan, former 112th FA indoor poloist, graduate Infantry School, 1922, Field Artillery School, 1931. Command and General Staff School, 1935.



Master Sergeant James K. Brought, 12th FA, reputed Dizzy Dean's first coach, retires at Ft. Sam Houston, and is escorted by bugle corps and men of regiment off post. . . . New Assistant Commandant, C and GSS, is Col. Francis W. Honeycutt, FA. . . . "Carbine and Lance," a history of Fort Sill (and incidentally a vivid story of Indian Warfare in the Southwest) by Captain Wilbur S. Nye, FA, will be published by the University of Oklahoma press this spring. . . .



Among scholarships to be awarded by Rensselaer Poly (Troy, N. Y.), is one to a son of an army officer, active, retired, or deceased. It will provide full tuition for four years, equivalent of \$1,600. Only exceptional students will be considered, and successful applicants will be required to maintain average of 85. . . . Tests of organization of artillery of proposed new infantry division for three support battalions and a battalion of 155-mm. howitzers will be made by Eighth Corps Area, to include units of 12th, 15th, 82d, and 77th (Marfa) regiments of FA. An experimental antimechanized battalion also will be formed.



During week of February 27, USMA won 31st straight indoor polo game, from Princeton, 13-9; defeated Western Maryland at boxing, 7½ to ½; won from Princeton at gym, 32-22; from M. I. T. at hockey, 5-2; from Colgate at swimming, 51-24, and lost only at fencing, to Yale, 14-13.

THANKS TO THESE—

Winner of the 1937 Prize Essay Contest of the United States Field Artillery Association is Captain THOMAS NORTH, FA, whose "Maps for Tomorrow," the winning entry, leads this issue.



CAPTAIN THOMAS NORTH

Captain North, now Field Artillery member of the Engineer Board, Fort Belvoir, Va., was born in London, England, and attended Christ's Hospital School and King's College there before coming to this country in 1911. He left his business in New York at the outbreak of the World War to enlist in the 11th Engineers. Later, he served at Chaumont in the G-3 map room, where one of his duties was posting General Pershing's daily order-of-battle map, the original of

which now is in the National Museum. There he was commissioned in the Engineer Corps, and, in 1920, in the Field Artillery of the Regular Army. He is a graduate of the Field Artillery Basic School, 1921, and of the Command and General Staff School, 1933-35 course. He organized and commanded the First Observation Battery, served with the 5th Field Artillery at Fort Bragg, N. C., and has done two tours abroad with the Battle Monuments Commission. Decorations: Purple Heart and French *Palmes del'Academie*. Reluctant witness, prize-winner North baffles interviewers. (Aside to Captain North: "So you won't talk, hey?").



"Yes." writes B. M. BARROWS (Lines to a Wheel Horse), in answer to our question, "Barney was a real horse. When the ROTC was established here [Colorado State College, where the writer is a sergeant, DEML] about 1920, Barney was included in a shipment of horses from Fort Sill. He died a couple of years ago, and achieved passing recognition by an obituary in the college newspaper, principally because he had reached the advanced age of 25 years."

Sergeant Barrows has been in the army since 1923, the last ten years as an instructor in first-year basic courses in the college ROTC. Married, and the father of three, as he says, "potential field artillerymen."

Barney "got a good press" in the Barrows obituary. He deserved it. The years he spent in the collar preaching his own funeral sermon have some lessons for us.

THE FIELD ARTILLERY JOURNAL

We will match Captain CHARLES P. NICHOLAS, the Secretary of The Field Artillery School, against any bean-counter in the country. His "Adventure in Gunnery" breathes the spirit of grim determination. Note the dogged, even stubborn, application of his artillery training to a problem whose solution was so richly rewarded. Yet the possibility that an uneducated guess might have triumphed over his painstaking methods makes one wonder if the study of long division is really worthwhile. This article should be sufficient answer to those who have claimed that no one could make probabilities interesting.

Colonel RALPH TALBOT, JR., FA (The Defensive-Offensive Maneuver), former instructor at the Command and General Staff School, now is on duty at Headquarters, Ninth Corps Area, Presidio of San Francisco.

Lieutenant Colonel J. E. LEWIS, FA, who puts in a word for Praise, is late Director of Materiel at the Field Artillery School, now a student at the Army Industrial College, and next year will be a student at the Army War College.

"With the Crimson in Triumph," line from a Harvard song, just wouldn't do as a title wherewith to confront readers, who, at last accounts, were members of a Blue force, which, and so on. . . . So some guidons had to be worked into the heading for the story by Harvard ('17) A. R. GINSBURGH, now on duty in the office of the Judge Advocate General, but field artilleryman of many service years. To his A. B. at Harvard, Captain

Ginsburgh added an A. M. at University of Louisville in 1922, and an A. M. in Journalism at University of Missouri in 1931. He is a frequent contributor to magazines (notably The American Legion Monthly). We hope to publish, in the near future, his "O'Brien's Bulldogs," story of an outstanding feat of arms.

"When Warriors Dream" was written by Colonel ALLEN J. GREER, FA, one of that small but greatly distinguished group who hold this country's highest-prized military decoration, the Congressional Medal of Honor. Well-known writer on military history, Colonel Greer now is on duty at Headquarters, 98th Division, Buffalo, N. Y.

Captain WALTER J. GARDNER, FA-Res., is the very active leader of the very active Lincoln, Nebraska, unit of the Reserve Officers Association.

Captain W. F. MILLICE, FA, is on duty with the ROTC at the University of Illinois.

Lieutenant Colonel A. R. HARRIS, FA, is Professor of Military Science and Tactics at Harvard University.

"Man, Horse, and Dog" we owe to Captain DAVID LARR, 1st FA, Fort Sill, Oklahoma.

Captain JOHN R. CULLETON, whose "Forks and Fallacies" appears in this issue, is a member of the 24th Field Artillery, Fort Stotsenburg, P. I.

The JOURNAL salutes Major General William S. Key, newly promoted commander of the 45th Division, National Guard, long a member of The Field Artillery Association, and at present on its Executive Council.

Some Forward Observations



SOMETHING ABOUT the JOURNAL—it is edited at 1624 H St., N. W. It is published in, and mailed from, Baltimore. When we get your change of address, that's where we send it. (It costs us a nickel.) We enjoy the aid of a one-person office force, the only salaried employee. This employee does everything humanly possible to find out where you are at, so to speak, and what your rank is, but sometimes a little supplementing by yourself will help.

The JOURNAL has recently expanded to 20 percent more reading matter, and is only looking for a good excuse to increase this to 50 percent. Our idea of a good excuse would be more income—from memberships. We have no advertising income. The JOURNAL is not offered to readers primarily on the basis of being three dollars' worth of magazine, despite the fact that there are, among other outside subscribers, over a hundred foreign readers who think it is. It is offered as the voice of the United States Field Artillery Association. The dues in this association are \$3.00 per year.

We have recently been reading the annual reports of other associations, and we note that the Cavalry has all but 30 of its regular army eligibles. (We have all but 464.) They actually have more members than we, although with a much smaller field. In fact, among the National Guard and Reserve they have nearly twice as many members, with about one-fifth our field. They have a number of 100 percent outfits.

If, outside the office of the Chief of Field Artillery, we have any 100 per cent units, we should be glad to learn of them. Who will be the first?

We have, in the regular service, but one 100-percent grade, that of major general of field artillery. Looks like some of the other grades were being outgenerated.

One feels pretty sure, from reading the Journals of these other service associations (to whom our congratulations for the excellence of their publications), that not only do their readers get their money's worth from the magazine, but that their individual members take pride in enrolling a dozen, a score, several-score subscribers at a time. It was hoped, when Major John H. Fye, FA, sent in 16 memberships last summer, that the idea would prove contagious. It didn't, so we mention it again, just in case.

Now that that's over, we'll sit back and pick up listening to *your* suggestions again, where we left off.



FLASH!—As we go to press, comes Captain C. A. Kaiser, FA-Res., adjutant of the Fort Lewis, Washington, CCC District, with eleven new memberships, and the announcement, "We are endeavoring to obtain a 100 percent membership in the Association among the Field Artillery on duty in this District."

More power to him.

THE FIELD ARTILLERY JOURNAL

SEVERAL MEMBERS have written, asking for a story about Santa Barbara. One is being prepared, and will be included in an early issue. In the meantime, we can tell you that veneration for the saint has existed since the first centuries of Christianity; that she has been honored as the patron of artillerymen in nearly every country of the world, and the object of the brush of the great masters of art, and that as early as 1920, a page-length photo of Palma Vecchio's celebrated painting appeared in THE FIELD ARTILLERY JOURNAL.

AT THE siege of Jerusalem, the Romans, according to 1st Lt. John P. McWhorter, Engr Res, in the March-April *Military Engineer*, painted the rocks hurled by their ballistae the color of the sky, so that

the besieged could not see them coming, and dodge.

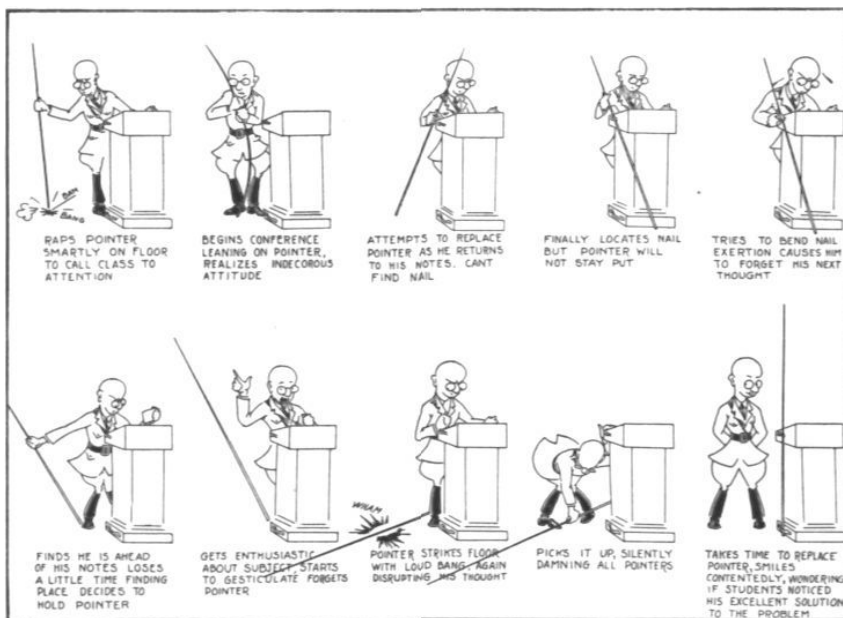
It is most annoying, not only to be reminded that science has made so little progress, but that so many lost arts—bronze-tempering, for instance—stay lost. One may be pretty sure, too, that the recruit legionary of those days was sent to the supply sergeant for sky paint, "the dark—not the light."

MILITARY DEFINITIONS in terms of the sport page:

Tactics. "Never give a sucker an even break."

Dispersion. "Close—but no cigar."

Forward, March. "Don't lead with your right."



MANUAL OF THE POINTER
—Captain Rex Chandler, FA.

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