

Courtesy of *Janes' Fighting Ships*

#### H. M. S. NELSON

Two ships, the *Nelson* and the *Rodney*, are of the same class. Both were completed in 1925 and conform to the Washington agreement of 1922. The following are the important characteristics: Displacement, 35,000 tons; Length, 702 feet; Beam, 106 feet; Draught, 30 feet; Speed, 23.5 knots; H. P., 45,000. Armament: 9—16-inch; 12—6-inch; 6—4.7 A.A.; 2—Torpedo tubes. Armor: Largely concentrated over guns and magazines in fore part of ship. Thickness, 14-inch (belt); Turrets, 9—11-inch. The 16-inch gun is a new caliber in the British service. By grouping the big guns forward, fire control is facilitated and the risks attendant upon locating magazines in the after part of the ship are obviated. The 6-inch guns have exceptional elevation and can presumably be used as A.A. The ships are said to be designed to withstand the simultaneous explosion of four torpedoes.

## Report Documentation Page

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# THE COAST ARTILLERY JOURNAL

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## Comments on the Revision of T.R. 435-55, Coast Artillery Target Practice

By THE COAST ARTILLERY BOARD

NOTE: The revised T.R. 435-55 which will become effective July 1, 1930, has been approved and is now being printed. In order that the Coast Artillery Corps may have an opportunity to study these regulations and to better explain those features which may appear to be departures from previous methods of scoring, the Coast Artillery Board has prepared, in four parts, for the JOURNAL, an article dealing with the new score. Parts I and II are published below. Part I consists of extracts from the new target practice regulations and includes those sections which are of immediate interest to seacoast batteries. Part II is a discussion of Part I. Parts III and IV (to be published later) will be similar to Parts I and II, respectively, but will deal with the score for antiaircraft artillery.

The changes in T.R. 435-55 are not limited to the extracts that will be given in these articles. The entire text has been revised and hardly a paragraph has been left unchanged. The method of scoring for antiaircraft artillery, particularly guns and machine guns, has been completely changed and bears no resemblance to the score now in effect. New illustrative problems with complete analyses have been prepared.

### PART I—SEACOAST ARTILLERY TARGET PRACTICE

#### 13. TARGETS.

a. *Hypothetical*—Hypothetical targets, used in connection with the scoring, are rectangular parallelepipeds with approximately the same vulnerable area as: the battleship “*California*”; a U. S. destroyer, flush deck; and the U. S. transport “*Henderson*.”

(1) *Battleship*—This target is for use with mortars and guns of 8-inch caliber and greater. Deck, thirty-two yards by one hundred and sixty yards. Hull (above water), ten yards; hull (below water), four yards. Sides and ends of ship, vertical.

(2) *Destroyer*—This target is for 3-inch, 6-inch, and 155-mm. seacoast guns with exceptions noted in the following paragraph. Deck, ten yards by eighty yards. Hull (above water), five yards; hull (below water), two yards. Sides and ends of ship, vertical.

(3) *Transport*—This target is for 155-mm. guns firing record service practices at a range of fourteen thousand yards or more. Deck, twenty yards by one hundred and fifty yards. Hull (above water), ten yards; hull (below water), four yards. Sides and ends of ship, vertical.

b. *Standard pyramidal or improvised targets*—The center of the danger space of the hypothetical target is marked by the standard pyramidal or improvised target at which fire is directed. The standard target is that supplied by the Ordnance Department under existing regulations. Improvised targets may be constructed locally to increase visibility, improve coincidence range finding, or facilitate spotting. The latter is especially desirable when firing 3-inch guns and adjusting fire by the

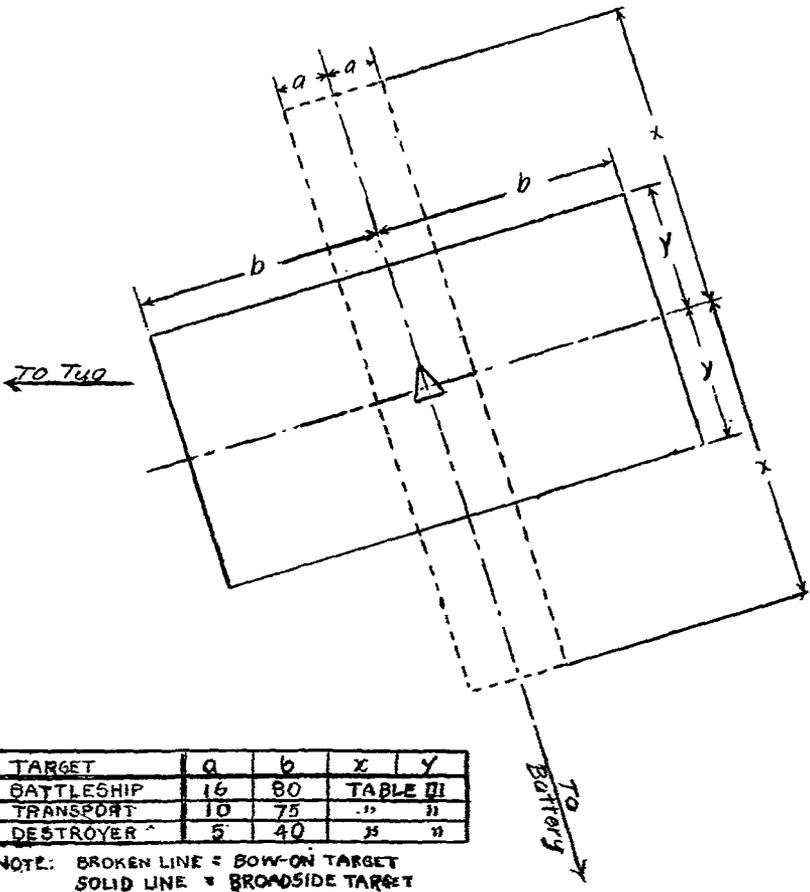


FIG. 1. DIMENSIONS OF THE DANGER SPACE (in yards)

bracketing method. Small improvised targets may be used for sub-caliber practice.

18. ADJUSTMENT OF FIRE.

a. Trial fire.

\* \* \*

(3) *Number of shots for trial fire*—Unless otherwise authorized by the

War Department, trial fire will be limited to four shots for each record practice. "Settling" and calibration shots will not be fired on the day of practice.

## 19. OFFICIALS AND THEIR DUTIES.

### a. *Time keepers.*

\* \* \*

(7) The time of practice is that of record firing and includes *all* fire except trial fire.

(a) Time for record fire for the battery is the mean of the corrected times of the separate guns computed as in the example.

(b) Time for record fire for a gun begins at the command COMMENCE FIRING for the battery and ends when that gun fires its last shot. The breech-block will be closed and locked and the gun will not be loaded until the command COMMENCE FIRING is given. Time-out for a gun will be deducted to obtain its corrected time. When materiel failure occurs in salvo fire, time-out will be allowed only on the piece on which the failure occurred. A deduction of time during the firing of a series will be allowed only for

(1) Interference of vessels.

(2) Delays incident to movements of the towing tug.

(3) Defects in materiel which could not, in the opinion of the Harbor Defense Commander, or his representative, have been foreseen and remedied by the Battery Commander.

(4) Determination of the sources of excessive lateral deviations in mortar or howitzer firing.

(5) Obscuration of target, except when resulting from smoke or dust incident to the firing.

## 21. ANALYSIS OF SERVICE PRACTICE.

a. The object of the analysis of target practice is to determine the proficiency of the firing unit and the performance of the materiel. These can only be studied after the collection and orderly arrangement of all data used during the practice. These data are used in the determination of the score which, in itself, serves as a measure of the practice. For this analysis it is not necessary to determine individual errors but the errors made by the firing unit, as a whole, are determined. The analysis is both tabular and graphical.

b. *Example*—The example given (in another paragraph of the regulations) was carried through the analysis of drill. This same example, including the assumed trial shot data, will serve to illustrate the analysis of practice.

(1) *Records required*—In this example Forms 1, 3, 5, 6, 7, 9, 11, 17, 18, 19, 20, 21, 23, 24, and 25 will be required.

TIMEKEEPER'S RECORD

Shot No.	TIME												CAUSE OF DELAY	TIME OUT ALLOWED											
	PIECE NUMBER													PIECE NUMBER											
	1			2			3			4				1			2			3			4		
Trial	h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
1	1	10	20																						
2	1	13	20																						
3	1	15	20																						
4	1	18	20																						
Record	0	25	38	1	25	38																			
1-2	1	26	00	1	26	00																			
3-4	1	26	30	1	26	30																			
5-6	1	27	00	1	27	00																			
7-8	1	27	30	1	27	30																			
9-10	1	28	00	1	28	00																			
11	1	28	30																						
12				1	29	00																			
In action																									
R.F. ....	2	52		3	22																				
Less time	0	00		0	00																				
out .....																									
Corrected																									
Time R.F.]	2	52		3	22																				

Time per shot per gun R.F. =  $\frac{2^m 52^s + 3^m 22^s}{12} = 31.2 \text{ Sec.}$

Total Corrected Time R.F. =  $\frac{2^m 52^s + 3^m 22^s}{2} = 3^m 07^s = 3.1^m$

AM PM

Examined and approved:

—C.A.C., Timekeeper

(2) *Tabular analysis* (Form 23)—To complete this form the following procedure should be followed:

(a) Replot the course using the B' and B'' readers' forms (1 and 3), corrected where necessary for personnel errors and to give uniform values in the difference columns. Also replot the trial shot impacts using the trial shot data on Forms 1 and 3.

(b) Upon the replot of the course determine the position of the target at each instant of impact by plotting the azimuth of the target (Form 17). Record the ranges to these points on line 2. In the case of the trial shots enter the range to the trial shot point from Form 5.

(c) Check the pointer settings on Form 6 against the original sources. Using the ranges from line 2, re-operate the range correction board to determine the ballistic correction that should have been applied in each case. Convert these values into yards and enter on line 3.

(d) From the Battery Commander's record (Form 17) and the range percentage correction board operator's record (Form 7), determine the Battery Commander's correction which was actually ordered and the salvo to which applied. Enter these values on line 5 under the shots to which they were applied.

(e) Determine the ranges at which the pieces were actually laid from the display board record (Forms 9 and 11) and enter on line 7.

(f) Determine the actual deviation of each splash from the plot of impacts. This requires the use of the records of lateral deviations (Form 19) and range deviations (Form 20). Enter these values on line 9.

(g) Enter on line 16 the range deviations reported by the spotting section, from the Battery Commander's record (Form 17).

(h) The remaining lines on this form are filled in as indicated on the form itself.

(3) *Plot of impacts*—From the record of range deviations and the record of lateral deviations the Battery Commander will plot the position of the impacts with reference to the pyramidal target as follows:

(a) Cross-section paper (one-tenth-inch) will be used.

(b) Plot the position of the target at the intersection of two heavy lines of the cross-section paper.

(c) Along one of the heavy lines lay off the length of the towline (Scale: one inch equals one hundred feet) and plot the position of the towing vessel.

(d) From the target, lay off the line of direction to the battery. The angle vessel-target-battery (VTG) will be determined from the plotting board, using the replot of the target course and assuming that the towing vessel has passed over the same course as the target.

(e) Draw through the target a line perpendicular to the line of direction from target to battery.

(f) Lay off from the target, on this line, the deviation in yards to the right or left of the target as shown on Form 19 in the column "Deviation yards." Mark the point, thus determined, "d."

(g) Through d draw a line parallel to the line of direction from target to battery (da).

(h) On the heavy line through the target perpendicular to the towline lay off from the target the deviation in yards shown on Form 20 and mark the point, thus located, "C." When camera records have been obtained and recorded on Form 20 they are to be used and the range records discarded.

(i) Draw a line from the towing vessel (V) to C.

(j) The line da represents, with sufficient accuracy the line along which the lateral observer saw the impact, and the line VC represents the line along which the range observer saw the impact. So the point S, the intersection of the two lines, represents the position of the impact with respect to the target.

(k) By measuring the length of the line ds, we have the range deviation of the impact. This value is entered in line 9 of Form 23, and together with the lateral deviations (Form 19) determine whether or not a hit has been secured.

(i) When two or more shots fall at the same time it will be impossible, with the methods now available, to plot with certainty the two points of impact. Unless the Battery Commander is able to tell from the records of his observation of fire which pair of plotted points represents the true positions of impacts, he will use the greatest deviation (Form 20) with the greatest deviation (Form 19), the next greatest deviation (Form 20) with the next greatest deviation (Form 19), and so on, to determine the points of impact. There is no assurance that this method will determine the correct points of impacts; it is prescribed solely for the purpose of uniformity.

*c. Graphical analysis*—The graphical analysis is designed to present a picture of the more important aspects of the practice as a whole. The graph shows, in chronological order, what actually happened; the progress of the shoot (center of impact of actual deviations); what information was available to the Battery Commander as to the fall of the shots (plot of the splotted deviations); what action was taken (adjustment corrections applied). These items are all indicated on the graph by means of distinctive symbols. In addition, the graph shows the magnitude of the personnel errors, the developed and theoretical armament errors, the dimensions of the danger space area and other pertinent data. While the graph is based on range deviations alone, the magnitude of the lateral deviation of each shot is indicated, so that a complete picture of the fall of the shots with reference to the danger space is presented. The graphical analysis will be made on Form 24 (Figure 3). The symbols that appear on this form will be used in preparing the graph.



(1) The vertical scale is in yards, over or short, and the horizontal scale in time. A suitable scale will be chosen for each. Black ink, only, will be used in preparing this graph. A heavy horizontal line will be drawn leaving one and one-half inches at the left for binding. This line will be used throughout to represent the position of the target. A vertical line extending one-tenth inch above and below the target line will be drawn on the time line of each shot or salvo to represent the position of the pyramidal target. Directly above these vertical lines and near the top of the graph the appropriate symbol will be used to indicate the number of shots in the salvo, the number of cross lines drawn in the symbol indicating the number of shots. These symbols will be drawn for both trial and record fire. Immediately below these symbols, for record fire only, will be placed the serial number of the salvo. The lateral deviation in yards to the right (left) of each impact, as determined from the plot of impacts, will be indicated in small figures at the right (left) of the cross lines. The order, downward, in which these figures are placed is the same as that of the plotted impacts pertaining to the same time line. The figure on the uppermost cross line is the lateral deviation of the uppermost impact, and the figure on the next cross line is the lateral deviation of the next uppermost impact, and so on. Shots fired before record fire will not be plotted with respect to time but the time of the first and last of such shots will be noted on the graph. The symbol for COMMENCE FIRING will be plotted on the axis.

(2) From the target line plot

(a) Each range deviation from the target as determined from the plot of impacts (line 9, Form 23).

(b) The center of impact of each salvo when salvo fire is used (line 9a, Form 23).

(c) Each deviation from the target as determined by the spotting section (line 16, Form 23).

(3) Trial impacts will be marked with the tactical number of the piece. It will be noted on the graph whether the trial fire was at a fixed target or moving target.

(4) The means of applying the correction based upon trial fire will be noted on the graph as "RCB" (range correction board, "%") (range percentage corrector), or "Flat."

(5) When it is possible to identify the shots from particular guns the impacts will be marked with the tactical number of the piece.

(6) The center of impact of the actual splashes of each series of shots carrying the same correction will be plotted.

(7) The center of impact of the spotted deviations upon which each correction was based will be plotted with its proper symbol. When computing this center of impact, if a part of the group of deviations upon which this center of impact is to be based carry corrections that have not

been applied to the rest of the group, the latter will be adjusted so that all the deviations upon which this center of impact is based will carry the correction applied to the last shot of the group. From the same vertical line with this symbol and near the top of the graph a horizontal line will be drawn to the left, extending as many small subdivisions of the cross-section paper as there were salvos considered in the computation of the center of impact in question. Symbol ← . This line will be broken one space for each salvo which was disregarded in such computation. The number of the salvo to which the correction was applied will be placed after the symbol.

(8) Draw a heavy solid line representing the Battery Commander's adjustment correction (vertically, the amount and sense; horizontally, the shots to which applied). When the magnitude of the corrections vary due to their having been applied as a percentage of a changing range, this variation will be shown by sloping the line from the horizontal so that the distance from the target line to the correction line will represent the amount of the correction in yards to that particular shot.

(9) At the right of the graph the center of impact of all actual splashes (record) will be plotted, using the symbol.

(10) Vertical lines representing the longitudinal limits of the danger space of the broadside and bow-on targets will be laid off symmetrically with respect to the target line and marked as shown in Figure 3.

(11) Dispersion ladders for the DAPE and PE (Table 1) will be drawn on the right of the graph shown in Figure 3. These values will be noted below their respective ladder. When the bracketing method of adjustment is used the value of the assumed PE will also be noted on the graph.

(12) When two or more symbols overlap they will be offset horizontally a sufficient amount to clear each other.

(13) In a convenient position either above or below the target line draw a horizontal axis and construct a graph of errors as shown in Figure 3. On the time line through each shot or salvo an ordinate will be drawn in the proper direction from the horizontal axis and equal in magnitude to the personnel error (line 8, Form 23) occurring on such shot or salvo. When the splashes of the individual shots of a salvo can be identified the personnel error on each shot will be plotted.

(14) When time-out is allowed all guns, a broken vertical line will be drawn at the beginning of time-out and a similar line at the expiration of time out. The notation "Time out for..... (giving reason)" will be made in the space between these lines. If necessary the time scale may be broken. In all other cases when time out is allowed, a notation to that effect will be made—the time scale will not be broken.

(15) The method of showing the Battery Commander's corrections in the successive approximation method is obvious from the foregoing.



(16) When the bracketing method of adjustment is employed the symbols for plotted deviations are placed above or below the target line in accordance with the sensing of the individual shots of the salvo.

(17) The services of master gunners may be utilized in the preparation of this form.

22. SCORE.

For the purpose of scoring, a practice will consist of two parts: trial fire and record fire. The score will be based on record fire. The following is the score for seacoast armament.

$$\text{Score} = A + B + C - D$$

a. A component—Hitting.

$$A = \left( \frac{H'}{P'S} + \frac{H''}{P''S} \right) \times 15$$

S = Number of record shots.

H' = Number of hits on broadside target during record fire.

H'' = Number of hits on bow-on target during record fire.

P' = Probability of hitting broadside target.

P'' = Probability of hitting bow-on target.

In computing the A component, the value of the DAPE used will not be less than one nor greater than one and five-tenths times the PE given in Table I.

(1) *Determination of hits*—Paragraph 13 provides the hypothetical target to be used with each type of armament. The pyramidal target is assumed to be at the center of the danger space and not at the center of the hypothetical target (See Figure 1). The hypothetical target is assumed to be in two positions:

(a) Bow-on, when the longitudinal axis coincides with the gun-target line.

(b) Broadside, when the longitudinal axis is perpendicular to the gun-target line.

(2) Table III gives the longitudinal limits of the danger space for various angles of fall for all types of targets. The lateral limits of the danger space, right or left of the pyramidal target, are as follows:

	<i>Bow-on</i>	<i>Broadside</i>
Battleship .....	16 yards	80 yards
Transport .....	10 yards	75 yards
Destroyer .....	5 yards	40 yards

(a) An impact is a hit when the following two conditions are satisfied:

TABLE III  
LONGITUDINAL LIMITS OF DANGER SPACE  
in Yards, Over or Short, from  
PYRAMIDAL TARGET

Angle of Fall °	Destroyer		Transport		Battleship	
	Broadside	Target Bow-on	Broadside	Target Bow-on	Broadside	Target Bow-on
4 00	55	76	110	146	116	151
4 10	53	74	106	144	112	149
4 20	51	73	102	141	108	146
4 30	49	72	99	138	105	143
4 40	48	71	96	136	102	141
4 50	46	70	93	134	99	139
5 00	45	69	90	132	96	137
5 10	44	68	87	130	93	135
5 20	43	67	85	129	91	134
5 30	41	66	83	127	89	132
5 40	40	65	81	125	86	130
5 50	39	64	79	124	84	129
6 00	38	64	77	123	83	127
6 10	37	63	75	121	81	126
6 20	37	63	73	120	79	125
6 30	36	62	71	119	77	124
6 40	35	61	70	118	76	123
6 50	34	61	69	117	74	122
7 00	34	60	67	116	73	121
7 10	33	60	66	115	72	120
7 20	32	59	64	114	70	119
7 30	32	59	63	113	69	118
7 40	31	59	62	112	68	117
7 50	30	58	61	111	67	116
8 00	30	58	60	111	66	116
8 20	29	57	58	109	64	114
8 40	28	56	56	108	62	113
9 00	27	56	54	107	60	112
9 20	26	55	53	105	59	110
9 40	26	55	51	104	57	109
10 00	25	54	50	103	56	108
10 00	25	54	50	103	56	108
10 20	24	54	48	102	54	107
10 40	24	53	47	102	53	107
11 00	23	53	46	101	52	106
11 20	22	52	45	100	51	105
11 40	22	52	44	99	50	104
12 00	21	52	43	99	49	104
13 00	20	51	40	97	46	102
14 00	19	50	38	95	44	100
15 00	18	49	36	94	42	99
16 00	17	49	34	92	40	97
17 00	16	48	33	91	39	96
18 00	16	48	32	90	38	95
19 00	15	47	30	90	36	95
20 00	15	47	29	89	35	94
22 00	14	46	27	87	33	92
24 00	13	46	26	86	32	91
26 00	12	45	24	85	30	90
28 00	12	45	23	84	29	89
30 00	11	44	22	84	28	89
35 00	10	44	20	82	26	87
40 00	9	43	18	81	24	86
45 00	8	42	17	80	23	85
50 00	8	42	16	79	22	84
55 00	7	42	15	79	21	84
60 00	7	41	14	78	20	83
65 00	7	41	13	77	19	82
70 00	6	41	13	77	19	82

Formula  $5 + 3.5 \cot \omega$   $40 + 2.5 \cot \omega$   $10 + 7 \cot \omega$   $75 + 5 \cot \omega$   $16 + 7 \cot \omega$   $80 + 5 \cot \omega$

NOTE: Since each value in this table is one-half the corresponding danger

Organization..... Place.....

<i>Graphical Analysis</i>	<i>Line No.</i>	<i>Shot No. Gun No.</i>	<i>Trial</i>	<i>Record</i>
	1	Zone		
	2	Actual range to target at instant of splash (From replot)		
	3	Ballistic correction which should have been applied (Re-operation Range Correction Board).		
	4	Line 2/line 3		
	5	B. C. Correction actually ordered (B. C. Record)		
	6	Range at which piece should have been laid, assuming no error made in ordering B. C. Correction (4/5)		
	7	Range at which piece was actually laid (Pointing checker's record)		
<i>Graph of Errors</i>	8	Personnel errors exclusive of spotting errors and errors made in ordering B. C. Correction (7-6)		
o	9	Deviation determined by plotting (Plot of impact)		
	9a	Deviation of salvo center of impact (When spotting is by salvo) (From line 9)		
	10	Repeat line 5		
	11	Deviations stripped of B. C. Corrections (9-10)		
	12	Repeat line 8		
	13	Deviation stripped of B. C. Correction and personnel errors (11-12)		
	14	Center of impact under conditions of Line 13, excluding wild shots		
	15	Armament error (13-14)		
∅	16	Deviation reported by spotting section (B. C. Record)		

Form No. 28 *Trial* *Record*

Average armament error (arithmetical mean of entries in line 15 exclusive of wild shots)  
 DAFE (.845 X average armament error)  
 Average actual range (arithmetical mean of entries in line 2)

(1) The range deviation (line 9, Form 23) does not exceed the value given in the danger space table. In entering the table use the angle of fall corresponding to the mean actual range of all record shots. In using this table, results will be brought out to the nearest yard, dropping fractions less than five-tenths yard.

(2) The lateral deviation (Form 19) does not exceed the value given above.

*b. B component—Accuracy.*

$$B = 30 \frac{M + N}{d} - 10$$

M = Value shown in Table I divided by 0.845.

N = Average armament error (Form 23).

$$= \frac{\text{DAPE range (stripped of wild shots)}}{0.845}$$

D = Mean of actual range deviations, record fire (arithmetic mean of entries (in line 9, Form 23) stripped of wild shots).

(1) *Determination of wild shots*—A shot is defined as wild when the armament error of the shot is greater than four times the DAPE. This rule is to be applied as follows: Compute the data for lines 14, 15, and the DAPE (Form 23). Select that shot which has the greatest armament error (line 15) and apply the rule. If the shot is wild, recompute lines 14, 15, and the DAPE (Form 23) excluding the wild shot. From the remaining shots, select the shot having the greatest armament error (line 15) and apply the rule again. This process is to be repeated until all wild shots are excluded. In no case will a shot be regarded as wild if the armament error of the shot is less than six times the probable error as given in Table I.

*c. C component—Time.*

$$C = 30 - 10 \left( \frac{gt}{ks} \right)^2$$

g = Number of guns firing.

t = Total corrected time of record fire, in seconds.

s = Number of record shots.

k = Number of seconds prescribed as the normal time of firing one shot per gun with the following values:

90—Railway mortars

80—14-inch turret mount

80—14-inch railway mount

50—12-inch seacoast mortar

45—16-inch howitzer and gun

45—Case III, 14-inch D. C., 12-inch B. C., 12-inch D. C. guns

- 40—Case II, 14-inch D. C., 12-inch B. C., 12-inch D. C. guns
- 40—10-inch D. C. gun
- 40—8-inch railway gun
- 18—155-mm. gun
- 18—6-inch D. C. gun
- 12—6-inch B. C. gun
- 5—3-inch B. C. gun

*d. D component—Penalties.*

(1) For each shot that falls outside the limits of the broadside target, in direction, a penalty shall be imposed equal to the score for the B compound divided by the total number of record shots—provided, that the divisor shall never be less than twelve, e. g., a battery fires sixteen record shots obtaining a score of forty-eight in the B component; three shots fall outside the limits of the broadside target in direction. The penalty to be imposed is  $3 \times \frac{48}{16}$  or 9.

(2) *Lost or wild shots*—During day practice, for each shot lost, and for each wild shot, a penalty of five points shall be imposed. No penalty will be imposed for lost shots during night firing. A shot shall be regarded as lost when its point of fall cannot be determined by the officials responsible for the records of the range and lateral deviations.

*e. Form for computation*—A form for computing the score is provided on the reverse side of the graphical analysis (Form 24). This form for computation contains detailed instructions as to the computation of the score. A careful study of these instructions is necessary in order that the score be correctly computed. The quantities substituted in the formulas for the components of the score must be shown on the computation sheet in order that the computations may be checked. The form for computation is shown in Figure 5. When mortars fire in more than one zone, special instructions will be issued covering the method of computing the score.

## PART II—DISCUSSION

The matter contained in Part I will be discussed in the following somewhat more fully than would be possible in the training regulation itself, and the reasons underlying some of the features that are new will be indicated. Frequent references will be made to the present score. This, however, is merely for the sake of emphasis or illustration and is not to be construed as interpreting the new score in terms of the one now in effect.

*The new target.* (Par. 13 *a, b*). The revision of T.R. 435-55 presented two distinct problems. The first was to establish the score on a more rational basis; the second was to simplify the procedure involved in pre-

"A" COMPONENT—HITTING	SCORE
<p>1. <i>Broadside Target</i></p> <p>Mean actual range = _____ which gives <math>\omega</math> = _____                      From Table III, <math>\frac{1}{2}</math> D.S. = _____</p> <p>and <math>F'r = \frac{\frac{1}{2} \text{ D.S.}}{\text{DAPE}} = \frac{\text{_____}}{\text{_____}} = \text{_____} =</math></p> <p>From Table II, <math>P'r =</math> _____</p> <p><math>A' = \frac{H'}{SP'r} \times 15 = \frac{\text{_____}}{\text{_____}} \times 15 =</math> _____</p>	
<p>2. <i>Bow-on Target</i></p> <p>From Table III, <math>\frac{1}{2}</math> D.S. = _____</p> <p><math>F'r = \frac{\frac{1}{2} \text{ D.S.}}{\text{DAPE}} = \frac{\text{_____}}{\text{_____}} =</math> _____</p> <p>From Table II, <math>P'r =</math> _____                      From Table I, PE in direction = _____</p> <p><math>F'd = \frac{\frac{1}{2} \text{ width target}}{\text{PE in direction}} = \frac{\text{_____}}{\text{_____}} =</math> _____</p> <p>From Table II, <math>P'd =</math> _____</p> <p><math>A' = \frac{H'}{SP'r \times P'd} \times 15 = \frac{\text{_____}}{\text{_____}} \times 15 =</math> _____</p>	
<p>"B" COMPONENT—ACCURACY</p> <p>PE from Table I = _____</p> <p><math>M = \frac{\text{PE}}{.845} = \frac{\text{_____}}{.845} = \text{_____} ; N = \frac{\text{DAPE}}{.845} = \frac{\text{_____}}{.845} = \text{_____}</math></p> <p><math>B = 30 \frac{(M + N)}{d} - 10 = 30 \left( \frac{\text{_____}}{\text{_____}} \right) - 10 =</math> _____</p>	
<p>"C" COMPONENT—TIME</p> <p><math>C = 30 - 10 \left( \frac{gt}{KS} \right)^2 = 30 - 10 \left( \frac{\text{_____}}{\text{_____}} \right)^2 =</math> _____</p>	
<p>TOTAL "A" + "B" + "C"</p>	
<p>"D" COMPONENT—PENALTIES</p> <p>1. Direction:  <math>q</math> = No. of shots whose lateral deviations are greater than <math>\frac{1}{2}</math> length of target = _____  <math>S</math> = No. record shots = _____                      Penalty = <math>(q/S) \times B</math> component = _____</p> <p>2. Lost or wild shots.                      No. shots lost = _____ No. shots wild = _____                      Penalty = <math>5 \times \left( \frac{\text{_____}}{\text{_____}} \right) =</math> _____</p> <p style="text-align: center;">TOTAL "D"</p>	
<p>TOTAL SCORE = "A" + "B" + "C" - "D" = _____</p>	

I certify that the graph and the computations above are correct.

..... C.A.C.  
 Battery Commander



paring the report of record practice. The first step in connection with the latter was to change the form of the hypothetical target, and the rectangular target was decided upon because hits could be determined with such a target without resort to any special drafting operations. The method of determining hits is given in Par. 22 a.

“*Trial fire will be limited to four shots for each record practice.*” (Par. 18 a (3).) This provision was inserted to remove the doubt which seems to exist on this point. In several record practices, more than four trial shots were used. In one case eighteen shots were fired during trial fire. In some cases the extra shots were called “settling shots” even though the “settling” shots were used in determining the correction applied on the record shots.

In this connection it might be well to state that the new regulations do not give ammunition allowances. Such items will be included in special instructions to be issued at least once a year. These instructions will also contain information as to special methods of conducting practice where such methods are not provided for in the target practice regulations.

*Tabular analysis.* (Par. 21.) The tabular analysis has been greatly simplified (Form 23). The number of lines has been reduced, the line headings rewritten to eliminate ambiguities, and the lines have been rearranged so that the form can be used as a work sheet. Under the new score, no tabular analysis in direction is required.

*Graphical analysis.* It is hoped that the graphical analysis will prove easier to prepare than the present one. The heading has been completely changed so that the data required can be tabulated in one line reaching across the top of the form. Black ink only will be used in preparing the graph. The symbols employed in the graph were revised so that only circles and straight lines are drawn. No squares or triangles are required. The graph also shows the fall of the shots in direction as well as range.

*The score.* (Par. 22.) The score for seacoast artillery is based on four components: A, B, C, D; the score for a practice is  $A + B + C - D$ . D, the penalty component, is always subtracted. B and C also may, in extreme cases, be negative.

The A component, or hitting component, has a formula of the same form as in the present score:

$$A = \left( \frac{H'}{P'S} + \frac{H''}{P''S} \right) 15$$

The only innovation is that in determining the value of P, the probable error used shall not be less than one times, or greater than one and five-tenths times, the value of the probable error given in Table I of T.R. 435-55. The par value for this component is thirty: fifteen for the broadside target and fifteen for the bow-on target.

The formula for the B component, or accuracy component, is

$$B = \frac{M + N}{d} 30 - 10$$

While this formula is new, the principle is the same as in the present score. Comments accompanying annual target practice reports seem to indicate that few officers understand the significance of the B component. A separate discussion<sup>1</sup> has been prepared giving a mathematical analysis of the B component. In that article it is shown that the B component is a measure not only of accuracy of fire but also of accuracy of practice. It is for this reason that the new score places most emphasis on the B component.

The par score for the B component is fifty, and is attained when the center of impact of all record shots is on the target and the DAPE is equal to the proving ground probable error (Table I).

The C, or time component, has the formula:

$$C = 30 - 10 \left( \frac{gt}{KS} \right)^2$$

This formula is entirely new. It is of such a character that the bonus for beating K is limited. For example, the par value is twenty as compared with thirty-five under the present score. If a battery has a K of forty seconds and shoots in thirty, the bonus is only four and four-tenths. In the present score, assuming a par of twenty, the bonus would be six and six-tenths. On the other hand, if the battery exceeds K by 10 seconds, the score of this component will be fourteen and four-tenths, a penalty of five and six-tenths, while under the present formula, with a par of twenty, the penalty would be only four. If the developed K is one and seventy-three-hundredths times the normal K, the C component becomes zero. It is hoped that the limited bonus which this formula gives for beating K, and the greater penalties which it imposes for exceeding K, will lead a Battery Commander to fire his practice in about par time and devote his energy and ingenuity in improving other features of his firing.

The D (penalty) component marks a distinct departure from the present score. In the new score there will be but two classes of penalties imposed: five points for each lost shot or for each wild shot, and for each shot that misses the broadside target in direction, a penalty equal to the B component divided by the total number of record shots. In determining this penalty, if the number of record shots is less than twelve, the penalty will be one-twelfth of the B component. There are no penalties for personnel errors. When this feature of the score was proposed, the usual argument was cited as to the possibility of two excessive personnel errors compensating each other thereby securing a hit. To refute this it was

<sup>1</sup> NOTE: See Professional Notes.

stated that the success of a practice should be measured by the fall of the shots and this common-sense view prevailed.

One important feature in which the new score differs from the present one is that no component of the new score is limited by special conditions of adjustment or rate of fire. The score is based entirely on the fall of the shots and the time in which they were fired.

Another feature to be noted is the relative weight attached to each component. In the new score, out of a par total of one hundred, the par for the A component is thirty as compared with twenty-five in the present score; the par for B is fifty as compared with forty at present, and the par for C is twenty as compared with thirty-five in the present score.

*The discipline, morale, training and organization that give men the will and the power to suffer, to sacrifice, and to win, do not spring up over night. They must come from habitually living in accordance with the military code. With the small number of our man-power incorporated in the military establishment, it is the more important that they should be highly trained so as to impart rapidly the requisite knowledge and standards to the masses who must be absorbed in a national emergency. It was no accident that four millions of men became soldiers and two millions successfully engaged in campaign and battle in 1917-1918. Rather it is a tribute to the organizing ability, knowledge and leadership of the small nucleus of officers and men who composed the Regular Army and the National Guard forces before the war.—*  
From an address delivered at Washington by General Charles P. Summerall, Chief of Staff.

# Communications To and From Airplanes in Flight

By CAPT. FRED G. BORDEN, Signal Corps

**EDITOR'S NOTE:** *Communications have had a great effect upon the size of armies and the tactics employed in combat. The armies of antiquity were small due to the limitations of the communications of those times rather than the inability to assemble and supply large numbers of fighting men. Communications have been compared to the nervous system of the human body. One of the most common examples of the failure of the human nervous system is due to a cause which is still a matter of common knowledge. This well-known failure of the human "communication" system to function properly may result in an entire loss of the power of coordination, locomotion, and articulation. The absence of an efficient system of communication for air forces also results in an inability to coordinate, to make the decisions of the commander known to the component parts of large air units during the execution of a mission, and is a serious handicap in developing Air Corps tactics to the fullest extent. No doubt this problem will be solved eventually since our Signal Corps is attacking it energetically. Antiaircraft artillerymen should anticipate its solution and visualize conditions which will exist when confronted by air force units greatly exceeding in size those of the present and instantly responsive to the direction of their Commanders.*

*The following article discusses the technical difficulties hampering the development of air communications. It appeared, originally, in the Signal Corps Bulletin.*

**T**HE will of a commander can be imposed on his subordinates only by conveying to them at the proper time his orders and instructions. It must be realized that formation of pursuit of the size of a group or larger will probably be common in any future war. Since control of the air will be necessary to eventual success, each belligerent will use all air power available to attain this end, and it is evident that if performance of airplanes, skill of pilots, and other factors be equal, aerial battles will be won by the combatant having the largest number of aircraft engaged. Any first-class power is now able to assemble a group of one hundred pursuit planes, and it is probable that the next war will see engaged in combat hundreds of aircraft on each side. The principle of war, mass, will require that this be the case, and the principle, cooperation, will require that they be under the control of one man. Many methods of visual signaling are available between individual planes and throughout small formations up to about twenty-five airplanes which are adequate, quick, and satisfactory, but above that number visual signals are impracticable; therefore, the only other communication available, radio, will be discussed. The necessity for such communication is well understood. A joint board of Air Corps and Signal Corps officers meeting in Dayton, Ohio, November 5, 1928, stated: "It is the opinion of the board that a short-range command radio-telephone set has become a necessary item of bombardment, attack, and pursuit equipment. The group and squadron commanders must be able to communicate with each other in the air if the tactical employment of aircraft is to be further developed." Great Britain is

equipping all of her military airplanes with radio sets. France and Italy are closely studying the subject, and our own Navy will have a receiving set in every airplane and a two-way set in each command plane.

In addition to other technical considerations which will be discussed later, the design of a satisfactory radio set for a pursuit plane and its installation offer many difficulties. The pilot of a pursuit plane while on a mission during a war may be compared to the driver of an automobile in a race in that he is required to exercise every faculty constantly and almost to the limit of human endurance. He must be dressed in electrically-heated clothing and use bulky gloves to withstand subzero weather. He must be strapped tightly to his seat, and he often uses oxygen equipment. It is evident, therefore, that any radio set suitable for the present type of pursuit plane must be practically self-operating.

Three of the most important characteristics of a pursuit airplane are speed, rate of climb, and ceiling. A radio set which requires a larger fuselage affects speed. The weight of the set affects climb and ceiling, and, in any case, weight and size of the set must be a compromise between what is lost in performance to what is gained by having communication. The more the subject is studied the more apparent it becomes that the absolute necessity of adequate communications must over-balance any detrimental factors, and the problem becomes one of proper design. Fortunately, from a communication standpoint, it is very probable that the future pursuit plane will carry personnel in addition to the pilot. Size and weight of a radio set will not be such important factors, and the set can be operated much better by an observer than by a pilot. We will assume, therefore, that the group commander will impose his will upon his command by means of radio; not because it is at present satisfactory and reliable, but because it is the only means, and we will leave until later a discussion of the probable characteristics of the set.

Radio was used more or less successfully between airplanes in flight during the war, and the question as to why no apparent progress is being made in the development of communication between airplanes in flight is pertinent. The lack of progress is due to many causes, most of which are technical; therefore, it seems proper to discuss briefly some elementary characteristics and limitations of radio.

There are five elements necessary to transmit a radio signal from one point to another. These are (1) apparatus capable of creating an alternating current of electricity of high frequency; (2) apparatus to carry this current to the conducting medium; (3) a conducting medium; (4) apparatus capable of collecting the current from the conducting medium and carrying it to the receiving set; (5) apparatus to modify in some way this high-frequency current to bring it within audible range. Of the five elements mentioned, the first and last offer no difficulties. In other words, the radio transmitting set and the radio receiving set, unless unduly restricted as to size and weight, have now been perfected to such an extent

as to give performance comparable to that of any other method of electrical signaling. The fourth element—the receiving antenna—offers no difficulty whatsoever. A readable signal from thousands of miles away can be received by an antenna two or three feet square, and it is therefore evident that failure to perfect radio communications from airplanes is due to two of our elements—the second and the third, i. e., the transmitting antenna and the conducting medium, the latter an element of which we know little, over which we have no control, and which we call ether.

It has been brought out that radio is an alternating current of electricity of high frequency. By an alternating current we mean one which, starting at zero, attains maximum positive potential, falls through zero to maximum negative potential, and returns to zero. These changes are periodical and the value of the potentials from one fraction of a second to another form a sine wave and the entire change is known as a cycle. The distance between corresponding points of adjacent waves is the wave length and the number of times per second that the complete change occurs—or the cycles per second—is the frequency. There is, of course, a definite relation between wave length and frequency. Radio travels at the speed of light, which is one hundred and eighty-six thousand miles, or three hundred million meters, per second; therefore, frequency equals three hundred million divided by wave length in meters, or conversely wave length equals three hundred million divided by frequency. The frequencies used in radio are very high, from about one hundred thousand to thirty million cycles per second. The human ear has a range of from twenty to thirty thousand cycles per second. Radio sets using wave lengths of from ten to about one hundred meters are known as high-frequency sets; from about one hundred to one thousand or two thousand meters, intermediate frequency; and above that as low-frequency sets. The high and intermediate frequencies only are used in airplane sets.

Returning to the two principal sources of difficulty in perfecting radio transmission from airplanes, we noted that one was the transmitting antenna. Two types are in use—a weighted wire, which is unreeled to a length of one hundred or two hundred feet, is called a trailing antenna, and an antenna supported some four feet above the wing to a strut near the tail is called a fixed antenna. A transmitting antenna is fairly efficient when its length is about one-fourth of the wave length used, its efficiency dropping rapidly as this length is reduced. Due to the small size of the airplane, it is difficult to build a fixed antenna of more than about twenty feet, or between six and seven meters, which is efficient for wave lengths up to about thirty meters; but due to certain characteristics of such high frequencies, which will be mentioned later, they are not practicable, and experiments indicate that an antenna of this length will not efficiently transmit a radio signal of a frequency which is practicable. The problem is similar to that which would be encountered if we tried to use a 12-inch propeller on a four hundred-horsepower engine.

The problem has been attacked from all angles by the Signal Corps aircraft radio laboratory at Wright Field and by many private concerns, but up to the present, results have not been satisfactory. A comparison between a trailing antenna and a fixed antenna using the same transmitting set shows that the trailing antenna will transmit an eighty-meter wave about five times as far as will a fixed antenna. Due to the difficulty in obtaining proper characteristics as to capacity and inductance of even a trailing antenna, a transmitting set will send readable signals from an airplane only about one-third as far as will the same set on the ground; therefore we can assume that, other things being equal, a set which will transmit a signal seventy-five miles when used as a ground set will transmit only something like five miles from a plane using a fixed antenna. Trailing antenna can be used more or less satisfactorily on observation airplanes and on bombers. On pursuit airplanes, which dive at full throttle, loop and roll, a trailing antenna can not be used, nor can it be used on an attack plane, which not only maneuvers rapidly but also flies just over the tree tops, fences, and other obstructions. On these two types fixed antenna are necessary. That the problem of transmitting satisfactory radio signals by means of a small fixed antenna will eventually be solved goes without saying, but up to the present it has presented one of the most difficult problems in the art of radio.

Let us now consider the third element necessary to the transmission of radio signals—the conducting medium, or ether. We know nothing about the ether, even that it exists, but since there must be something that conducts radio signals, we assume that it has certain characteristics and that it permeates all space and all substances, and we call it ether. The transmission of radio waves is but little understood. For example, a high-frequency wave of forty meters will be heard distinctly at a distance of perhaps ten miles, can not be picked up again within a distance of two or three hundred miles, and can be easily read at a distance of several thousand miles. This dead space varies from day to day and even from minute to minute and is called the sky distance. The tendency of high-frequency signals toward phenomena of this kind render them very difficult to properly control. Using waves of any frequencies within the high or intermediate bands, many phenomena which have not been satisfactorily explained will be noted. For example, the same transmitting set will send a readable signal about three times as far at night as it will in the daytime, and about three times as far in winter as in summer. Now let us compare the range of a transmitting set in an airplane under unfavorable conditions (and it will have to operate under unfavorable conditions at times) to the range of a similar set on the ground on a winter night. The set which will transmit signals only five miles from a fixed antenna in an airplane will transmit around six hundred or seven hundred miles from a ground set on a winter night. This is the range of a

pretty good broadcasting station, which will weigh in the neighborhood of half a ton and occupy a space about the size of a fuselage. To obtain a range of fifteen miles from a pursuit plane, we must design a set about three times as powerful as our broadcasting station, and which will weigh complete around seventy-five to one hundred pounds, while occupying a space of less than one cubic foot.

The problem seems difficult of solution, but we have progressed a long way and it is only a matter of intelligent experimentation and time until it will be completely solved. As an example of what is being done we will mention one phase, that of supplying current to a radio set by means of a new engine-driven, double-voltage generator developed by the Signal Corps aircraft radio laboratory. The set operates little or no differently than when using batteries and other equipment, and the saving in weight over airplane sets as at present installed is as follows: Bombardment, one hundred and ninety pounds; observation, forty-one pounds; pursuit, thirty pounds. The generator set in the pursuit plane also furnishes current for gun synchronization, for heating element in clothing, etc.

Radio is a laboratory product and has characteristics more closely allied to laboratory equipment than to a simple, portable piece of apparatus which can be used by anyone who can turn a dial. Its extreme delicacy is not generally realized. For example, the energy required to raise the temperature of one teaspoonful of water one degree is sufficient to maintain an audible note in an ordinary radio head set for several thousand years. The human voice—the only available means with which to modulate the wave used for radiotelegraphy has a power equal to twenty-five-millionths of a watt. A change in distance of one one-thousandth of an inch between plates of fixed condensers, commonly used in radio sets, will change the frequency of the set by thousands of cycles. It is not surprising, therefore, that radio sets are complicated and require skillful operation, but it is almost a miracle that they operate at all.

Before we can arbitrarily decide as to the kind of radio equipment best suited for various classes of aviation, it will be necessary to study the problem from two angles: First, characteristics of radiotelephone and of radiotelegraph sets; second, the probable need for communications (a) within each class of aviation, (b) between various classes, (c) between plane and ground, and (d) between Army units—both air and ground—and Navy units of all types.

Comparing first, radiotelephony to radiotelegraphy we can say that except for the single fact that radiotelegraphy requires two skilled operators for each message while telephony does not, that all factors favor telegraphy.

Under the same conditions, a radio set which will transmit a readable continuous wave (cw) telegraph signal for sixty miles using fifty watts, will require about one hundred and fifty watts to transmit a telephone

signal for the same distance. In a frequency band which allows only two radiotelephone sets to operate without interference, we can use ten or more radiotelegraph sets, and when we consider that a field army has something like one thousand two hundred radio sets, the need for conserving channels is evident. The microphone of the telephone set picks up noise caused by the engine, propeller blast, etc., which interferes with transmission of speech. The radiotelegraph is not affected by noise at the transmitting end. A telegraph set is much lighter, smaller, and simpler than a telephone set of the same range. Telegraph signals can be read through static and other interference that would render a telephone set useless. Except in the rare instance when the originator and the addressee are in direct communication, a telegraph message is faster than a telephone message and it is always more accurate. Telegraphy is more suitable than is telephony for sending messages in code.

In consideration of all of its obvious advantages, we must conclude that except in cases where its use is impossible, radiotelegraphy is far superior to radiotelephony.

In considering the cases where it is, to all intents and purposes, impossible to employ radiotelegraphy we find that in all instances where the pilot must operate the set, radiotelephony must be the agent. A pilot possesses certain faculties developed to a much higher degree than in the average man and other faculties that are not common. It is very probable that there never will be sufficient thoroughly trained pilots, and it is obviously shortsighted to insist that all be telegraph operators. The offensive power of aircraft and of anti-aircraft weapons has developed far ahead of the defensive power of aircraft. In other words, we must expect losses of personnel to be much greater in proportion than in the last war, which means that the majority of war-time pilots will be hastily trained in essentials only and there will be no time to teach them codes. Telephony then will be used in communicating between airplanes in formations either of one class or of supported and supporting classes in which it is necessary or desirable for the pilot to operate the set. Any other use for radiotelephony probably will not be encountered because in multiplace ships an expert operator will form one of the crew and he may act as observer, gunner, and bomber as well.

Before we can visualize the kind of communication equipment desirable for airplane installation, we must first discuss from a tactical standpoint the probable use of these planes during war. It is difficult to conceive of any war against a first-class power that would not, especially at the beginning, require the close cooperation of the Air Service of the Army and of the Navy, and therefore require good communication between the various units of each—not only between those in the air, but also between air elements of each, and terrestrial elements of their own and of the other force. In other words, we must visualize rapid and reliable communica-

tion between Army planes and Navy planes; between Army planes and ships, and naval shore establishments; and between naval planes and the headquarters of Army units. These elements may be from a few miles to several hundreds of miles apart and as direct communication will ordinarily be impossible, the only practicable means of communication must be radio. Radio installations in either Army or Navy airplanes which did not take into consideration the necessity of sets being within the same wave-length range as that of the other service should not function, and in war this might be disastrous. All capital ships and the headquarters of the larger Army units are able to transmit and to receive both intermediate and high-frequency signals. Therefore, an airplane radio set which would transmit and receive either one of these frequency bands would be able to communicate with terrestrial units of both services. The high-frequency transmitter is more efficient than is the intermediate frequency transmitter when a short antenna is used; and, as a very short antenna is required for some types of airplanes, high-frequency or short-wave sets will be standard airplane equipment. As the term "short wave" includes all frequencies between, say, fifteen million and three million cycles, it will be necessary for the two services to cooperate in choosing working frequencies in order to provide for intercommunication.

In considering communication between Army airplanes and between airplanes and ground establishments, we must be able to appreciate the probable tactical use of airplanes of the various types of aviation and the probable need of communication within units of different classes. A future war may see the need for airplanes of additional types or for radical changes in present existing types, and as planes are being constantly improved as regards speed, cruising range, etc., the characteristics of the different types are given in general terms only.

Four classes of aviation comprise an air force, and as they differ widely in characteristics and tactical employment, we will discuss them briefly.

Bombardment has the same importance as to mission in the air force as has infantry in the ground force. Its ships are heavy, comparatively slow (one hundred miles an hour or less), have poor maneuverability, and low service ceiling. They have a fuel capacity sufficient for several hundred miles. Their objectives are lines of communication, important industrial factories and other enemy establishments which require the use of bombs weighing up to a ton. Examples of their objectives are essential bridges and large ammunition factories located from a few miles to several hundred miles within enemy territory.

Attack.—These are fast, easily maneuverable planes, armed to the front and rear, with .30-caliber and .50-caliber machine guns, and capable of carrying several twenty-five-pound bombs or one one hundred-pound bomb. Their objectives are enemy airdromes, airplanes on the ground, light bridges, troops on the march or in bivouacs, etc., They can be

equipped to lay smoke screens. Attack planes make the fullest use of the principle of surprise. They are commonly used to support bombardment missions.

**Pursuit.**—This is a very fast, easily maneuverable plane armed with machine guns to the front only, and with a service ceiling of more than twenty thousand feet. Its fuel capacity is low as compared with other types. As at present designed, it carries only the pilot and is the only type without additional personnel. It is commonly employed as support for other types of aviation, and its principal objectives are enemy airplanes in flight. It habitually operates in large formations. Due to the desirability of a fighting plane possessing power to fire to the rear, it is probable that future development will tend toward addition of personnel at the sacrifice of speed and ceiling.

**Observation.**—This is a fairly fast ship, armed with machine guns to front and rear, and ordinarily operates either alone or in formations of three or five planes. Its functions are to keep enemy territory under surveillance, to spot shots for the artillery, to locate desirable target for attack and bombardment aviation, and to take photographs of enemy establishments and troop dispositions.

The above outline of the characteristics and functions of the various classes of aviation indicates that the communication equipment must vary widely. As an example, observation aviation requires constant communication to and from ground establishments while there is little need for communication between observation airplanes. On the other hand, pursuit aviation, the planes of which return to their airdrome at frequent intervals, seldom requires communication to or from the ground, but because of the fact that it operates in very large formations does require good communication between individual planes in flight.

For the purpose of bringing out some of the reasons why communications are necessary between units of different types of aviation, we will discuss a typical mission of bombardment supported by attack aviation and pursuit aviation.

Assume that a daylight bombardment attack has been ordered against a large enemy munitions factory, which is essential for the supply of his troops and which is located about one hundred and fifty miles within his lines. Since it is imperative that he keep this factory intact, he will protect it by placing antiaircraft batteries on positions to guard every avenue of approach. His pursuit aviation will have assigned to it as one of its missions the attack of any formations crossing into his territory, therefore the attacking bombardment will require the support of two additional classes of aviation: First, pursuit, which while it will be unable to accompany him throughout the mission due to its small gasoline supply, can rendezvous with him in friendly territory, escort him across the lines and through the zone of enemy pursuit activity, say fifty miles, and can also

meet him at approximately this distance within enemy territory and escort him back to the airdrome. Second, attack aviation can support the bombardment throughout the mission and can afford a certain amount of protection, probably sufficient outside of the usual enemy pursuit zone, but the necessity of attack aviation is for the purpose of neutralizing enemy antiaircraft batteries, which will be located around the essential factory and at a distance of some five thousand yards from it. These batteries may be neutralized by machine-gun fire and bombs from the attack aviation, but will more probably be blinded by smoke laid by attack planes coming in just over the tree tops and spraying a smoke screen, which will cover the antiaircraft, but which will not obscure the objective. A smoke screen has a duration of but a few minutes, and as the cloud drifts with the wind, the laying of the smoke screen and the arrival of the bombardment planes over the objective must be synchronized within, ordinarily, one or two minutes.

To do this successfully will require constant radio communication between the bombardment and the attack. The range required for this communication probably will not exceed fifteen miles, but within this distance the communication must be assured. Radiotelegraphy should be the means used, and the sets must be operated by personnel other than the pilots. Communication between the bombardment and the pursuit and also between the attack and the pursuit is necessary for the purpose of cooperation. It may be taken as an axiom in war that one unit can not properly support another unless there is adequate communication between them. This is equally applicable to air units and to ground units. Due to the fact that the different classes of aviation have great differences of speed, rate of climb, and tactical employment, any form of visual signaling will be impracticable, and radio communication between them must be maintained. The range of the sets must be as great as possible consistent with allowable weight and size of the set. Radiotelegraphy must be accepted as the most practical form of communication.

As a contrast to the communication required by a supported bombardment unit, that required for observation units is of an entirely different nature. Instead of a large number of airplanes requiring intercommunication between planes, observation functions in small units—from one to five planes—and has little use for a communication system from its airplanes to other airplanes. On the other hand, it is difficult to conceive of any usual tactical employment except, perhaps, the taking of photographs, which does not require constant and rapid communication to ground units. While under unusual conditions it might be possible to send information by means of dropped messages, such conditions will be the exception, and under some forms of tactical employment, such as the very common one of spotting shots for the artillery, such practice would be impossible. Information obtained by observation aviation to be of value, must be trans-

mitted to the ground unit interested without delay; therefore, if it is to function at more than fifty per cent of its efficiency it must have constant radio communication to and from the ground. The required range is about twenty-five miles and the method of signaling should be radiotelegraphy, the set to be operated by the observer.

Space will not permit a discussion of all phases of interplane communication nor of the necessity of communications between ground and planes for various kinds of missions. It may be said that, in general, communication of pursuit units is mainly for purposes of command; of observation units for purpose of liaison and for bombardment; and of attack units for both.

In considering the type of radio set which would be proper for various kinds of airplanes from a standpoint of allowable size, weight, and simplicity, and which will function properly for the duty required of it, we must come to the following conclusions: (1) The set must be rugged enough to withstand rough take-offs and landings. (2) A radio set must be portable enough to permit removal from one plane and installation in another similar plane within the alert time—fifteen minutes. (3) It must have sufficient power to work up to its required range under ordinary atmospheric conditions. (4) Its operation must be as simple as possible and still permit it to fulfill the first three conditions. (5) Its size and weight must be as small as possible consistent with reliable operation.

It must be admitted that the first requirement for any piece of apparatus is that it will work; simplicity and size are secondary. It is therefore impracticable to make any arbitrary decision as to allowable weight of a radio set. It is also impracticable to decide that, since radiotelephony does not, the latter is the more desirable means of communication. The problem must be examined from all angles. It is impracticable also to take the position that, since radio communication is not at present entirely satisfactory, no considerable use will be made of it until it is perfected. The problems connected with the design of adequate radio equipment are varied and difficult, and can be solved only by close and willing cooperation between the designer and the user. The following quotation from an address by the Chief Signal Officer is pertinent:

“The trend of development in electric communications leads us to believe that we may look to the future to give us greater speed, greater accuracy, but not great simplicity. I can hold out no promise for fool proof signaling equipment. Each increase in service, each increase in speed and accuracy, and each decrease in weight and bulk brings with it an additional complication in parts and an additional delicacy of operation.”

It is believed that radio equipment as at present perfected by the Signal Corps is equal, if not superior, to that designed by any other agency of any government, and if properly operated will afford satisfactory communication under usual conditions. It is as impossible to properly operate

a radio set with an untrained operator as it would be to operate an airplane by an untrained pilot, and it is a fallacy to expect that a radio set can be developed which will obviate the long and careful training of the operating and maintaining personnel.

The following conclusions are reached as to the type and range of radio equipment desirable for the four types of aviation: Pursuit—all planes to be equipped with high-frequency receiving sets, capable of being tuned with one hand while wearing heavy gloves, and without the necessity of the operator looking at the set while tuning or operating it. Its only controls must be a switch and one dial, the planes of the squadron and flight commanders to be equipped with high-frequency transmitting and receiving telephone sets for command. The receiver must have a wavelength range which will allow it to be tuned to the frequency of the transmitting set of bombardment, attack, and observation aviation for liaison. A fixed antenna must be used—required range under usual conditions, fifteen miles. Bombardment—all airplanes to be equipped with intermediate frequency transmitting and receiving combination telegraph and telephone radio sets using trailing antenna; range to ground, fifty miles. Attack—similar to bombardment except range of only twenty-five miles, using a fixed antenna. Observation—similar to bombardment.

In considering radio communication there are two ideas which seem to be generally accepted, but which are not true in fact. (1) It is impossible to tune radio sets before taking off and expect them to communicate in the air. The characteristics of any type of antenna as regards its capacity and inductance—hence, its resonant frequency—is not the same on the ground as in the air; also characteristics of the set itself change with the temperature. Radio sets must be mutually adjusted in the air, which adjustment must be changed at frequent intervals. (2) It is impossible for an enemy to jam radio communication, especially radiotelegraphy. The amount of apparatus required to do this successfully would be too great to allow of its transportation or probably its use even at a fixed location. Since the strength of a radio signal approximately varies inversely as the square of the distance from the transmitter, the attempt to interfere with even a few of the frequencies available would be unsuccessful, and any attempt to cause interference would be much more detrimental to his own radio communication than to that of his opponent.

The average length of life of an airplane in the World War was from ten to fifteen hours. Since 1918 the offensive powers of airplanes have been greatly increased, particularly as regards a realization of correct principles of tactical employment and fire-power. While the better performance and greatly increased speed of airplanes have increased their defensive powers, these two factors have added to their offensive powers equally and, since it appears to be impracticable to armor planes, we may state that the offensive has increased much more than the defensive. In addition to this unequal improvement of the defensive as compared to the

offensive ability of airplanes, it must be realized that antiaircraft guns and locating and sighting devices have been greatly perfected since the World War.

Taking all of these factors into consideration, it is evident that airplanes and, hence, their personnel will have only a very limited expectancy of life in any future war. This affects the subject of communications in two ways: (1) Since the personnel will be frequently replaced, we must expect to see air units fortunate indeed if their squadron commanders and flight commanders are experienced pilots, while other pilots will have only the minimum training necessary. This will require that these commanders have rapid and reliable communication to members of their command. (2) Under many circumstances, it will be necessary to use experienced observers in the rear seat of the plane. These observers must be trained to do well all of the following: To properly operate a radio set, to see objects on the ground and to interpret what they see, to take photographs as required, to fire machine guns and to hit the object at which they fire, and to bomb. The proper instruction and training along these lines will require fully as much time as to train a pilot, but the qualifications of an observer and of a pilot are entirely different. It would appear, therefore, that a policy to train as observers none but qualified pilots should be carefully examined to ascertain whether or not it will furnish qualified personnel, in case of a sudden emergency, and also if it will furnish observer replacements as and when necessary.

While not strictly a matter of communications, a subject closely allied thereto must be discussed briefly—the radiobeacon. The radiobeacon consists of two transmitting sets, each of which transmits automatically a distinctive telegraph signal. These two signals are of equal intensity only in a very narrow band, and an airplane flying on a line which approximately bisects the area covered by the two signals will hear them both. If through error in direction or because of wind drift he gets off his course, he will hear only one signal strongly, and upon correcting his line of flight he will again hear both equally well; he is, therefore, able to fly a correct course under all conditions of atmosphere and wind, at night as well as by day. The required apparatus in the plane consists only of a radio receiving set—the same set as is used for communications. The radiobeacon is in practical daily use, and the number of beacons will be increased considerably within the next few months. As their use by Air Corps personnel becomes more general, the influence of this apparatus in tactical employment of military airplanes will be more generally realized. As an example, let us assume that a certain bridge, some two hundred miles within enemy territory, is assigned as a target to a bombardment squadron. As the war has existed for some months, the personnel situation in this squadron is normal—practically all are insufficiently trained. The squadron commander has two methods of operation which are open to him—he can make a daylight attack in squadron formation, taking the risk that enemy pursuit aviation

and antiaircraft fire will leave enough of his planes in the air to enable him to accomplish his mission, or he may choose a moonlight night, when these two elements would be somewhat less effective, trusting that his untrained personnel, making successive single plane attacks, would be able to locate the target and to again locate their own airdrome. Whether or not this could be done by more than a small fraction of his command is problematical.

By the use of the radiobeacon, the chance of accomplishing his mission without serious losses could be greatly increased. Assume that the radiobeacon on his airdrome was caused to send its radio beam exactly in the direction of the target. This could be done from the map, and even a poorly-trained pilot would easily be able to fly directly over the target through fog or darkness, which would prevent any hindrance by enemy planes or antiaircraft. Now assume that another radio beam was directed on the target from a separate transmitting station, located some one hundred miles distant from the first station and on a line with it. These two beams would intersect at one point only—at the target—and the probable error should be less than two miles. Provided the pilot was given adequate apparatus to correctly locate this intersection, he could drop his bombs from any altitude with good expectations of striking the target, and could follow a beam directly back to an airdrome. No insurmountable difficulties from a technical standpoint are seen, and the tactical advantages can not be denied.

Mention must also be made of telephotography. The value of a photograph transmitted by radio from an observation airplane to Army headquarters, within a minute or two after exposure, can easily be realized. Telephotography is practical, and the apparatus can be made practicable for use from a military airplane. That the apparatus is complicated can not be denied, but military history shows that no matter how heavy a piece of apparatus may be and no matter how difficult its operation, if it can demonstrate its military value it will be used in war. Again quoting from the address of the Chief Signal officer: "Not so many years ago a board of United States Army officers solemnly recommended against the adoption of the magazine rifle because it was too complicated and could shoot too fast."

Conclusion: (1) A commander of a group or larger unit of pursuit will impose his will upon his command by means of radio. (2) The problems connected with the perfection of communication equipment are so varied and so difficult of solution as to require the closest and most willing cooperation between the Air Corps and the Signal Corps. (3) Signal installations in airplanes are governed by the tactical use of such planes. In general, communication should be by radiotelephony for command purposes and by radiotelegraphy for liaison purposes. (4) Considerations governing design of radio sets: Primary, that it will function; secondary, weight and size.

# The Value of Training a National Guard Unit in Association with a Regular Unit

By MAJ. JOS. D. EISENBROWN, 213th C. A. (AA), PNG.

UNDER the terms of the National Defense Act the National Guard as organized today, with its contemplated expansion in emergency, becomes an important factor in the first line of defense of the country. The units of the National Guard are identical in organization with those of the Regular Army. The first line of defense in time of emergency is the Regular establishment in its entirety, and the Guard becomes a factor to be relied upon only if it is properly trained and disciplined and competent to perform the mission assigned to it. It is natural to assume that the Regular Army is interested in the degree of efficiency attained and maintained since in time of emergency these two components will go into action side by side, possibly with no opportunity to acquire a higher state of training than that which exists in peace time. If the Regular Army should ask us the question, "Are you prepared?" our answer would be, "We are, with what we have." It is upon this qualifying phrase that much depends and it is for the information of those of the Regular Army who have never been associated with the National Guard that some elaboration is believed desirable. Perhaps the majority of Regular officers do not appreciate the fact that the Regular service has many instruments and devices which we have had little or no practical experience in handling unless it has been our good fortune to have trained with a Regular unit where the latest materiel is available.

Antiaircraft units of the National Guard have the same mission as Regular Army units. They are highly technical specialists organized for the protection of ground troops, industrial establishments, railroad centers, depots, etc., against hostile bombing attacks. Any target of sufficient importance for attack will require defense. Such an attack in future wars may come at the outbreak of hostilities and the burden of defense fall upon the skeletonized units which exist now. Those members of the National Guard who have kept up with the important developments of the past ten years realize that a great responsibility rests upon our shoulders. Our opportunity to perfect ourselves in the duties we will be called upon to perform are limited. First the number of our Armory drills is limited and also the amount of time available for active training is limited. Much is expected of a National Guard unit in perfecting its basic training, its discipline, administration, and technique. We are also limited in the amount of equipment issued. Not only is the amount limited but many times it is obsolete and in no condition for strenuous field service. It cannot be expected that a unit in time of emergency will be able to go into

the field and function with a satisfactory degree of efficiency unless it has a reasonable portion of first-class equipment with which to acquire the required fundamental basic training. If that equipment cannot be furnished then there is only one other means of obtaining experience and instruction in the use of the most up-to-date equipment and that is that National Guard units be permitted to train each year with Regular Army units that have standard equipment or as near standard as is possible to obtain.

It has been the good fortune of our regiment, the 213th C. A. (AA), PNG., to train and be associated with the 61st C. A. (AA) at Fort Monroe, Va., and we feel that to them we owe a great deal for the high state of efficiency that exists in our regiment. We have had the benefit of their equipment, their training in theory, their practical experience, and their habitual willingness to impart for our benefit any knowledge they may possess in order that in a limited time we may acquire the greatest possible value from our field training and accomplish what we cannot accomplish in our armories.

Several years ago I overheard a discussion among some old timers of the Regular service on the subject of National Guard training with Regular units. One maintained that it cut in on the available training period of the Regular unit. In addition, the use of the Regular unit equipment was a hardship on the Regular troops because the departure of the Guard unit left a great deal of unserviceable equipment to be put in condition by the Regular troops. To my way of thinking this sounded as though there might be a cause for friction. In a short time I was in the argument, asserting that where two units are associated in training the first consideration is one of harmony. The Regular service is right to expect us to use their equipment with as much care as though it were our own. If it is not properly used then it is up to the powers that be to state the deficiencies of the National Guard unit in plain language in order that the point might be emphasized throughout the regiment and proper precautions taken to insure the proper care of materiel. Any conscientious officer or enlisted man, if he appreciates his job, feels a great amount of responsibility for equipment, especially under these conditions. In all my years of training with the Regular establishment I have never heard of any particular difficulty that was not ironed out to the satisfaction of all concerned.

As to the waste of time in assisting in Guard training, one would have to possess an extraordinary lack of vision to fail to see that something worth while had been accomplished. We have had many Regular Army instructors who have assisted us in our training. I do not know of a single one who felt that he was wasting his time or who was impressed with the thought that his work with us was wasted. I feel that the days of hostility and aloofness have passed and only in rare instances do they crop up. This is due to the fact that so many Regular officers are out in our midst as instructors. When we arrive at a Regular Army post it seems as though

everyone there knows us and that we know them—a feeling, I dare say, that never existed prior to the training system now in vogue and which should be kept up henceforth.

In the National Guard I believe we realize that certain conditions retard our progress in measuring up to the best standards of the Regular service. But any Guard organization that puts forth its best effort is bound to succeed and I am safe in saying that we have quite a number of first-class units. To accomplish most it is necessary that each officer and enlisted man possess the spirit of doing his best. That is the spirit of this regiment and much of it is attributable to the splendid training we have received in association with the Regular service as well as the Regular Army instructors who have been detailed with us for Armory training during the past nine years.

The problem of the National Guard battery commander is somewhat different from that of the Regular service in so far as establishing discipline is concerned. First of all, soldiering is a side issue with us, a hobby. Everyday we live with our men as civilians. Yes, many are employed by us in the business world. To establish discipline of the highest order our unit commanders must set an example for them to follow while intimately associated with them at all times. It is necessary to help them with their troubles (and they do get into them) and keep their morale and interest boosted at all times. It may amuse you to relate that in order to secure a hundred per cent attendance at one camp, I personally had to put up bail amounting to one thousand nine hundred dollars. Most of the cases were trivial in nature, perhaps family affairs. But I wanted a hundred per cent attendance and once the men appreciated my great desire in this respect they continued to report at one hundred per cent strength for seven consecutive years and the same at Federal inspections during the same period—a record of which I was proud. This is mentioned to show that it was only obtained thoroughly by a system of personal contact. This condition of course, does not apply to the Regular service.

We do not fall back on the court-martial until everything else has failed but there is no hesitation in awarding battery punishment where it is deserved. In most cases this has accomplished good results. Our system of discipline is mentioned because it varies somewhat from that of the Regular units with which we might be associated and is one of the slight points of difference concerning which there might be much discussion. Associated training might possibly bring about a greater similarity in discipline methods but it is believed that there are certain fundamental differences in conditions which would never be entirely overcome. Discipline is one of the subjects to which we pay much attention and in this regiment every-one, in general, responds to our system.

In National Guard Service many difficulties are encountered. There are lack of proper Armory facilities, storage facilities for equipment, and

many other hamperings. It is up to us to go out and fight all these obstacles and produce, for the average inspector cares little about where it came from but wants to see it and in first-class order. We are compelled to use many makeshifts with the unfailing lack of interest which always accompanies them. I am a firm believer in the saying "Wooden guns develop wooden soldiers" and our experience in the last affair seems to bear this out. I again state that we must have an avenue by which we may overcome this condition and it is my belief that this can be accomplished by associated training. We realize quite well that associated training means more than friendships. In our training with Regular units we have observed that they have the best and most up-to-date materiel obtainable and are perfected in its use. We, too, are permitted to use it and this very fact makes for renewed and increased interest in acquiring the basic knowledge which we should possess. It is quite true that many valuable publications and pamphlets are written and published (with accompanying changes) but to be afforded the opportunity of handling the actual instruments gives us more knowledge of their use than all the books and pamphlets we can ever hope to digest. With the time element important in Armory training we are fortunate indeed if we can take our unit into the field well drilled in basic training. When we arrive at our summer camps we are anxious to go into our higher training which includes target practice with real live guns, ammunition, airplanes, targets, and every known device that goes with it. Our only hope for doing this lies in associated training.

Neither the War Department nor the Militia Bureau need hesitate to send out the latest technical instruments for the use of the National Guard. The increased number of commercial airports renders target tracking possible. It is right that the government should insist that proper care be taken of its equipment especially where it consists of delicate and expensive instruments. It is right that an explanation should be demanded if there is negligence in this respect. But from observation it is believed that a very high per cent of National Guard personnel realize their responsibility in this respect and care for their equipment with as much pride as though it were their own. If the latest instruments are furnished so that the personnel may be trained at its home stations more time for actual firings and higher tactical training will be available at camp and our primary object is to score as many hits on the target as possible. If our requirements in submitting target practice reports are to be the same as those of the Regular establishment it is no more than right that we be furnished or permitted to use everything available connected with the firing.

We should keep foremost in our minds the fact that in any future conflict we will not be permitted the same length of time for training in basic subjects as was available in the last war. We must be prepared to move at once and defend effectively vital points that would be subject to attack.

If the National Guard is really considered an important part of the great army to be mobilized in time of emergency (and we know it is) we must know our stuff. The best way to learn it is by association with those who are at it every day in the year, where may be imparted in the limited time available the knowledge which will be required of us in time of emergency. With the rapid developments of the last ten years there is much to learn which is intricate and difficult. Practical experience with and the handling of the new weapons and their accessories is the quickest and most practical method to accomplish this and associated training is the best method by which to obtain the most in the time available.

Every year it is a pleasure to attend the 28th Division reunion in western Pennsylvania. There we enjoy meeting our old commanders whom we all love and respect. The names of Muir, King, Fuqua, Nolan mean a great deal to all of us and we cherish their comradeship. Had it not been our good fortune to be associated with them in the late war we would never have known their sterling qualities of leadership and manhood. When they took over the guiding reins of our division we were all strangers, each one suspecting the others. They gave us plenty of hell but we needed it. Today theirs are counted among our most cherished friendships. With such a feeling of association we can never go back to the old days when fire sprung from all eyes. An important argument for associated Regular Army and National Guard training is that a better knowledge and understanding of each by the other will be developed and a better team will be put out when the time comes. We have learned many things from the Regular Army. Perhaps they have learned some from us. The closer the association we have in peace the closer we will be in an emergency. Therefore it is hoped that the powers that be will see to it that associated training is kept in force for the good of all concerned and that sufficient appropriations be set aside to permit it to continue.

# The Robot Brothers—Gunners

By LIEUT. ARTHUR WILLINK, O. D.

IN this age of mechanization the "Robot" family is playing an increasingly important rôle in everyday life. We find at home vacuum cleaners, washing machines, dishwashers and what not, all designed to replace the human race in its laborious struggle for an existence. We see that the "Robot" clan is indispensable in industry, not only because that all-important labor cost is decreased, but because their operations are performed with uncanny reliability and uniformity. An automatic screw machine, for example, will make several thousand screws of practically identical dimensions with almost no attention. Mathematicians and engineers have ceased to generate gray hairs by days of calculations on long and tedious problems. Robots have been put to work not only on addition, subtraction, multiplication and division, but on complex problems involving higher mathematics; some so difficult that without Professor Robot, they would be impossible of human solution.

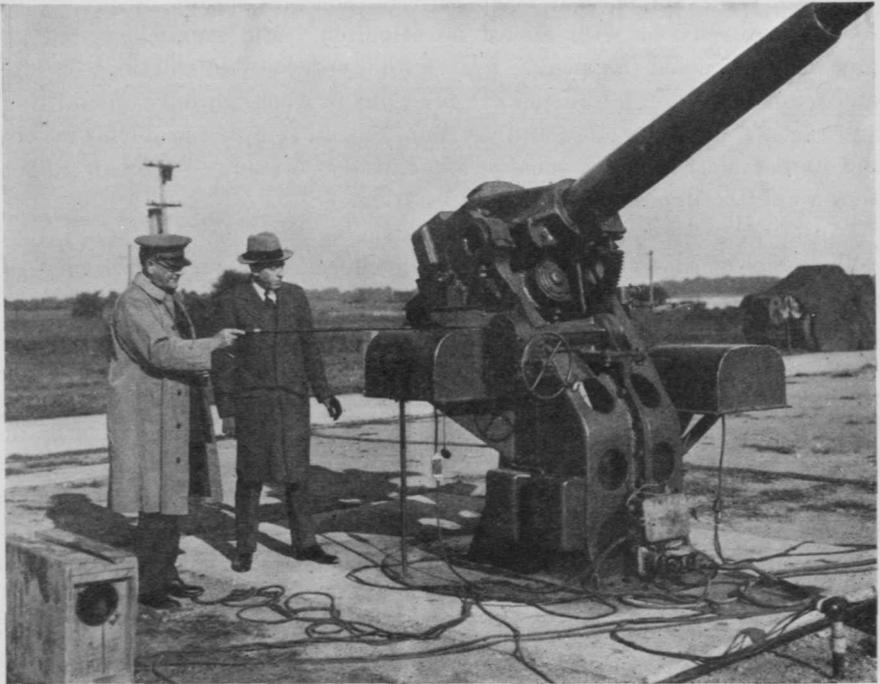
In military materiel Robots are just making their debut. Indeed, they will be welcomed with open arms by quartermasters, etc., since they require no food, clothing, or even shelter, to say nothing of heat and light.

There is a problem which has arisen out of recent progress which we have had to look to the Robot family for a satisfactory solution. This is the problem of anti-aircraft fire. Even the best mathematicians cannot hope to solve instantaneously the ever-changing problem presented by an airplane target flying through three-dimensional space. The time required for predicting the future position of the target and adding the various ballistic corrections must be practically zero. This is accomplished by the director. The above prediction must be accurate and instantaneous to eliminate any dead time. The Case III firing system has been used and dial or "clock" pointers have been followed by human hands turning the elevating and traversing handwheels. The human element again is a cause for error in this system of following the pointer. To minimize this error, the torque amplifier was called into service to man the guns. It eminently demonstrated the value of machine control of azimuth and elevation settings. Consisting essentially of band brakes kept in a nicety of adjustment, it was subject to the inherent disadvantages of such a system.

These difficulties led to seeking other means of remote control, and to the development of the remote control system T-1, which was tested this year at the Aberdeen Proving Grounds. The design of the system is quite different from any other type of control. The essential points of difference are, first, that there are no moving parts when the gun is stationary; the motors move only when they move the gun, and second, there are no band brakes, eliminating the necessity for constant adjustment which accompanies them.

The system makes use of a gear brake which, connected to a data transmission system, controls the movement of a power motor. The power motors are coupled directly to gun, and under the influence of the gear brakes give the proper angular movement to the gun. Suitable provisions are made for reversing the power motor.

The new remote control system combines many advantages and has practically no disadvantages when compared with any other known means of control. Its construction is rugged and it will withstand the most severe tests of firing without making any adjustment necessary. The adjustments



GENERAL WILLIAMS INTRODUCING THE ROBOT BROTHERS TO SENATOR REED

are desirable only after long periods of use. The construction is simple. The average enlisted man can be trained to service it quickly, the occasion for servicing being infrequent. There being no band brakes, the resulting effect of moisture in the air, swelling brakes, and making a new adjustment necessary, is entirely eliminated. The system works equally well in wet weather or dry, hot or cold.

High accuracy is obtained with this system, an average error of sixty-six-hundredths mils in elevation and two and seventy-four-hundredths mils in azimuth being obtained in the tests at the Proving Ground. Considerable of this error could be attributed to backlash in the gun. There is no tendency to "shimmy" or oscillate. The tracking is extremely uni-

form, following faithfully the data input at the transmitter. The operation is practically noiseless.

There is no clutch required to disconnect the system from the gun and in case of the failure of the electric power it is merely necessary to turn the handwheel. This greatly simplifies resynchronization when the system is used on guns having an uneven gear ratio, for example, when one turn of the handwheel equals fifty-seven and five-hundredths mils.

It is a physical impossibility for a gun controlled by this system to "run away." A suitable governor is provided to automatically throw the gun in reverse should the mark be overstepped.

A disadvantage at the recent tests, which showed a somewhat higher starting torque than it is desired to put on the director, is removed by a relatively simple device which will automatically make the power motors deliver more torque at starting; in fact, will make the power motors develop a torque just greater than any opposing torque that may be encountered, thus making the system adaptable to a mobile mount.

The procurement aspect of this control system presents a strong argument for its adoption. Practically every major part is a standard commercial product, thus a minimum of specially manufactured components are required. From the industrial war planner's point of view, this is a highly desirable feature as it makes the war-time procurement of this item a relatively simple matter. Going hand in hand with the procurement is the reduction in cost, which results both in war time and in time of peace.

The application of this system is by no means limited to antiaircraft guns, and it was suggested to use such a system on seacoast guns; also an enthusiastic friend from the Tanks suggests a one hundred per cent Robot antitank gun, self loading and controlled from a distant point. Anyway, it has been a source of great pleasure to introduce the Robot brothers manning the elevating and traversing handwheels of a Model 1917 M1 3-inch antiaircraft gun, and it is our sincere hope to see new members of the family put to work at other military applications.

# Constructive Economy

By CAPT. GEORGE H. RAREY, Infantry, (Tanks)

ANY survey of methods by which governmental or commercial operating expenses may be reduced will be incomplete if it does not take into consideration the present wasteful and extravagant practice of handling lubricating oil for most government and commercial automotive vehicles.

The practice referred to is that of discarding millions of gallons of perfectly good cylinder oil annually by draining it from the gasoline engines and throwing it away as a thing of no value.

Unless the reader has investigated this matter it will be natural for him to conclude that the oil has given all of the service of which it is capable when it has lubricated the engine over a given number of miles, or for a given time, and consequently, that there is no waste in then discarding the oil, or that this waste is unavoidable.

The facts are, however, that a large percentage of this great waste can be avoided easily and scientifically by the use of simple and economical equipment which has now been in use long enough to prove its utility and practicability. The used oil may be drained from the engines and sent to the oil cleaner, from which it will be returned free of the carbon, dirt, metal particles, water and fuel dilution, fresh and clean for further use.

We cannot expect to drain the same quantity of oil put into the engine because some of it will be burned up and lost during engine operation. Neither can we expect to have the same quantity sent to the cleaner returned to us, as the drained oil contains considerable dilution and foreign matter.

Questions may occur to the reader as to the quantity that will be drained after one period of use, the percentage of the drained oil remaining after it has gone through the cleaning process, the cost of cleaning, and the actual value of the reclaimed oil as a lubricant.

## *The Quantity Drained After One Period of Use:*

This quantity can be controlled within certain limits, by the length of time the oil is used in one lubrication period. For the purpose of arriving at a basis for calculation, we will assume that forty per cent of the oil originally placed in the engine is drained at the end of the first period of use. This assumption is not excessive (providing there are no leaks) in fact this quantity may be increased by shortening the period of use.

## *The Cost of Cleaning the Oil:*

Some time ago the writer had an opportunity to make a study of this question and data obtained from users of oil-cleaning equipment showed that the cost of cleaning a gallon of oil, including the materials used, fixed

charges, insurance, electrical power used, and the labor involved, was well under *eighteen cents per gallon*.

The cost of cleaning will be practically the same for any grade of cylinder oil used, hence the saving to be effected, in any particular case, is easily determined. *Securing cylinder oil by this method is equivalent to purchasing the oil at the figure shown.*

#### *The Value of the Reclaimed Oil as a Lubricant:*

As a result of the above mentioned study, the writer reached the conclusion that the reclaimed oil may be used for engine lubrication and that it would lubricate the engine as thoroughly and efficiently as new oil.

This conclusion was not based upon claims made by the manufacturers of the equipment. It was based entirely upon statements made by the oil experts of the Bureau of Standards and by reputable users of the equipment.

The following extracts from technical papers and correspondence received from the Bureau of Standards constitute part of the evidence in favor of the reclaimed oil as an engine lubricant:

“Used lubricating oils may be reclaimed by apparatus already commercially available and thus saved for future use. Such reclaimed oils will pass all of the commonly accepted tests for new oils, such as flash point, viscosity and sediment.” “Used oils should be judged by the same tests as are applied to new oils, and they will be equally serviceable.”

The users of oil-cleaning equipment confirm the statements of the Bureau of Standards as to the value of reclaimed oil in lubricating qualities.

The Ford Motor Company states: “As far as we know, there is little or no diminution in the lubricating qualities of the reclaimed oil.”

The Yellow Cab Company of Philadelphia reported: “We have secured good results and we are able to bring our oil back to its original characteristics with the exception of color.” (The color of the oil is of little real importance.)

The Public Service Production Company of Newark, N. J., stated: “The first of the year we had a fifty-gallon reclaiming unit installed for a six-months’ trial, and as a result of our experiments we purchased the machine and are now adding a second unit. We have tried the reclaimed oil carefully on several sets of units (vehicles) and from the satisfactory results of these tests we are intending to make its use general in the near future.”

Section Base Nine, of the Coast Guard Service at Cape May, N. J., reported: “Our experience has been that the reclaimed oil is superior to that in the original package.” This statement may, at first glance, appear to be too enthusiastic. However, this claim is sometimes justified and in accordance with the facts, especially if the oil used was of a com-

paratively low grade, in which case the temperatures in portions of the cleaning process bring about additional refining. The oil used by Base Nine at the time this report was made was not of a high grade.

The Dayton Power and Light Company stated: "The reclaimed oil is quite satisfactory."

The Packard Motor Company of Long Island City reported that its oil-cleaning equipment has given excellent results and that the use of the reclaimed oil has resulted in a reduction of the expense of operating its vehicles.

The Engineering Department of Camp Holabird, a branch of the U. S. Quartermaster Department, stated that they have used their oil-cleaning equipment over a period of eighteen months; that they have used the reclaimed oil in their trucks and passenger cars for over a year; that the cost of cleaning a gallon of oil is about eight cents. This cost was reported by a number of users of the same kind of equipment as that used at Camp Holabird. It is believed that fixed charges, insurance, etc., was not included in the amount stated.

Other companies have reported that the reclaimed oil compares favorably with new oil. One company stated that it had secured forty-eight gallons of good oil from a batch of fifty-two gallons of drained oil, or more than ninety-two per cent of the amount drained.

In determining the practicability of the use of this equipment at military and naval stations and by commercial firms, one other point remains to be considered: The number of vehicles required at one point in order to justify the purchase of the equipment.

#### *The Number of Vehicles Required at One Point:*

The equipment is available in various sized units, the smallest of which is designed to make the cleaning process profitable with a fleet of ten vehicles. There are a great many places in commercial and governmental service where ten or more vehicles, boats, stationary gas power plants, etc., are in use, and in addition to these vehicles and plants, airplanes have successfully used the reclaimed oil for engine lubrication.

The cost of cleaning and the saving to be effected thereby is based upon one cleaning operation only. This does not tell the whole story because the oil may be cleaned and recleaned over and over again as long as any of it lasts, hence the actual monetary saving will be great and the reduction in the quantity purchased per annum will be more than fifty per cent wherever the oil is carefully drained and cleaned. At some points where less than the minimum number of vehicles are operated, it has been found well worth while to drain and save the oil and, where transportation costs justify, to take it to a point where there was an oil cleaner in operation. The transportation and handling charges can be computed in any case and the question of the practicability and advisability of transporting the oil to a cleaner, can easily be determined.

The small oil cleaning sets placed upon motor vehicles have helped the situation somewhat since they have increased the mileage secured from a given batch of oil. The oil is discarded and wasted, however, when it is finally drained.

The monetary saving derived by cleaning cylinder oil is impressive and worth while even if that were the only advantage to be gained by the practice, but when it is remembered that every gallon that is cleaned and used again will reduce to that extent the quantity of oil required to be withdrawn from the oil wells, this practical and economical practice seems doubly desirable.

A saving of two or three per cent in the form of discounts on monthly statements is considered important both in governmental and commercial transactions.

*The use of oil-cleaning equipment offers a profit or saving of many times three per cent.*

Great sums are spent upon forest conservation and this is a worth while form of insurance for future generations. The forests can be replaced and this is being done to a great extent by replanting the devastated areas.

*No method has yet been devised for the replacing of the crude oil taken from the ground.*

We are burning our candle at both ends. At one end, we are spending money needlessly to replace perfectly good cylinder oil which we literally throw away after one period of use; while at the other end, we are daily drawing upon a limited supply which we cannot replace, in order to secure oil to take the place of the oil we have thrown away.

*The conduct of war has always been one of man's most baffling problems and greatest responsibilities. Today, with all of the inventions of progress and science it is immeasurably more complicated than ever before. It involves the lives of multitudes and the existence of peoples. It cannot be entrusted to novices without disastrous results.—From an address delivered at Chicago, Ill., by General Charles P. Summerall, Chief of Staff.*

# The Tortoise-Boat and the Flying Thunderbolt

By 1ST LIEUT. E. CARL ENGELHART, C. A. C.

IN THESE days when the taxpayer is casting dubious glances at the bulky battle wagons in the Navy, it is interesting to note that armored fighting ships were in use quite a few years before the *Monitor* and the *Merrimac* bounced cannonballs off each other. Back in 1592 A. D., Hideyoshi, one of the greatest generals Japan has ever produced, decided upon a conquest of Korea and then China. Almost immediately he struck a stumbling block. The Korean navy had an unorthodox superdreadnaught with the following specifications:

“It was called the Kwi-sun or ‘tortoise-boat’ from its resemblance to that animal. There is no doubt that the tortoise furnished the model for the boat. Its greatest peculiarity was a curved deck of iron plates like the back of a tortoise which completely sheltered the fighters and rowers beneath. In front was a hideous dragon’s head, erect, with wide open mouth, through which arrows and other missiles could be discharged. There was another opening in the rear, and six on either side for the same purpose. On top of the curved deck there was a narrow walk from stem to stern, and another across the middle from side to side, but every other part of the back bristled with iron spikes so that an enemy who should endeavor to board her would find himself immediately impaled upon a score of spear-heads. This deck, being of iron, rendered the ship impervious to fire arrows, and so the occupants could go into action with as much security as one of our modern battleships could go into an engagement with the wooden war vessels of a century ago. In addition to this, she was built for speed, and could easily overtake anything afloat. This made her doubly formidable, for even flight could not avail the enemy.”

It seems that this stone-age cross between an oil-tanker and the Ersatz Preussen was the brain-child of a Korean admiral named Yi Sun-sin. Admiral Yi was in command of eighty such vessels when the Japanese invasion got under way. For a time Admiral Yi trained the crews of his tortoise-boats in battle practice by falling on small Japanese squadrons and wiping them out of existence. Then he surrounded an enemy supply convoy and captured it including some twenty-six escorting war vessels.

Less than two months after Admiral Yi had first put his weird battleship into practical use, one of his scouting vessels dashed in to report that a vast Japanese armada, with nearly one hundred thousand fighting men on board, was approaching. Perhaps this number was exaggerated by the excited scout, but Admiral Yi was curious. He ordered his whole fleet to weigh anchor and he went out to see for himself.

The scout had been right; there was a big Japanese fleet. When almost within fighting distance, Admiral Yi and his Korean navy turned and fled.

Immediately the Japanese ships broke formation and pursued the Koreans with enthusiasm.

In a short time there was no longer semblance of order in the Japanese armada. Then, Admiral Yi gave the command "To the Rear, March!" At this command the rowers hopped over their oars, executed a snappy about face, sat down, and started to row again. Admiral Yi's flagship at full speed astern rammed the leading vessel among his dumfounded pursuers. Leaving that ship to sink at leisure, Admiral Yi rapidly rammed other ships one after another. In the meantime the rest of the Korean fleet not had been idle. The tortoise-boats sank about seventy enemy ships.

Later the same day, Admiral Yi found the second section of the Japanese armada. He added forty-eight more ships to his score for the day, thus ending one of the world's most decisive naval battles.

On land, the Koreans soon tried out another invention against the invaders. Peculiarly enough, this was the device of another Yi—Yi Jang-son—but history makes no mention of kinship to the Admiral Yi. Yi Jang-son held the patents on a missile called "The Flying Thunderbolt." It was used by the Koreans for the first time when they advanced to attack a walled city held by the Japanese:

"It was projected from a kind of a mortar made of bell metal, and having a bore of some twelve or fourteen inches. The mortar was about eight feet long. The records say that this thing could project itself through the air for a distance of forty paces. It doubtless means that a projectile of some kind could be cast that distance from the mortar. The records go on to say that the "Flying Thunderbolt" was thrown over the wall of the town, and when the Japanese flocked around it to see what it might be, it exploded with a terrific noise, killing twenty men or more instantly. This struck the Japanese dumb with terror, and so worked upon their superstitious natures that they decamped in haste and evacuated the city—"

and they could hardly be blamed, for brave men in Chicago have been known to run wildly for cover at the approach of a back-firing motor car.

Yi Jang-son kept the secret of the construction of his "Flying Thunderbolt" to himself, and his death came as a blow to the artillery of the East. The range of his gun, its length and caliber, its high-angle fire, and the delayed burst of the projectile (accidental, perhaps) seem to indicate that this was one of the first mortars ever used. Were there similar pieces of ordnance in Europe at the close of the Sixteenth Century?

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Quotations from James Murdoch's "History of Japan."

# COAST ARTILLERY ACTIVITIES

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## Office of Chief of Coast Artillery

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*Chief of Coast Artillery*  
MAJ. GEN. ANDREW HERO, JR.

*Executive*  
COL. H. L. STEELE

*Organization and Training Section*

MAJ. S. JARMAN  
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*Intelligence Section*

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### Air Forces and the Weather

Air forces have other enemies in addition to hostile air forces and anti-aircraft weapons. The most potent of them is "Old Man Weather." Since wars are generally fought out of doors, weather has an important effect on all phases of their operations. It particularly effects mobility and is sufficient at times to pin mobile forces to the ground just as effectively as the rifle, the machine gun, or artillery.

All means of locomotion are affected by weather. Trains are late during unfavorable weather and, if not storm-bound altogether, fall behind schedule. Ships at sea are more dependent on the weather than means of land transportation although sea voyages are by no means so perilous as in the days of sailing vessels.

Aircraft is no exception to the rule. In spite of the great progress which aviation has made it will probably never be able to overcome the severest buffeting of the elements—an inherent weakness which detracts from the many desirable qualities for military purposes which it possesses.

As an example of unfavorable conditions which may exist and strike terror into the heart of the aviator the following is quoted from the *Air Corps News Letter*:

"The Air Corps Tactical School during the afternoon of December 17 met the old enemy of airmen, fog, and though the battle which followed was not decisive, the honors, if any, lay with the school pilots, who suffered no casualties of any kind to personnel, the only losses being one airplane completely wrecked and another damaged so that it will require complete overhaul.

"It all happened late in the afternoon of a day which had been given over to an all-day practical problem. The entire command, consisting of eighteen pursuit ships and eight two-seaters, had been sent on the last mission of the day and was to land on the Langley Field airdrome at 4:45 p. m. This plan must have been known to the enemy, for at about 4:00 p. m. a fog rolled in from the east and in a few minutes the post was obscured. Thus, a new situation was suddenly injected into this particular problem and, in view of the fact that the pursuit ships had about exhausted their gasoline supply, quick action was necessary.

"At about 4:45 the first airplanes were heard flying toward the field. All landing lights, obstacle lights, and the beacon had been turned on to guide the pilots, and arrangements were made to burn magnesium flares on the flying field in the hope that the pilots would be able to see them. Signal lights were fired from the ground and from the water tank. Vertical visibility appeared to be better than lateral visibility, but the pilots would require visibility in all directions to land successfully.

Soon there were many airplanes flying over the field and evidently some of the pilots were attempting to land. Two three-ship formations could be dimly seen flying over the field at about five hundred feet. The fact that they were keeping a fairly close formation indicated that they were not in the fog at that altitude. Then it was evident that a pursuit ship was attempting to land. It could be heard as it glided in, the pilot evidently feeling for the field. The next sound indicated that it was on the ground and taxiing to the line. The pilot stated that after flying around in what he thought was the vicinity of the field he suddenly saw the beacon only a short distance away. That gave him his location and down to the landing he came, gradually feeling his way.

"Then came a telephone call that a ship had crashed on Tom Jones' farm near New Bridge Creek on the Back River road. Meager information—but a medical officer, an engineering officer and crew were dispatched to locate it. It turned out to be Capt. H. W. Flickinger who had struck a tree in landing the U. S. M. C. F603 which he was flying, completely washing out the ship, but coming out of it himself uninjured.

"In the meantime, three other single-seaters had landed on the airdrome and had taxied to the hangars. Rumors were being spread to the effect that two pilots had jumped and that a ship had crashed near the airship hangar. None of these rumors had any foundation.

"A little after five a telephone call came reporting several ships down near Hilton village, without injury to pilots or ships except Maj. B. K. Yount, A. C., who had been injured when his P-1 was wrecked in landing. However, it wasn't long before Major Yount called by phone to deny that he had even so much as a scratch. This report lessened the tension to a great degree, but there were still twelve airplanes to be accounted for. Several minutes passed without news. The single-seaters must be on the ground as their gas supply must be exhausted. The two-seaters had sufficient fuel to go to Richmond, or further, if necessary. Finally a phone call came. Name after name was given over the phone and the list was checked against that on the school operations blackboard. Every ship and every pilot was accounted for. Personnel O. K.—two ships wrecked. A yell of joy went up from the crowd assembled in the office. Who cared about two ships when the pilots were all right? The Commandant and the Assistant Commandant slapped each other on the back, both talking

at once in a relief from the tension and expressing joy that all was well after a hectic, harrowing hour.

“As for the ships which were several miles from the field and must be brought back—ask the engineering officer.”

### **Is Attack Aviation Effective Against Infantry?**

The answer to this question is not to be found in the experiences of the late war. Conditions today differ greatly from those existing then. There is a common belief authenticated by the teaching in the service schools that it will no longer be possible for infantry to move on the roads in column in daylight. This statement probably should be qualified by the addition “without air superiority.” Air superiority is a very loose statement. Some say that it will never wholly exist, that no such superiority *can* exist with the mobility which is possible with air forces, provided the hostile nation has any air forces worthy of the name.

The answer to air attack is air defense. The answer to air-tight air defense is antiaircraft artillery. It is expected that all arms will be expected to use such small arms as they are furnished in their own defense to as great an extent as possible. Recently the Infantry have been carrying out tests of various kinds consisting of firing rifles, automatic rifles, and machine guns against towed targets in order to observe the effectiveness of such fire. Other tests have been conducted of a different order to determine the efficiency of taking cover as prescribed in the Infantry School pamphlet “Infantry Protection Against Aircraft.”

Recently a battalion of the 29th Infantry, approximately three hundred men, conducted a test at Fort Benning to determine just what damage could be done by attack aviation (eighteen planes) by means of light bombs and machine guns. The battalion was marched along the Yankee road and simulated an advance guard of a larger force. Buglers sounded a prearranged blast on their bugles upon the approach and discovery of the attacking airplanes. The battalion took cover on either side of the road as prescribed in the pamphlet, and within a period of about forty seconds. At the end of this time the position of each man, animal, and vehicle was marked by a target, and the battalion retired to a safe distance to allow the planes to again approach and attack the targets by bomb and bullet.

In all, four hundred and forty-four rounds were fired from machine guns while one hundred and sixteen seventeen and one-half-pound bombs were dropped from an altitude of five hundred feet. Of the latter, nine landed on one side of the road, forty-seven on the other, and sixty were classed as strays. Unfortunately the test was somewhat marred by a grass fire which broke out and destroyed some of the targets on the side of the road where the greatest number of bombs landed. As near as could be estimated fifty-six men, twenty-nine animals, and fifteen carts were hit by bombs. No machine gun hits were noted.

Another test was conducted with targets placed in a wood and representing infantry and its transportation in reserve. The wood ("woods," we always called it) was approximately four hundred and fifty yards long and from seventy-five to one hundred and fifty yards wide. Altogether two thousand eight hundred and ninety-one machine gun rounds and one hundred and twenty seventeen and one-half-pound bombs were dropped in the area. Thirteen landed in the transportation area, seventeen in the rifle company area, eighty-nine were strays, and one was a dud. There were seven hundred and fifty targets representing men, seventy animals, seven combat wagons, and 22 carts. Casualties: Men, five per cent; animals, twenty-two per cent; carts, fifty-four per cent. *No machine gun hits were noted.*

The test was of very little value to the Infantry but furnished some information for the Air Corps. The Infantry had no opportunity to demonstrate what it could do for its own protection other than the negative measure, taking cover. It was apparently demonstrated that Infantry may expect the most of its casualties from bombs rather than machine guns. The animals, as might be expected (unless the mules learn to take cover) suffered the greater percentage of casualties. Of course, if, in the future, transportation is motorized, casualties to animals would be reduced to zero. Infantry in fox holes (as in the woods) would seem to have adequate protection except from direct hits. In other words, a bomb is no more effective because it is dropped from an airplane than it would be if discharged from a light field piece—probably not so much so because it hasn't the striking velocity although the explosive content may be somewhat higher.

One test is not a sufficient indication of what attack aviation can accomplish. (Ours is the only nation that favors attack aviation.) It is more or less common knowledge that fifty yards is considered a fairly long range for axially (to coin one) mounted machine guns. However, in the future, two-seaters will carry at least one gun capable of all-round fire. Bomber droppers will probably improve their technique. The conditions of the test may not have been altogether favorable to the Air Corps. The element of surprise was no doubt somewhat lacking. Certainly conditions were not exactly as they would be in time of war. (The Infantry regretted very much that they couldn't return the fire and give a good account of themselves.)

One can imagine the consternation (back in the middle ages) when the first explosive shell landed among the mailed and casqued infantry of those times. Since that time infantry has developed a certain high-explosive-shell discipline which is remarkable when one gives it detached consideration. During the war it had its trenches, its dug-outs, and if the strafing became somewhat annoying it called on the artillery to do something about it. Columns were caught *then* on the roads by long range

cannon. So will they be caught in war today by hostile aviation. But defensive measures are possible. Today hostile aviation will not deal with infantry lacking in striking power. Air attack discipline will be established and no longer will the aviator amuse himself by machine gunning an infantry column or front line trench when he needs a little extra excitement. When necessity arises the infantry will give a good account of itself with its own weapons because it will be trained to use them and it will not be left to its own defense. In addition and as a principal defensive measure the antiaircraft artillery will make it highly unprofitable to rake an infantry column from an altitude of five hundred feet even if some flying members of a hostile suicide club manage to sneak by our own pursuit planes.

### Visual Instruction in the Army

That's what they call it in certain quarters but its nothing more than our old friend, the training film.

At the present time, that well-known scenario writer, Maj. Claude M. Thiele, is locked in with his typewriter (Underwood or Remington), and is pounding out the well-known script. The writing of a scenario for a training film is no casual matter and the facetious reference to it here should not be taken seriously. This antiaircraft training film will be made at Aberdeen Proving Ground and the stars, doubles, and spear carriers will be members of the 62nd C. A. (AA) who will be in training there at that time.

Other films are projected to assist in the training of Coast Artillery. Film No. 1 will be on a subject intimately connected with our gunner's instruction days—the subject being Powders, Projectiles, Primers, and Fuzes. In this film all the actors (and actresses, if you will have it so) will be dumb. Perhaps this is not out of the ordinary but in this case (we presume) Mr. Projectile and Miss Fuze will be chased from the muzzle by the angry father, Mr. Powder. (Well, we don't *know* what part Mr. Primer has. Perhaps he is the villain since he stirs up all the trouble.) To become serious, this film will be of the animated-drawing kind.

Three other films are contemplated. No. 2 will show seacoast artillery; No. 3, railway artillery; and No. 4, the 155 G.P.F. These four films will not be made during the fiscal year 1931 and the Reserves, R. O. T. C., and National Guard, who are particularly interested, still have a considerable period of anticipation.

### Course in Ballistics at Aberdeen for Coast Artillery Officers

During the period September 15-December 1, 1930, the students of the Advanced Engineering course, Coast Artillery School, will attend a course of instruction in ballistics at Aberdeen Proving Ground. The period September 15-November 1 will be spent in experimental work in connection with firings by the 69th Coast Artillery (AA), the new antiaircraft regi-

ment recently organized. The remainder of the time at Aberdeen will be devoted to ballistics and gunnery in conjunction with the ordnance activities at this station.

Effort will be made to devote a considerable part of the time at Aberdeen to practical work rather than theoretical study.

That part of the Advanced Engineering course extending from December 1-March 21 will be given at the Coast Artillery School at Fort Monroe.

### **Coast Artillery Officers at Foreign Artillery Schools**

If recommendations made in the office of the Chief of Coast Artillery are approved, two very desirable details will be open to Coast Artillery officers in France and Great Britain, respectively. It is believed that much valuable instruction can be obtained by officers detailed to attend the artillery schools in these two countries, particularly in antiaircraft artillery. It is desired that the Coast Artillery be kept in close touch with foreign developments of antiaircraft materiel and especially with their tactical methods.

Great Britain, more than any other nation, has developed the tactics of air defense and has been outstanding in the conduct of air force—antiaircraft exercises. Officers detailed on this duty will be offered an unusual opportunity and no doubt the duty will be eagerly sought.

### **Coast Artillery Officers to Attend Air Corps Tactical School**

Two Coast Artillery officers of the grade of senior captain or above will be selected to attend the Air Corps Tactical School, Langley Field, during the school year 1930-31. Officers selected should be graduates of the Advanced course, Coast Artillery School or the Command and General Staff School, Fort Leavenworth. No officer will be selected who is unwilling to be placed on duty involving flying. Major Metzger is now attending the course at the Air Corps Tactical School. With the beginning of the next school year the quota for the Coast Artillery has been increased to two.

### **Air Corps Exercises**

During the month of April combined Air Corps field exercises will be held at Mather Field, Sacramento, California. The following Air Corps units will be concentrated at this airdrome for a period of about one month.

- 2nd Bombardment Group, Langley Field, Va.
- 3rd Attack Group, Fort Crockett, Texas
- 1st Pursuit Group, Selfridge Field, Mich.
- 7th Bombardment Group, Rockwell Field, Cal.
- 91st Observation Squadron, Crissy Field, Cal.

The purpose of these exercises is to train both individuals and units in coordination in the performance of tactical missions as well as to test equipment. Many new developments in air force tactics resulted from the

Ohio maneuvers in 1929 and will be practiced and tested during the West Coast exercises.

Approximately one hundred and sixty officers, one hundred and fifty mechanics, and one hundred and thirty-five planes will participate.

### Special Chemical Warfare Course

A special course of instruction for field officers will be conducted at the Chemical Warfare School, Edgewood Arsenal, Maryland, during the period July 7-August 1. The course is intended for officers who are relieved from the War College course about that time. Eight officers will be selected from the Coast Artillery Corps.

### Assignment of M-VI Searchlights

It has been recommended that the twenty-eight mobile searchlight units (M-VI) purchased from funds appropriated during the fiscal years 1929 and 1930 be assigned as below, in order of priority as listed:

<i>No. units</i>	<i>Organization</i>
3 .....	69th C. A. (AA), Aberdeen Proving Ground
1 .....	62nd C. A. (AA), Fort Totten
1 .....	61st C. A. (AA), Fort Sheridan
3 .....	12th C. A. (HD), Fort Monroe
1 .....	63rd C. A. (AA), Fort MacArthur
6 .....	65th C. A. (AA), Fort Amador
11 .....	64th C. A. (AA), Fort Shafter
2 .....	69th C. A. (AA), Aberdeen Proving Ground (afterwards to be sent to Hawaii)

### Coast Artillery Officer to Take Course at University of Michigan

First Lieut. Wilbur R. Ellis, now on duty as a student, Advanced Engineering course, C. A. S., has been designated to take a course of instruction in Motor Transportation at the University of Michigan. This course began with the second semester (February 17) and will continue through the summer session.

### The Coast Artillery School

Antiaircraft artillery has been the subject most under discussion recently in the Department of Tactics. Hedge-hopping is an Air Corps term originated to describe the maneuvers of a plane which flies at a low altitude with the object of executing a surprise attack with machine guns and light bombs against ground troops and establishments. The surprise effected in this form of attack is its principal advantage although others might be mentioned. The approach of low-flying pursuit or attack planes is not visible at a great distance as would be the case if flying at a higher altitude—naturally the attacking planes are not subject to hostile fire for as great a period. The advantage of opening fire at a close range is also obvious.

Hedge-hopping attacks will be made principally against troops in column on the roads although good results are anticipated in such attacks against antiaircraft guns and infantry in trenches, reserve, or bivouac. Under such conditions it is highly important that antiaircraft machine guns, even on the march, be kept "set up" and ready to fire at all times. This is easily accomplished in the machine gun battalion but it is believed desirable that the remaining twelve machine guns in the regiment be mounted on trucks so that they too may get into action instantly.

Truck transportation appears to be deficient in another important respect. If the weight of machine gun ammunition to be carried with the regiment is totaled it is found that the present allowance of transportation is not sufficient to carry it. There appears to be a necessity for a machine gun combat train of six trucks for this purpose. The development of the new mechanical fuze for the three-inch projectile together with the new gun, itself, has increased the effective range of antiaircraft artillery. It is estimated that these developments have rendered the gun as efficient at six thousand five hundred yards as it was formerly at five thousand yards. This seems to call for a change in former instructions covering the location of antiaircraft batteries relative to the distances from the defended area and from each other. This increase of thirty per cent in effective range considerably increases the odds in favor of the antiaircraft gun since the hostile bomber will be under effective fire for a greater length of time and his chances of reaching his objective will be just that much slimmer. Naturally, a greater area can be defended with an equal number of guns.

Coast Artillery School instructors conducted a two weeks' course of instruction in Antiaircraft Artillery Materiel and Methods at the Air Corps Tactical School for Air Corps officers. One conference on Materiel and six conferences and one map problem on the Tactics and Technique of Antiaircraft Artillery were given. In return, instructors from the Air Corps Tactical School will conduct a course on Air Corps Tactics for Coast Artillery School Advanced Course students, at a later date. This exchange of instruction is of the highest importance and is evidence of that cooperation which should exist between two arms of the service closely associated in their respective air defense missions.

Two very interesting lectures were delivered before the School recently by naval officers. Capt. A. C. Stoff, U. S. N., spoke on Naval Tactics and the subject of Lieut. Comdr. H. A. Flanagan, U. S. N., was Naval Gunnery. Both of these lectures were highly instructive and well presented.

As a further means of obtaining information pertaining to Navy methods and the conditions under which the Navy fires, four officers from the School were sent to observe the target practice of the scouting fleet held off Guantanamo, February 25. The officers selected were: Capt. H. F. E. Bultman and Capt. J. T. Lewis, instructors in the Harbor Defense and Antiaircraft sections, respectively, of the department of Artil-

lery; Capt. D. M. Griggs and 1st Lieut. I. H. Ritchie, students of the Advanced Gunnery Course.

The end of January witnessed the completion of several of the School courses. Four officers graduated from the Advanced Motor Transport Course. They were:

Capt. R. E. McGarraugh  
1st Lieut. P. C. Howe  
1st Lieut. W. L. McCormick  
1st Lieut. G. H. Stubbs

First Lieuts. W. R. Ellis and J. F. Simmons completed the Advanced Engineering Course on February 7. Lieutenant Ellis is now attending the Motor Transportation Course at the University of Michigan.

The department of enlisted specialists graduated a clerical class of fourteen students on January 1. The average mark of the class was eighty-eight. Maj. Gen. H. D. Todd, Jr., the Commandant of the Coast Artillery School, personally presented the diplomas to the graduates during the exercises held in the assembly hall.

### Fort Monroe, Virginia Summer Training Camps

In addition to the activities incident to the re-organization of the Coast Artillery at Fort Monroe, plans for the summer camps are well under way. While the number and character of the camps will be much the same as formerly, the radical change in the line up of Regular troops at Fort Monroe this summer will necessitate a complete rearrangement of the duties assigned to the several Regular Army units. The 61st Coast Artillery, which has heretofore conducted all antiaircraft training, will have gone to Camp Knox. The 12th Coast Artillery (HD), which has previously conducted all harbor defense training, including supervision of the C. M. T. C., will have turned over all fixed harbor defense batteries to the battalions of the 51st Coast Artillery (TD) and the 52nd Coast Artillery (Ry.). Since the 12th will contain an antiaircraft battery, it will be charged with the conduct of all antiaircraft training formerly handled by the 61st Coast Artillery (AA). The 51st Coast Artillery and the 52nd Coast Artillery will, between them, handle all of the training formerly conducted by the 12th Coast Artillery.

The first camp to open will be that of the third class of cadets at the United States Military Academy. The tentative dates set for this camp are from June 14 to July 2. The three hundred cadets will be divided into three groups and distributed among Fort Monroe, Fort Eustis, and Langley Field, changing periodically so that every cadet will serve at each

of the three Army posts. All groups will reassemble at Fort Monroe or Fort Eustis on July 2, preparatory to embarking.

On June 15, the day after the cadets arrive, the R. O. T. C. Camp will open. Present plans contemplate the training of units from the University of Pittsburgh and Virginia Polytechnic Institute, and in addition, about seventy students from Massachusetts Institute of Technology and the University of New Hampshire in the First Corps Area. This camp will close on July 25th.

The C. M. T. Camp will extend from July 2 to 31. The quotas allotted to this camp include six hundred Coast Artillery Red, White and Blue, and two hundred basic candidates. The conduct of the C. M. T. C. will again be turned over to the Organized Reserves, except that the number of groups of Reserve officers will be reduced to two. Since each group is limited to fourteen days' active duty, two of which will be consumed in travel, it will be necessary to have sufficient Regular Army officers on duty to open the camps, conduct the training during the first week, and carry a large part of the load in the middle of the camps when the Reserve units are changing. The Reserve regiments selected for this duty are the 516th Coast Artillery (AA), July 6-19, and the 622nd Coast Artillery (HD), July 19-August 1. The number of Reserve officers on duty during each period will be limited to one field officer and twenty-one battery officers.

Due to the limitation placed on the number of Reserve officers who can assist in the conduct of the C. M. T. C. in July, it is expected that approximately one hundred and fifty Reserve officers will apply for active duty in August. For this month three camps have been planned; the 523rd Coast Artillery (AA) and the 603rd Coast Artillery (Ry.), August 3-16, and the 916th Coast Artillery (AA), August 17-30. In addition a number of Medical, Quartermaster, Finance and Chaplain Reserve officers will be trained at various times.

National Guard regiments to be trained at Fort Monroe include the 260th Coast Artillery (AA) from the District of Columbia during the period July 26-August 10, and the 246th Coast Artillery (HD) from Virginia during the period August 3-16. It is not known at present where the training of the 213th Coast Artillery (AA), Pennsylvania National Guard, will be held. Fort Story has been suggested.

In all there will be ten different camps held at Fort Monroe between the middle of June and the end of August, counting the Reserve units which conduct the C. M. T. C. During this time it is expected that the trainees will include approximately three hundred cadets, eight hundred National Guard officers and enlisted men, two hundred Reserve officers, over two hundred R. O. T. C. students, and eight hundred C. M. T. C. candidates, or a total of two thousand three hundred. The great number of camps and the varied character of the training will demand the utilization of every available training facility.

## The Panama Coast Artillery District

We note that a brigade review of all Coast Artillery troops was held in Panama on January 27. Col. F. K. Ferguson, 1st Coast Artillery (HD), received the review while Col. Robert E. Wyllie, 4th Coast Artillery (HD), commanded the troops. Over one thousand four hundred Coast Artillerymen were present, "the largest concentration of Coast Artillery troops ever assembled in the Panama Canal Department." (Personally we, respectfully, doubt this. The review for General Mangin, French Army, was much larger.) The following regiments were present:

1st Coast Artillery (HD), Lieut. Col. Walter Singles, Commanding  
 2nd Coast Artillery (HD), Maj. Frank Drake, Commanding  
 4th Coast Artillery (HD), Lieut. Col. W. M. Colvin, Commanding  
 65th Coast Artillery (AA), Lieut. Col. L. C. Brinton, Commanding

*The public was "cordially invited to be present."*

The annual battle practice was held in the Harbor Defenses of Balboa on February 7. Nine batteries participated (twenty-two guns) and fired a total of two hundred and twenty-four rounds against eight or ten targets. The 1st and 2nd Coast Artillery (Harbor Defenses of Cristobal) remained at Amador following the Department field meet and participated in the battle practice. Col. Frank K. Ferguson is, at present, in command of the Panama Coast Artillery District relieving Brig. Gen. William M. Cruikshank following his departure for the States.

### The 4th Coast Artillery (HD), Fort Amador

Colonel James Brady Mitchell, upon his recent retirement, relinquished command of the 4th Coast Artillery to Col. Robert E. Wyllie. This completed Colonel Mitchell's second tour at Fort Amador, the first being in 1914-16 during the construction of the post. It was entirely fitting that Colonel Mitchell should complete his military career at Amador, the post which he had seen arise from the Balboa dump to become one of the most beautiful in the Army. As Colonel Mitchell left the post for the last time the troops were drawn up along the road at present arms. In the evening a farewell reception and dance was given in his honor at the Union Club by the garrison. Colonel Wyllie was welcomed by the officers and ladies of the post at the same time.

On December 12th Battery D completed its annual mine practice with one hundred per cent, laying a group of nineteen mines in ninety-nine and five-tenths minutes.

During the month all batteries of the 4th, except Headquarters Battery, conducted sub-caliber practices under gas. In two instances the gas concentration was laid down by Capt. Thomas Phillips, Chemical Warfare Service, giving both branches of the service a practical demonstration.

Following the idea of cooperation between the services, the proper liaison was established with the Air Corps through Captain Skemp. Four planes from France Field landed at Fort Clayton and took on four officers from Fort Amador. The artillerymen were treated to views, from the air, of the harbor defenses at both entrances to the canal, including two cross-continental trips above the canal and a short, but very interesting stop at France Field. These officers now consider themselves "air-minded." Trips are being arranged for the other officers of the 4th.

A Christmas party of merit was staged by local talent and was declared a grand success by the children of the post and a "good time was had by all."

Baseball being a winter sport in the tropics has captured the interest of the garrison as Amador appears to have championship material despite two 1-0 defeats.

The period from Christmas to New Year's day was declared a holiday. This well-earned rest allowed time for retrospection and relaxation, leading to the conclusion that the past year had been a successful one and the determination to make the next year even better.

### The 13th Coast Artillery (HD), Fort Barrancas

The Harbor Defenses of Pensacola were visited and inspected by Maj. Gen. Frank R. McCoy, the Corps Area Commander, on January 27. General McCoy in addition to inspecting Fort Barrancas, Pickens, and McRee, also inspected Fort Morgan located at the mouth of Mobile harbor.

The regiment finished its small arms practice before the first of the year. A considerable improvement was noted over previous years. The percentage qualified in rifle and pistol in each battery was:

	<i>Rifle</i>	<i>Pistol</i>	<i>Commanded by</i>
Hq. Battery .....	95	100	Capt. C. A. Valverde, Inf.
13th Band .....		100	Capt. F. G. Epling
Battery "A" .....	100	67	Capt. J. J. Maher
Battery "B" .....	100	80	Capt. J. D. Brown

Captain C. A. Valverde, Infantry, has recently completed a four-year detail with the Coast Artillery and has left for his new station, Fort Francis E. Warren (D. A. Russell), Wyoming.

The 1930 target practice of Battery "A" (Capt. J. J. Maher) was fired during December. While it is unusual to schedule a target practice so far in advance the arrangement has the advantage of less interference from summer training. The record practice of Battery "A" (10-inch) was fired on December 3 and resulted in five hits, bow-on, and three, broadside. The total score was eighty-one and seven-tenths. The target was completely destroyed by the fifth record shot, necessitating a change of target.

The entire post is busy with preparations for the additional personnel due to arrive about March 1. All enlisted personnel will be housed on the Barrancas side of the Bay, the old brick barracks being occupied by the Headquarters Battery.

### The 51st Coast Artillery (TD), Fort Eustis

On January 28 a detachment of the regiment began a march to Aberdeen Proving Ground and return for the purpose of "training drivers, testing vehicles, and receiving practical experience in field conditions." The secondary purpose of the march was to transport a part of the baggage of the First Sound Ranging Battery to Aberdeen where the personnel of this battery will be transferred to the 69th C. A. (AA). The return trip was to be made on February 3. The distance is approximately two hundred and fifty miles.

The convoy was under the command of 1st Lieut. C. B. Wahle, 51st C. A., who was assisted by 2nd Lieut. W. A. Weddell, also of the regiment. The enlisted contingent consisted of approximately fifty enlisted men, including attached sound rangers, ordnance department, and medical department personnel.

The march was made in two sections. The following vehicles were taken

- 12 FWD cargo trucks
- 2 FWD gas trucks
- 3 GMC's
- 2 Rolling kitchens
- 2 Water carts
- 1 Ambulance
- 1 Chevrolet passenger car

The sections consisted of an equal number of vehicles. The second section followed the first at a distance of about one and one-half miles. The prescribed average rate of march was fourteen miles per hour.

Ten days' dry rations were carried, perishable food supplies being purchased en route. Gas and oil sufficient to make the journey one way were carried—Aberdeen Proving Ground being designated as a refilling point. Wood and coal for the trip were also carried.

On the night of January 30 twelve inches of snow fell in the Washington sector. As this is written the convoy had reached Fort Humphries and had been stopped due to the heavy snow fall. The "practical field experience" included this unusual condition and is well worth elaboration. Since the Convoy Commander was directed to keep a complete log of the trip it is possible that the Convoy Commander may be induced to take his pen in hand and describe his experiences.

## The 61st Coast Artillery (AA), Fort Monroe

The original plan for change of station of this regiment contemplated a movement in two stages: first, to Camp Knox, Kentucky, where the regiment would conduct summer training for civilian components, and the latter stage of the movement, to Fort Sheridan, Illinois, to be made after the completion of summer training.

Later consideration has resulted in a recommendation changing this plan. The regiment will move as a unit to some point on the line of march where a part will be detached and proceed to Camp Knox for the duty mentioned above. While there may still be some further change in the plan it is probable that the regiment will leave Monroe about May 15 for its new station.

The detachment destined for Camp Knox will consist of four officers and seventy-five enlisted men. One of the four officers will be Maj. D. D. Hinman, now instructor in antiaircraft at the Coast Artillery School. Major Hinman will be attached for summer training duty only, and upon its completion will return to Fort Monroe. This detachment will begin the training period about June 15 upon the arrival of R. O. T. C. units from Middle Western universities. It will continue with Reserve units located in this section and will not complete its tour at Camp Knox until well into August.

The training at Camp Knox will be undertaken with the best "set-up" yet furnished at this post. The equipment will include

- 4—3-inch guns
- 4—Machine guns, .30 cal.
- 4—Searchlights
- 1—Sound locator
- 2—Machine guns, .50 cal.
- 1—Height finder
- 2—Spotting cameras
- 1—Sperry director

and all the other appurtenances and motor transportation.

The remainder of the regiment will be settled at Sheridan long before the Camp Knox detachment finishes its work there. The decision to make the regiment movement in one jump will be much appreciated by the camp followers (maybe we should have said "dependents") of the regiment.

## The 62nd Coast Artillery (AA), Fort Totten

Beginning about April 1 the regiment is looking forward to a very busy season. The first ten days of April will be occupied in road marches and preliminary preparations for the march to Aberdeen Proving Ground. In accordance with the present schedule the date of arrival at Aberdeen has been set as April 14. Upon arrival at Aberdeen a period of intensive drill

and training will begin culminating with the Antiaircraft-Air Corps joint exercises set for the period May 12-17. During the joint exercises the regiment will be occupied with various phases of the defense of an airdrome against air forces. A joint board, of which Lieut. Col. J. M. Dunn is president is preparing the plan and instructions to govern during these exercises.

Immediately following the joint exercises preliminary and record firings will begin and will continue until about June 25. Following target practices a period of about ten days will be devoted to further searchlight exercises and preparations for Organized Reserve training. Five Organized Reserve units are scheduled for training at Aberdeen in association with the 62nd: 514th, 522nd, 530th, 533rd and 539th. A single two-weeks' period (July 7-20) will be devoted to this training but the unusual opportunities at Aberdeen will make it possible to provide training of a very high order and it is believed that Reserve officers will welcome the advantages which the Proving Ground offers.

Upon completion of the Reserve training the regiment will depart for its home station (about July 26).

**The 69th Coast Artillery (AA)  
Aberdeen Proving Ground, Md.**

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

This organization was born at midnight January 31. I am happy to state that there were no serious complications and both mother and child are doing well. I would not be surprised to find that it will be quite a bottle baby. We are using elephant milk in the bottles and expect to achieve full stature about February 20. As is not unusual with fond parents, we are already planning for the education of the brat and feel that a supply of G. I. (gunners' instruction) pamphlets should be on hand. We would like to have you bill and send some. . . .

Colonel Taylor has referred your letter anent an article describing our organization to me. I will keep a set of notes and when the affair has progressed to the point where the parties concerned are beginning to feel a bit blasé about it all, I will attempt to furnish you with the dirty details.

Sincerely,

G. B. ROBISON,  
*Major, C. A. C.*

**The 537th Coast Artillery (AA) (Res.)  
Minneapolis, Minnesota**

The activities of the regiment at the present time are confined to instructional conferences and extension courses. Ninety-one per cent of the

entire personnel of the regiment are enrolled in the extension courses. Figures on enrollments do not mean much unless it results in work done. It is discovered that all officers enrolled, with two exceptions, have turned in lessons. To put it in figures, fifty-eight officers out of a possible sixty-four are enrolled. The unit instructor states that the regiment holds a record for enrollments in the Artillery Group, Seventh Corps Area Reserves, and aspires to be the leading regiment in the entire Organized Reserve of the United States.

The instructor takes exception to the statement in the COAST ARTILLERY JOURNAL to the effect that R. O. T. C. graduates do not seek active or inactive training and lose their active commissions in the Reserve at the end of the first five-year appointment period. He furnishes the information that in the 537th there are fifty-two R. O. T. C. graduates commissioned and that only five of these are not enrolled in the extension courses.

The method used by the instructor to secure this high percentage of enrollments is one of personal contact, where practicable, and by personal letter (no mimeographs) where the officer cannot be interviewed in person.

Minneapolis is very hospitable towards the Regular Army, the Organized Reserve, or, in fact, any activity connected with National Defense.

Lieut. Col. Arthur H. Conary commands the 537th. The unit instructor is Capt. T. R. Phillips, C. A. C. (D. O. L.).

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NOTE: Later information has been received that the regiment is one hundred per cent enrolled. One hundred and ninety-six lessons were submitted during January.

# PROFESSIONAL NOTES

## Analysis of the B Component

**EDITOR'S NOTE:** In the leading article in this issue of the JOURNAL the new formula for the B component of the Seacoast Artillery score is mentioned. The new formula for this component is discussed in detail in the following article, also prepared by the Board.

The formula for the B component of the score is

$$B = \frac{M + N}{2d} \times W \quad (1)$$

where W is the par value for the B component.

In the present (1929) score,  $W = 40$

$$M = \text{P.E.} \div 0.845$$

$$N = \text{D.A.P.E.} \div 0.845$$

$d$  = the mean deviation of the shots.

The object of this discussion is to derive an expression for  $d$  which will show how  $d$  is affected.

- (1) by variations in the position of the C.I. with respect to the target, and
- (2) by variations in the D.A.P.E.

The effect of variations in  $d$  upon the B component will then be discussed.

In Figure 1 let the line AB represent the target and let the line CD

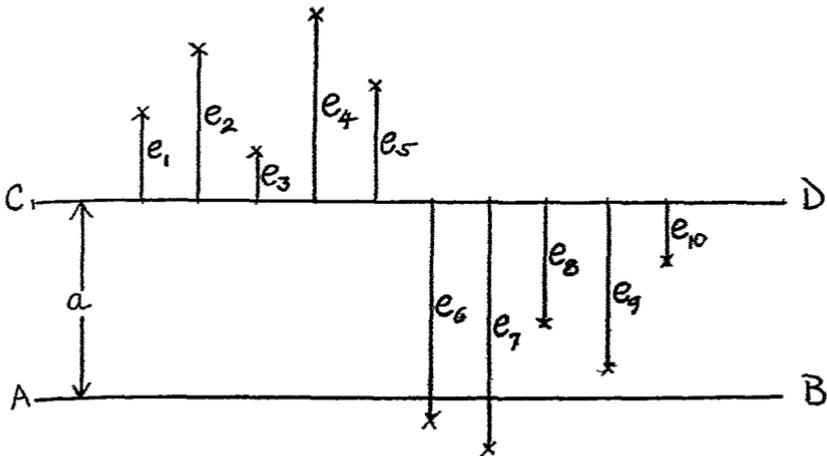


FIGURE 1

represent the C.I. of a group of shots. Let  $a$  be the distance from the target to the C.I. By definition

$$a = \frac{(a + e_1) + (a + e_2) + \dots + (a + e_s) + (e_s - a) + (e_7 - a) + (a - e_2) + (a - e_9) + (a - e_{10})}{s} \tag{2}$$

where the  $e$ 's denote the errors of individual shots and  $S$  denotes the total number of shots.

In what follows it will be assumed that the shots are distributed in accordance with the Normal Law of Probability. Consequently, there will be, in any series of shots, as many shots over the C.I. as there are shots short of the C.I.

Let  $S_1$  denote the number of shots short of the target. Then there will be  $\left(\frac{S}{2} - S_1\right)$  shots falling between the C.I. and the target.

Now referring to equation (2) and to Figure 1, it will be noted that for every shot over the target, i. e., for  $S - S_1$  shots, there is a plus  $a$  in equation (2) and for every shot short of the target, i. e., for  $S_1$  shots, there is a minus  $a$  in equation (2). Hence, collecting terms, equation (2) becomes

$$a = \frac{e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7 - (e_8 + e_9 + e_{10}) + (S - 2S_1)a}{s} \tag{3}$$

This can be written, by adding  $(e_8 + e_9 + e_{10}) - (e_8 + e_9 + e_{10})$  to the numerator,

$$a = \frac{e_1 + e_2 + \dots + e_9 + e_{10} + (S - 2S_1)a - 2(e_8 + e_9 + e_{10})}{s} \tag{4}$$

Let  $p$  denote the mean error of all shots falling between the C.I. and the target. Since there are  $\frac{S}{2} - S_1$  such shots, the term  $2(e_8 + e_9 + e_{10})$  can be replaced by  $2\left(\frac{S}{2} - S_1\right)p$ . Substituting this in equation (4) mak-

ing use of the fact that  $N = \frac{\sum_{i=1}^i e_i}{s}$  equation (4) becomes

$$d = N + \frac{S - 2S_1}{S} (1 - p) a \tag{5}$$

It will be shown later that the coefficient of  $a$  in eq. (5) increases with  $a$ . It is evident that  $d$  is a function of  $N$  and  $a$ .  $N$  measures the dispersion (accuracy of fire) and  $a$  measures the adjustment (accuracy of practice). A large  $a$  (poor adjustment) gives a large  $d$  and consequently a small score in the B component. A large  $N$  gives a larger  $d$  and consequently a smaller

score in the B component. But, since N appears also in the numerator of the B component equation (1), this effect of a variation in N on the score is not so obvious.

To show how N affects the score, a series of curves can be drawn based on equation (5). For a given value of N, d will vary as a. If a series of values of a is chosen and the corresponding values of d substituted in  $\frac{M + N}{2d}$ , a curve can be drawn showing the variation of  $\frac{M + N}{2d}$  (and consequently of the B component) as the C.I. is moved away from the target. To each value of N there corresponds one such curve. In order to compute the value of d corresponding to a given value of a, it will be necessary to construct a table giving the values of  $\frac{S - 2S_1}{S} (1 - p)$  corresponding to various values of a. Such a table is constructed as follows:

Suppose  $a = \frac{1}{2}$  D.A.P.E. (Figure 2.) If a dispersion ladder is constructed in which the zones are  $\frac{1}{2}$  D.A.P.E. in width, it will be found that when  $a = \frac{1}{2}$  D.A.P.E., out of a total of 1000 shots, 132 will fall between the C.I. and the target. The mean error of these shots is, approximately,  $\frac{a}{2}$ , or from the definition of p,

$$pa = \frac{a}{2} \text{ or } p = 0.5, \text{ and } 1 - p = .5$$

Also,  $S_1 = 368$ , and

$$\frac{S - 2S_1}{S}(1 - p) = \frac{1000 - 736}{1000} \times 0.5 = .132$$

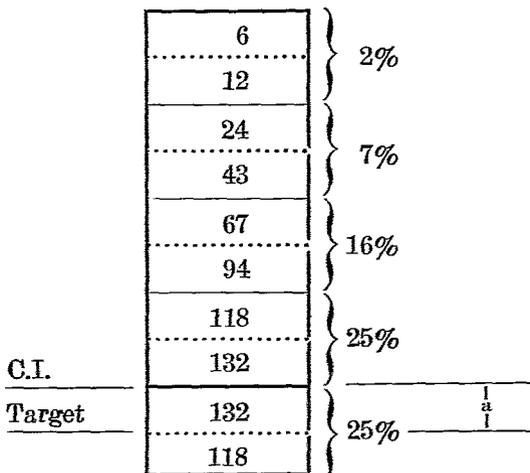


FIGURE 2

C.I. ----- a ----- Target	67	}	16%
	94		
	118	}	25%
	132		
	132	}	25%
	118		
	94	}	16%
	67		

FIGURE 3

Similarly, let  $a = 1$  D.A.P.E., Figure 3.  
If we assume that the C.I. of each group of shots within a zone falls at the mid-point of that zone, we find that, approximately,

$$pa = \frac{132 \times \frac{a}{4} + 118 \times \frac{3a}{4}}{250} = .486a$$

and  $1 - p = .514$

Also,  $S_1 = 250$ , so that

$$\frac{S - 2S_1(1 - p)}{S} = \frac{1000 - 500}{1000} \times .514 = .257$$

This process is repeated for successive values of  $a$ , giving the table shown in Figure 4.

$a$ (in D.A.P.E.'s)	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4
$\frac{S - 2S_1}{S}(1 - p)$	0	.132	.257	.369	.467	.545	.608	.662	.701

FIGURE 4

It is now possible to draw a family of curves

$$y = \frac{M + N}{2d} = \frac{\frac{1}{2}(M + N)}{N + \frac{(S - 2S_1)}{S}(1 - p)a} \tag{6}$$

in which  $a$  is the independent variable and to each value of  $N$  there corresponds a curve of the family. In order to simplify the form of equation (6)

let  $N = qM$ ,  
 $a \div \text{D.A.P.E.} = X$ ,  
 whence  $N = \text{D.A.P.E.} \div .845 = 1.18 a/X$   
 and  $M = N \div q = 1.18 a/qX$

Equation (6) becomes

$$y = \frac{\frac{1}{2} \times 1.18 \left( \frac{a}{X} + \frac{a}{qX} \right)}{1.18 \frac{a}{X} + \frac{S - 2S_1}{S}(1 - p) a}$$

which reduces to

$$y = \frac{\left( 1 + \frac{1}{q} \right)}{2 + \frac{S - 2S_1}{.59S}(1 - p) X}$$

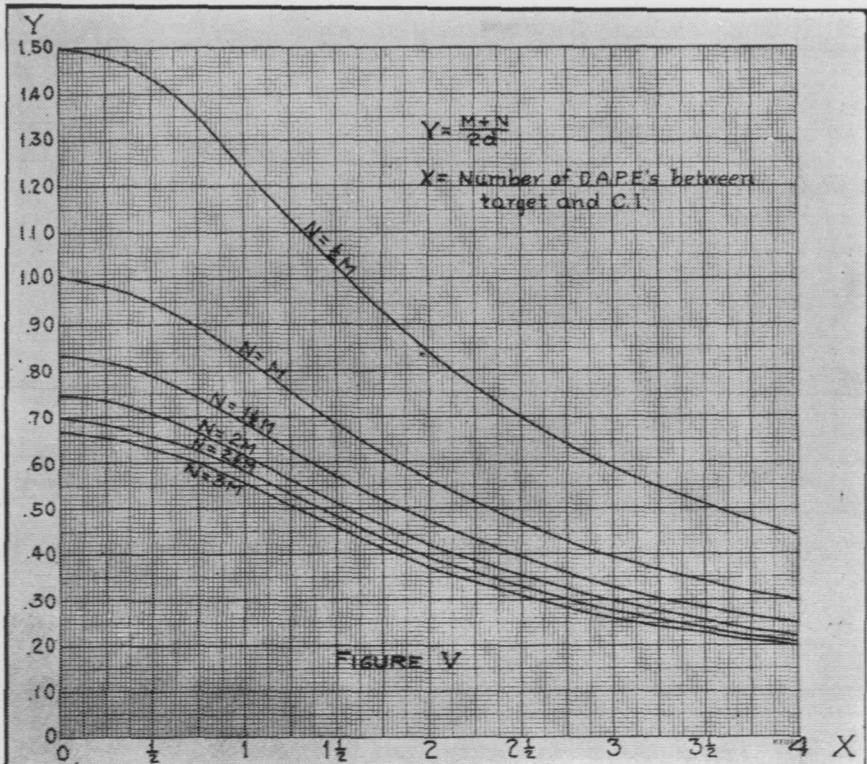
Let  $R = \frac{S - 2S_1}{.59S} (1 - p)$  and the equation becomes

$$y = \frac{1 + \frac{1}{q}}{2 + RX} \quad (7)$$

where  $q$  is the ratio between  $N$  and  $M$ ,  $R$  is determined from Figure 4, and  $X$  is the number of probable errors from the target to the C.I.

Figure 5 shows a series of curves for  $q = \frac{1}{2}, 1, 1\frac{1}{2}, 2, 2\frac{1}{2}, 3$  and for  $X$  varying from zero to 4. From an inspection of these curves it should be evident that for a given value of  $X$ , the  $B$  component will be larger as  $N$  becomes smaller. A small  $N$  (dispersion) becomes increasingly important as  $X$  decreases (i. e., as the adjustment improves) e. g., if  $X = 0$  (C.I. on the target), a decrease in  $N$  from  $1\frac{1}{2}M$  to  $M$  will increase the  $B$  component from 33.2 to 40, but if  $X = 2$ , the same decrease in  $N$  will increase the  $B$  component from 18.8 to only 22.4. In particular it should be noted that in no case is the  $B$  component of the score improved by developing a larger P.E. Further, as  $X$  increases, for a given value of  $N$ , the score decreases.

Throughout the foregoing discussion, it was assumed that the C.I. was beyond the target. If the C.I. is short of the target,  $S_1$  will denote the number of overs, and the equations and conclusions will apply without modification.

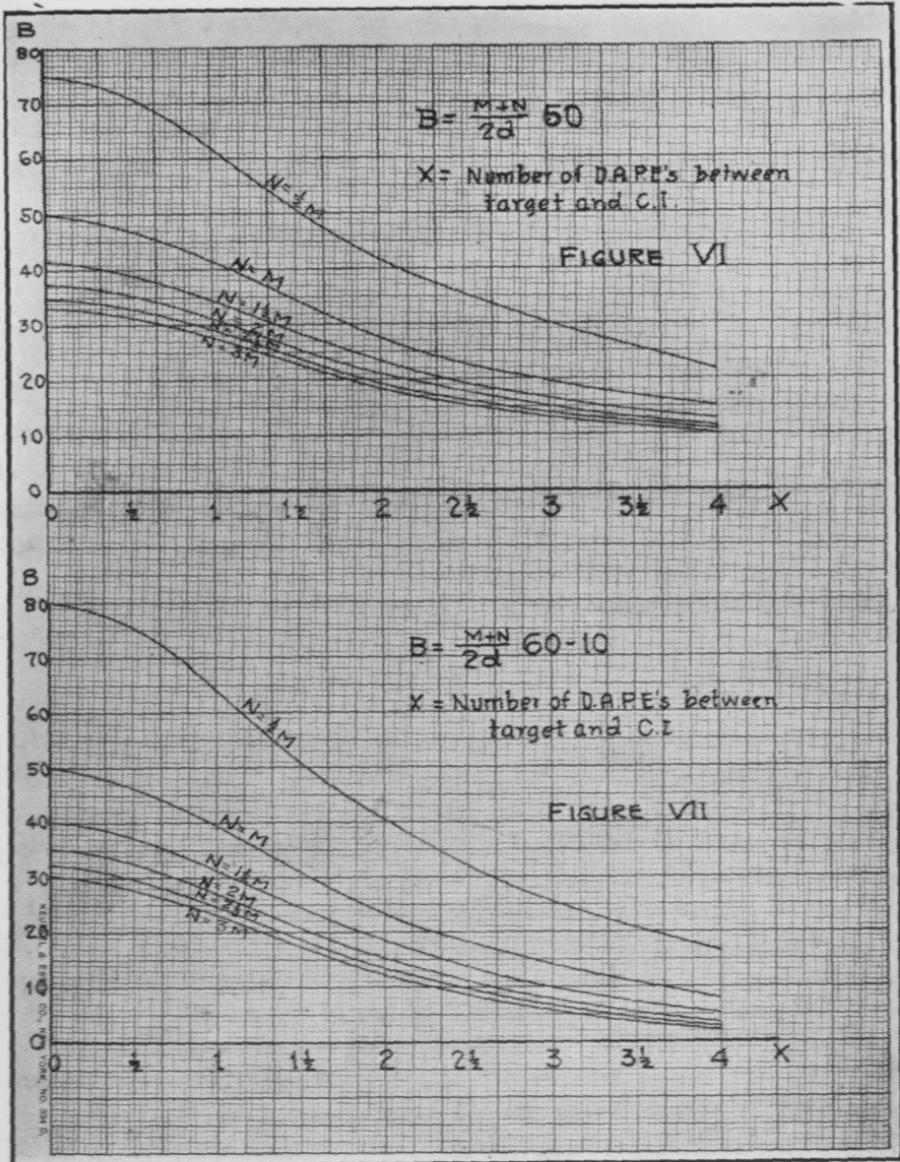


NEW FORMULA FOR B COMPONENT

Referring to Figure 5, it will be noted that in the worst case there presented, viz:

$$N = 3M \text{ and } X = 4, \quad \frac{M + N}{2d} \text{ is } .20$$

If the par value for this component is 50, as in the 1930 score, a score of  $.20 \times 50$  or 10 will be attained. The C.I. would have to be an infinite distance from the target to get a score of zero. It was felt that the score



should be corrected to meet this objection. In order to give lower scores for large values of X, the following formula was adopted for the B component:

$$B = \frac{M + N}{2d} 60 - 10 \text{ or } B = 30 \frac{M + N}{d} - 10 \quad (8)$$

Par is attained when  $d = N = M$ . In this case  $X = O$ . When N is less than M, par may be attained for values of X greater than O. When  $N = 3M$ , and X is 4,  $\frac{M + N}{2d} = .20$ , and B, e. g. (8) becomes

$$B = .20 \times 60 - 10 = 2$$

as compared with a score of 10 had equation (1) been used with  $W = 50$ .

In Figure 6 the curves show the value of the B component when equation (1) is used with  $W = 50$ . In Figure 7 the curves show the score when equation (8) is used.

### **An Antiaircraft Training Target**

*By* CAPT. K. P. FLAGG, C. A. C.

A successful moving target for antiaircraft gun and machine gun batteries has been developed at Michigan State College for use of R. O. T. C. cadets. Besides fulfilling all the basic assumptions of airplane target flight it is automatic. It is always ready at the snap of a switch and requires no attention except an occasional oiling and adjustment of the belts.

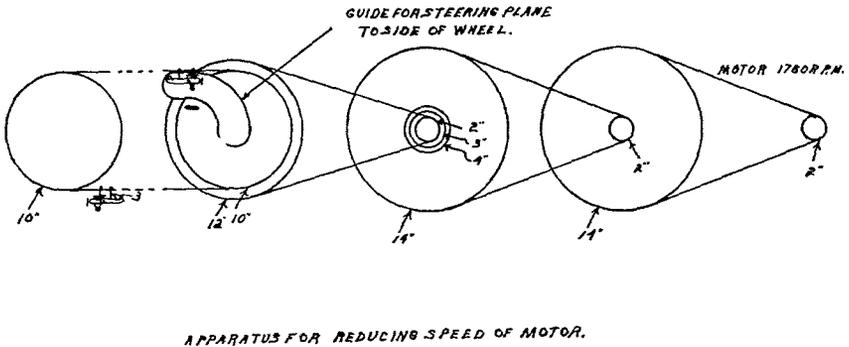
The general scheme is an endless belt which is kept in motion by a small electric motor. The belt carries a miniature airplane which reverses itself at each end of the course, traveling back and forth through the field of fire without supervision as long as needed.

The apparatus is simple and easy to construct. Practically everything needed can be found at any artillery station with the possible exception of a small electric motor. If a motor has to be purchased it is recommended that one of the three-speed types be obtained as it will be more efficient and greatly reduce the amount of labor and materials necessary.

The following description is of an apparatus which uses a single speed (1760 R. P. M.), one-fourth to one-eighth horsepower motor. In order to reduce the speed of the motor a series of pulleys is rigged as shown in the accompanying diagram. All the pulleys are made of wood three-fourths-inch thick with a one-half-inch V groove for carrying the belt. All belts are sash cord three-sixteenths-inch in diameter. The continuous belt which carries the plane is four hundred feet long and elevated thirty feet above the ground. This gives a field of fire of one hundred and ninety feet which is considerably longer than necessary. There is a twelve-inch sag in this belt, but it is believed that a stout flexible wire could be used in place of the sash cord with much less sag or stretching.

By assuming a reduced scale of one foot equals one hundred yards, all

instruments and sights function normally without alteration of any kind. The guns are placed about ten yards from the course and the range section as near as possible to the guns without reference to the reduced scale. The altimeter base line is about fifteen yards long and is placed anywhere nearby where a suitable altitude is obtained. The target speed represents a plane traveling at thirty to one hundred miles per hour, depending on the size of the pulley used in the last reduction stage. The actual speed is fifteen to fifty feet per minute.



The airplane or sleeve target is three inches long. It is made of paper or light wood and fastened to the moving belt by two short cords with loose ring connections to prevent twisting around the belt. As the plane approaches the end of the course (on the upper half of the course) it strikes a guide which steers it to one side of the pulley. It then rides around the side of the pulley and starts off on the return trip headed in the proper direction. At the other end (on the lower half of the course) the plane rides around the pulley without additional assistance.

The apparatus shown in the diagram can be simplified by the use of metal gears. Although designed for indoor use there is no reason why this device would not be suitable for outdoors provided the motor and gears were protected from the weather.

### Projectile Cleaning Machine

Second Lieut. James W. Mosteller, Jr., 1st Coast Artillery (HD), Fort Randolph, C. Z., has produced a machine for cleaning projectiles which appears to have considerable merit. Every officer and soldier has found himself confronted, at times, with a great number of projectiles which require a thorough cleaning and painting to prevent further deteriorating. To do the job by hand means many man-hours of monotonous labor. Lieutenant Mosteller, with the cooperation of the Ordnance machine shop at Fort Randolph, has produced, locally, a machine which does the job better, with less labor, and in a remarkably short time. It is said to require only

three minutes to remove all rust and paint down to the bright metal of the projectile.

The machine itself includes an electric motor, a rig constructed from salvaged narrow gauge cars, pulleys, etc. It works on a lathe principle. Too much information will not be given here because Lieutenant Mosteller has been asked to furnish a complete description with drawings and photographs for publication in the JOURNAL.

Many officers have expressed themselves as against gadgets. It is thought that they do so with certain reservations. A gadget, to gain any consideration, should be useful and necessary. The projectile cleaning machine is believed to be of considerable labor-saving value and will prove of great assistance to any officer who has any considerable number of projectiles to keep in condition. Therefore the JOURNAL will publish a full description of the manner of its construction.

#### **Change in Training Regulations for 155-G.P.F.**

As a result of the accident (See October JOURNAL, 1929) which occurred at Fort Kamehameha, T. H., on April 19, 1929, in which four men were killed and two seriously injured, the Chief of Coast Artillery has recommended that the training regulations on this gun be changed to include the following:

The firing mechanism will not be inserted until the breech block is rotated and locked in the closed position.

The percussion hammer lock bolt will be locked immediately the breech is opened, and this bolt will not be unlocked until after the breech block has been fully rotated and locked in the closed position, and the gun is ready to be fired.

# COAST ARTILLERY BOARD NOTES

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*Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the Service at Large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. J. C. Ohnstad, Lieutenant Colonel, C. A. C., President.*

**Project No. 740—Test of Sponge Rammer**—Sponge rammers of various types have been tested by the Coast Artillery Board, but in each case either the ramming or the sponging suffered. A sponge which fits tight enough in the chamber to sponge properly offers sufficient friction to passage through the chamber to preclude satisfactory ramming. The Coast Artillery Board recommended that further development of a combination sponge rammer for any type of armament to which Coast Artillery troops may be assigned be discontinued. This recommendation was concurred in by the Chief of Coast Artillery, and approved by the Ordnance Technical Committee and by the Chief of Ordnance.

**Project No. 747—"Stillman" Continuous Data Interpolator**—This is an ingenious device which reproduces the movement of the target, in range or direction, to a suitable scale, and permits of extrapolation but not prediction; both of which operations will be performed by the Seacoast Data Computer now being constructed by the Sperry Company.

**Project No. 748—Smoke Protection for Seacoast Installations**—The Coast Artillery Board made recommendations concerning an investigation to be conducted by the Chemical Warfare Service to determine the basic principles which underlie the protection by smoke of seacoast artillery installations from aerial observation and attack.

**Project No. 749—"Storrs" Spotting Device**—This device is a well-conceived combination of the Cole Spotting Board and a plotting board. Restrictions as to size limit its accuracy except at short ranges, which is not the case with the Spotting and Adjustment Board T-1 now under construction.

**Project No. 751—"Underwood" Powder Cart for 12-inch D. C. Guns**—This powder cart is a variation of the Uzella Cart, equipped with pneumatic tires mounted on wire wheels equipped with antifricition bearings. The Coast Artillery Board favors the development of such a powder cart rather than a modification of the present shot truck to carry the powder. With the larger major caliber guns such a combined load becomes excessively unwieldy.

**Project No. 752—"Stephens" Xylonite Plotter for Antiaircraft Artillery Target Practice**—This is the plotter used during the Aberdeen firings, in plotting hits. One has been sent to each antiaircraft regiment for test and report.

**Project No. 754—Test of Manuverability of Fully Loaded Bombing Plane**—This project consisted of the papers in the test of the manuverability of a fully loaded bombing plane which was held at Aberdeen Proving Ground.

# YOU TELL EM

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## Comments Desired from Others

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

Relative to your call, on page 11 of the January, 1930, issue of the COAST ARTILLERY JOURNAL, for ideas on the subject of the retention in the active Reserves of R. O. T. C. commissioned graduates after the initial five years, I may say that it has been in my mind for some months past to write to the P. M. S. & T. of the college I attended to see if there were not some likely graduates lying about loose that we might use in the Reserve regiment to which I belong. The question that you are bringing up seems to tie in with this proposition.

The young man recently graduated will find many new interests to divert his attention from the Reserves. It is evident that the problems of getting a proper start in his vocation and often of establishing a home of his own, will get first call; in some cases, frequent trips "on the road" will make difficult close association with the Reserves; in others, becoming oriented in a new environment will prove a distraction. By comparison, the military interest is not so vital a factor as it was during his college course. It is a period of transition and adjustment; and unless steps are taken to keep up the old interest, the value of his commission and his value to the Reserves will tend to receive less and less consideration from him until the termination of his first five years finds him utterly out of touch with the Reserves.

Another factor is change of address.

Much time and expense have been devoted to preparing the young officer for a commission. It is poor economy to slacken up and lose the value of this momentum of sustained interest and current knowledge and training if we are to place any reliance upon an *organized* Reserve of sufficient size and power to take its place in the line on short notice.

Does it not appear that the problem then is to keep in touch with these R. O. T. C. commissioned graduates?

Toward this end, the following ideas are suggested for what they may be worth:

1. The P. M. S. & T. at each institution where there is a senior R. O. T. C. to keep a card catalogue of each graduate who has ever been commissioned from the institution's R. O. T. C. unit, with pertinent data thereon, to be kept in a live file until known death, age limit, or lack of information for a determined period of years.

Each card to have many spaces for changes in address. Address to be kept up to date as far as possible, obtaining aid in this respect from the

college files, files of the college alumni association, fraternities and other organizations.

Periodic report to be made of any recorded change in address. This report may be made to the Commanding General of the Corps Area in which the institution is located, or to the Adjutant General, War Department, Washington, D. C., or otherwise, as directed in orders. Change in address to a different Corps Area may require different instructions, but require the P. M. S. & T. and the proper executive for Reserves to keep each other informed at least of the whereabouts of the R. O. T. C. graduate.

Upon assignment or attachment, reassignment or reattachment, the P. M. S. & T. at the educational institution where the officer was graduated and commissioned to be notified through proper channels of the organization to which the officer has been assigned or attached and of the Corps Area, and to have same noted on the officers' record card.

2. Upon such an officer terminating his connection with the service, Corps Area headquarters to notify the P. M. S. & T. at the educational institution where the officer was graduated and commissioned of such fact, with date, and same to be entered on said officer's record card at such institution.

This letter has grown much beyond the limits intended. It is not sent with any idea of appearing in your columns, but with the thought that in it may be the germ of an idea or ideas that you can use for the benefit of the Reserves of the Coast Artillery and of the other arms and services.

Respectfully yours,

SAMUEL ALMAN,  
*Captain, 533rd, C. A. (A.A.)*

### **We Guarantee the 100-Per Battery**

THE ARMY, NAVY AND AIR FORCE GAZETTE

London,  
February 9, 1930.

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

I am very grateful for your correction in the matter of the photograph (showing 61st firing new model 3-inch gun at Aberdeen at rate of five hundred rounds per minute) which appeared on January 9. I have reprinted it in the current issue with your correction below. The error arose through the inaccurate legend appended to the photograph by the American agency from which I bought it. Naturally I did *not* believe the statement that the guns had a rate of fire of five hundred rounds a minute but even one hundred a minute is startling. The highest rate we reached in the war—I was for a time General Staff officer, second grade, in the London Air Defences—was forty-eight rounds fired in the minute! That was with

an old 18-pdr. converted for AA use. The loader collapsed and the piece was somewhat warm.

I read the COAST ARTILLERY JOURNAL with much interest. It has a high reputation over here. I am glad that you find matter of interest in our journal.

Yours sincerely,

W. E. DE B. WHITTAKER,  
*Major.*

### **Another Female Outburst (Don't Worry, It's Deep Stuff)**

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

\* \* \* \* \*

I have heard much in praise of the COAST ARTILLERY JOURNAL since you have "Hearst" it so I looked at the last one. Lauditorially speaking I reckon the C. A. J. must be pretty good although I am too dumb to understand it from "Kiver to Kiver" as the other female of the species claims in her epistle.

\* \* \* \* \*

Sincerely,

M. L. K.

### **Tip for Publicity Officers**

HEADQUARTERS SECOND CORPS AREA  
Office of the Corps Area Commander  
Governors Island, N. Y.

Major Samuel T. Stewart,  
393 Seventh Avenue,  
New York City, N. Y.

Dear Major Stewart:

\* \* \* \* \*

I noted a recent article from the COAST ARTILLERY JOURNAL prepared by you, under the title of "Let's Get Acquainted" which has a tremendous lot of good common sense in it. Please allow me to compliment you on the article. You may be interested to know that my attention was drawn to your article by one of the officials of the "Paramount News" organization, who was much interested also.

\* \* \* \* \*

With very kindest personal regards, I am,  
Sincerely yours,

---

G. S. C.

**Colonel Dunn's Article Helps the 61st**

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

\* \* \* \* \*

The article by Colonel Dunn in the last copy about the move of the 62nd to Fort Story, is of great interest and value to the 61st at the present time in getting ready for its move west.

I will be very glad to have a similar article prepared after we get to Fort Sheridan covering the march of the 61st and I shall ask the officer in charge of the 61st detachment at Camp Knox to prepare an article covering the work there this summer.

\* \* \* \* \*

Yours very sincerely,

JAMES H. CUNNINGHAM,  
*Major, 61st C. A. (AA),  
Commanding.*

**Translated from the Scotch by the Editor**

Headquarters

Panama Coast Artillery District

Quarry Heights, C. Z.

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

Your magazine has acquired a most potent punch. I didn't think it could last but each issue has done its best to pry me loose from three dollars until finally here it is enclosed, eloquent testimony (if you knew how it hurts) of what I think of your efforts. The Oozlefinch-gone-aircraft held me absolutely breathless!

Yours enthusiastically,

PAUL H. FRENCH,  
*Major, C. A. C.*

**That Roster Business Again. It Would Cause Someone to Do  
Some Work Around Here**

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

\* \* \* \* \*

Specifically I "commend" (a great military word) the greater variety in the good old magazine, to wit: the departments "Coast Artillery Activities" and "Coast Artillery Orders." Occasionally I personally would like to see published the roster of officers assigned to regiments as used to be done in the Army List and Directory of prewar days, and of officers on various other jobs, especially details with dates of assignment thereto or of

probable relief. Perhaps the majority of officers don't care about such details in a monthly publication. I enjoy the broadened scope of your "Professional Notes." I hope you will continue to report the activities of the Coast Artillery Board when, and if, same are reportable. Also continue the mixture of "high-brow" and less seriously-veined articles, as the occasion demands. There's room (I hope and believe) in the JOURNAL for mathematical articles, for military historical papers of proper interest and a host of miscellaneous matters of current Coast Artillery happenings and progress, with something of what the other branches are doing.

\* \* \* \* \*

As ever,

W. C. F.

**We Want to Hear from Them, Too**

Battery I, 243rd Coast Artillery (HD)  
Rhode Island National Guard

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

May I open my letter by asking if you believe in miracles?

Surely one has happened, for since my commission as a Coast Artillery officer, I have never received a personal letter such as yours of the 17 inst. asking my subscription renewal, and, I have every copy of the JOURNAL since 1920.

I approve most heartily of your business methods in this respect. It has removed the old feeling that the JOURNAL was one of those things that went with the army game, whether one wanted to read it or not. Impersonal is the word to be used I think.

As to the general changes in the editorial policy, I opine that they are *certainly for the better*. The old sheet has put on pep lately that makes it well worth while.

My only suggestion is, that if it fits into your policy, let's hear from some of our National Guard battery commanders about the problems they have to meet. Some of them, I know, must "meet up" with some pretty interesting ones.

Thanking you for your interest and wishing you the heartiest of success with the JOURNAL, I beg to remain

Very truly yours,

FRANK B. RHODES,  
*Captain, 243rd C. A. (HD)*  
*Comdg. Battery "I."*

# COAST ARTILLERY ORDERS

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Col. William E. Cole, appointed brigadier general, January 13, from Fort Monroe to Langley Field for one month; from Langley Field to Fort Benning for one month; from Fort Benning to Fort Eustis and assume command 30th C. A. Brigade.

Col. Stanley D. Embick, from G. S., Washington, D. C., to duty as Asst. Commandant, Coast Artillery School, Fort Monroe, June 30.

Col. Robert F. Woods, from 3rd, Fort MacArthur, to Org. Res. Presidio of San Francisco.

Lieut. Col. Clifford Jones, leave, three months, June 1.

Lieut. Col. Jacob A. Mack, from 3rd, Fort Rosecrans, to Philippines, sailing San Francisco, May 29.

Col. Cyril L. D. Wells, CA-Res., to active duty February 1, and detailed with War Department General Staff, Washington. Relieved from active duty September 30.

Lieut. Col. Gordon L. Carter, CA-Res., Portland, Me., to active duty and to C. and G. S. School, Fort Leavenworth, March 14. Relieved from active duty June 18.

Lieut. Col. Harry P. Newton, CA-Res., Washington, D. C., to active duty and to C. and G. S. School, Fort Leavenworth, March 14. Relieved from active duty June 18.

Lieut. Col. John C. Ohnstad, from 51st, Fort Eustis, to Fort Monroe, as President, Coast Artillery Board.

Lieut. Col. Willis G. Peace, from 9th C. A. District, Presidio of San Francisco, to Org. Res., Los Angeles.

Lieut. Col. James B. Taylor, from 52nd, Fort Eustis, to 69th, Aberdeen Proving Ground, January 31.

Maj. Robert R. Hendon, Jr., CA-Res., Washington, D. C., to active duty at C. and G. S. School, March 14. Relieved from active duty June 18.

Maj. Monte J. Hickok, from Org. Res., El Paso, to Hawaii, sailing San Francisco, May 1.

Maj. George D. Holland, from 9th, Fort Banks, to Hawaii, sailing New York, May 28.

Maj. Frederick A. Holmer, from 30th C. A. Brigade, Fort Eustis, to 52nd, Fort Eustis, February 1.

Maj. William R. Nichols, leave, two months, August 1.

Maj. John S. Pratt, promoted lieutenant colonel, January 14.

Maj. Edward W. Putney, from 9th, Fort Banks, to 62nd, Fort Totten, and to temporary duty in office Chief of Coast Artillery upon arrival from Philippines.

Maj. Edward W. Turner, from Philippines, to (R. O. T. C.) Utah State Agricultural College, Logan, Utah.

Maj. Eugene B. Walker, from 30th C. A. Brigade, Fort Eustis, to 52nd, Fort Eustis, February 1.

Maj. Oscar C. Warner, from 52nd, Fort Eustis, to duty as National Guard instructor, New York.

Capt. Charles E. Atkinson, from 9th, Fort Banks, to 62nd Fort Totten, March 1.

Capt. Adam J. Bennett, from 10th, Fort Adams, to 7th, Fort Hancock.

Capt. Kenneth C. Bonney, from 51st, Fort Eustis, to 13th, Fort Barrancas, April 1.

Capt. Maitland Bottoms, from 61st, Fort Monroe, to 12th, Fort Monroe, about May 15.

Capt. James D. Brown, from 13th, Fort Barrancas, to Hawaii, sailing New York, May 28.

Capt. Allan P. Bruner, from Hawaii, to Columbia, S. C., and duty as N. G. instructor.

Capt. Edwin C. Callicutt, from 3rd, Fort MacArthur, to 14th, Fort Worden, March 1.

Capt. Robert M. Carswell, promoted major, January 13.

Capt. Morris E. Conable, from 3rd, Fort MacArthur, to Philippines, sailing San Francisco, May 29.

Capt. John B. Day, from 51st, Fort Eustis, to 52nd, Fort Eustis, March 15.

Capt. Douglas M. Griggs, from 61st, Fort Monroe, to 69th, Aberdeen Proving Ground.

Capt. Alexander L. Haggart, from 9th, Fort Banks, to Panama, sailing New York, June 12.

Capt. Walter Hart, from Philippines, to 14th, Fort Worden.

Capt. Milton Heil, from 63rd, Fort Winfield Scott, to 6th, Fort Winfield Scott.

Capt. Daniel H. Hoge, from Philippines, to 52nd, Fort Monroe.

Capt. Abraham M. Lawrence, from 52nd, Fort Eustis, to 69th, Aberdeen Proving Ground, January 31.

Capt. Riley E. McGarraugh, leave, three months, twenty-one days.

Capt. Hubert A. McMorrow, from 7th, Fort Hancock, to 69th, Aberdeen Proving Ground, February 5.

Capt. Bryan L. Milburn, from Panama, to 12th, Fort Monroe.

Capt. Elmer W. Miller, from 8th, Fort Preble, to Philippines, sailing New York, May 7.

Capt. William Sackville, from Frankford Arsenal and duty with Coast Artillery School, to 69th, Aberdeen.

Capt. William H. Sweet, from 63rd, Fort Winfield Scott, to 6th, Fort Winfield Scott.

1st Lieut. Osley D. Bowman, from 10th, Fort Adams, to 69th, Aberdeen Proving Ground, January 31.

1st Lieut. Alan F. Cameron, from 3rd, Fort MacArthur, to 6th, Fort Winfield Scott, sailing San Pedro, March 9.

1st Lieut. James B. Carroll, leave, two months, April 8.

1st Lieut. Willis L. Claxton, promoted captain, September 16.

1st Lieut. Robert W. Crichlow, Jr., from Hawaii, to 12th, Fort Monroe.

1st Lieut. William H. J. Dunham, orders from recruiting, Denver, Colo., to Panama, revoked.

1st Lieut. Wilbur R. Ellis, from 12th, Fort Monroe, to University of Michigan for course of instruction, February 17.

1st Lieut. John L. Goff, from 61st, Fort Monroe, to 69th, Aberdeen Proving Ground, January 31.

1st Lieut. Clem O. Gunn, from 58th, Fort Eustis, to Philippines, sailing New York, May 7.

1st Lieut. Joseph Harris, from 92nd, Fort Mills, and transferred to Finance Dept., February 1.

1st Lieut. Paul A. Harris, from 8th, Fort Preble, to 13th, Fort Moultrie.

1st Lieut. Norman E. Hartman, promoted captain, December 13.

- 1st Lieut. Harold P. Hennessy, promoted captain, January 17.
- 1st Lieut. Frank A. Hollingshead, promoted captain, October 13.
- 1st Lieut. Paul C. Howe, from 12th, Fort Monroe, to 61st, Fort Monroe.
- 1st Lieut. Raymond A. Knapp, from 9th, Fort Banks, to 11th, Fort H. G. Wright, February 1.
- 1st Lieut. Paul A. Harris, 8th, Fort Preble, orders assigning him to 13th, Fort Moultrie, revoked.
- 1st Lieut. Walter L. McCormick, from 12th, Fort Monroe, to 51st, Fort Monroe, April 19.
- 1st Lieut. Clarence M. Mendenhall, Jr., from 61st, Fort Monroe, to Paris, France, for duty in connection with Pilgrimage of War Mothers, sailed New York, February 12.
- 1st Lieut. Philip H. Raymond, from 11th, Fort H. G. Wright, to 13th, Fort Barrancas.
- 1st Lieut. William L. Richardson, from Hawaii, to 12th, Fort Monroe.
- 1st Lieut. Ralph W. Russell, from Hawaii, to 7th, Fort Dupont.
- 1st Lieut. Joe F. Simmons, from 61st, Fort Monroe, to 12th, Fort Monroe.
- 1st Lieut. William B. Short, from 3rd, Fort MacArthur, to 14th, Fort Worden, February 1.
- 1st Lieut. Raymond Stone, Jr., from 61st, Fort Monroe, to 12th, Fort Monroe, about May 15.
- 1st Lieut. Guy H. Stubbs, from 12th, Fort Monroe, to 62nd, Fort Totten.
- 1st Lieut. Harold P. Tasker, placed on duty involving flying (Aberdeen Proving Ground), vice 1st Lieut. John L. Goff, January 31.
- 1st Lieut. Gustave H. Vogel, from Philippines, to 13th, Fort Barrancas.
- 1st Lieut. George E. Waldo, to Army retiring board, Fitzsimons Hospital, Denver.
- 1st Lieut. Fred B. Waters, from detail in Q. M. C. and Fort Mason, to 6th, Fort Winfield Scott, previous orders revoked.
- 1st Lieut. Walter L. Weible, from Fort Winfield Scott, to Hawaii, sailing San Francisco, June 19.
- 1st Lieut. Albert J. Wick, from 52nd, Fort Eustis, to Philippines, sailing New York, May 7.
- 1st Lieut. Volney W. Wortman, promoted captain, October 20.
- 2nd Lieut. George A. Chester, two months, fifteen days leave, October 1.
- 2nd Lieut. Charles G. Calloway, sick leave, extended one month.
- 2nd Lieut. John W. Davis, 10th, Fort Adams, to 13th, Fort Moultrie.
- 2nd Lieut. George A. Ford, promoted 1st lieutenant, November 2.
- 2nd Lieut. William H. Francis, from 61st, Fort Monroe, to Hawaii, sailing New York, May 28.
- 2nd Lieut. Robert T. Frederick, from 62nd, Fort Totten, to detail in Air Corps and to Brooks Field, February 15.
- 2nd Lieut. Ernest F. Heidland, from 51st, Fort Eustis, to Philippines, sailing New York, May 7.
- 2nd Lieut. Edward B. Hempstead, from detail in Air Corps and from March Field, to Philippines, sailing San Francisco, February 8.
- 2nd Lieut. Carl W. Holcomb, from Philippines, to 14th, Fort Worden.
- 2nd Lieut. Frederick R. Keeler, promoted 1st lieutenant, October 27.
- 2nd Lieut. Edward B. Hempstead, orders to sail San Francisco for Philippines, February 8, revoked; to sail San Francisco for Panama, March 1.
- 2nd Lieut. Trumen H. Landon (A. C.) from Keely Field, to Fort Crockett, February 28.
- 2nd Lieut. Frank F. Miter, from Philippines, to 11th, Fort H. G. Wright.

2nd Lieut. Frank T. Ostenburg, from 51st, Fort Eustis, to 69th, Aberdeen Proving Ground, January 31.

2nd Lieut. Waylan H. Parr, relieved from duty at March Field and detail in Air Corps and to Hawaii, sailing San Francisco, February 7.

2nd Lieut. Andrew Samuels, Jr., from 6th, Fort Winfield Scott, to Hawaii, sailing San Francisco, May 1.

2nd Lieut. John R. Seward, from 11th, Fort H. G. Wright, to Philippines, sailing New York, May 7.

2nd Lieut. Donald H. Smith, from 52nd, Fort Eustis, to 69th, Aberdeen Proving Ground, January 31.

2nd Lieut. William F. Steer, from 13th, Fort Barrancas, to Philippines, sailing New York, May 7.

2nd Lieut. William M. Vestal, from 63rd, Fort Winfield Scott, to 6th, Fort Winfield Scott.

Warrant Officer Chilion V. Jones, from band leader, 62nd Band, Fort Totten, to band leader 27th Infantry, Schofield Barracks, sailing New York, February 21.

Master Sgt. Charles A. Cronkhite, 6th, Fort Winfield Scott, retired.

Master Sgt. Robert L. Johnson, 52nd, Fort Eustis, retired.

Master Sgt. Walter F. Slusser, 6th, Fort Winfield Scott, retired.

Master Sgt. Sog F. Williams, 12th, Fort Monroe, retired.

Tech. Sgt. Onson R. Dooley, 14th Band, Fort Worden, retired.

Sgt. Austin Almon, from 11th, Fort H. G. Wright, to Ordnance Specialists' School, Raritan Arsenal, New Jersey.

Sgt. Manuel Caetano, from 7th, Fort Hancock, to Ordnance Specialists' School, Raritan Arsenal, New Jersey.

Sgt. William E. Thompson, from 12th, Fort Monroe, to Ordnance Specialists' School, Raritan, New Jersey.

# EXTRACTS FROM FOREIGN PERIODICALS

Translated by COL. GEORGE RUHLEN, U. S. A.

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## Foch

The *Schweizerische Militärzeitung* contains a communication taken from *Wissen und Wehr* by Dr. Herman Stegeman, under the heading *Foch—an Attempt at an Interpretation*, in which the author reviews the character, achievements and military career of Marshal Foch. The general purport and method of treatment of his subject by the writer is indicated in the opening paragraph of his essay, an extract from which is here given :

“Foch is dead. With him departed the luckiest field commander of the World War, lucky not in the sense of an extraordinary *career*, even though he entered the campaign as commander of the XX corps and emerged from it as Marshal of France and of Great Britain. Others ascended the ladder of promotion in its earlier stages more rapidly; thus Petain, the colonel, who is awaiting his entry into the dome of the Invalides wearing the crown of uttermost success. But *luck* was with Foch, that mysterious *luck* which the soldier does not adequately appreciate as a chance of war but which he nevertheless desires above all things else: the lightning-like grasp of the moment in combination with reliance upon a star obedient to his orders. And still more there dwelt in Foch that magic will *never to admit himself to be defeated*. That is more than luck. But—and this is the third element, the third gift that was deposited in his cradle—he was never placed in a situation where failure could have resulted in complete ruin of the campaign or even of a battle action and he was always called in when the situation had reached the point where the crisis had advanced so far that all appeared to be lost but when there had actually set in a turn toward a successful issue to the crisis.”

In concluding his article, which covers six closely printed pages of the journal, the writer says: “His was one of the most complete types of French coinage and a personality of high rank. One can place him alongside of Turenne for comparison by using a somewhat diminished measure. Foch is dead, has departed as a great figure of the history of war, but still greater is the spirit of classic French policy that was inherent in him and exerted a measurable influence upon his qualifications as a leader and commander in the field. This is my conception of the strategist Foch whose greatness I am unwilling to lessen but wish to give greater significance.

## von Hindenburg

The editorial direction of the *Militär-Wochenblatt* publishes following eloquent tribute of congratulations to Field Marshal von Hindenburg, President of the German Republic:

*The Second October, 1929.* On this day the National President celebrates the eighty-third anniversary of his birth. On this day he will perceive with satisfaction that almost the whole of Germany, the greater portion of Germans of the nation and of those in foreign parts, look up to him with feelings of affection and confidence. The field commander is judged by his success, a repugnant, frigid but none the less indisputable verity. But that does not apply to von Hindenburg; he has, as defeated commander in the field, forfeited none of the esteem that he gained by his successes. The confidence in his personal strength of character remains untouched by blows of an adverse fate; it is grounded on causes outside of success or failure. He remained steadfast through fortune and misfortune; aye, by his unshaken assurance in days of the greatest exigency, by the very fact that he stayed at his post without imposing words or gestures postulating approbation when everything had given way, he won our hearts; from that time on he counts to Germans as the cherished symbol of the fatherland whom they have gratefully chosen and kept as their leader.

When Hindenburg was born Frederick William IV was still reigning as autocratic king. His life includes the government of three emperors. He was—with the exception of three years of retirement immediately preceding the war—in active service throughout this whole period; he stood by and fought along in the struggle against German discord, for German unity and the foundation of the German empire and he served in stations of the greatest responsibility when German unity had again to be defended against the assaults of a world. This unity has been preserved to us notwithstanding the other unforgettable losses that we suffered. German unity is personified to us at home and to Germans in foreign lands by the personality of Field Marshal von Hindenburg. It is not his fault that German unity is not combined with domestic unanimity.

We extend to our leader heartfelt and devoted congratulations on his entry into this new year of his life and hope that he may be permitted to exercise in future with undiminished strength the functions of his office as defender of German honor and German dignity.

### **Arming the French Divisional Artillery**

French views regarding armament of the division artillery are still at variance and the subject of controversy. General Herr has, on the basis of his war experience as inspector of general artillery, demanded that the division artillery shall consist of 7.5-cm. guns with ranges increasing from thirteen to fifteen kilometers and of light 10 to 10.5-cm. light howitzers of about fifteen kilometer ranges. The French army administration has to this date not approved this. The artillery of the French infantry division is still composed of one regiment (in three parts) of the old 7.5-cm. guns; one regiment (in two parts) heavy 15.5-cm. field howitzers.

This method of armament appears now to be opposed by the troops. In the *Revue d'Artillerie* Artillery Major Camps rejects both of these guns, the 7.5-cm. gun on account of its inadequate over-shooting of covers and the 15.5-cm. howitzer on account of its excessive weight. He considers ranges over ten kilometers superfluous for the division artillery since the corps artillery disposes of 10.5-cm. guns and 15.5-cm. guns with sixteen kilometer ranges. He holds that greater effect and lighter weight are more important than increased ranges. He therefore demands, as the principal gun of the division, a 10.5-cm. howitzer with box trail carriage with a high angle range of ten kilometers and weight of one thousand six hundred to two thousand two hundred kilograms; it is to fire shrapnel and shells with three graded charges. In addition the division shall have at its disposal a 7.5-cm. howitzer in split trail carriage which, in battery, weighs at most six hundred and fifty kilograms, has eight kilometer range and is to serve, at the same time, cavalry divisions and be susceptible for transportation and use with mountain and colonial batteries. Major Camps expects that this howitzer can also be utilized for fighting low-flying aircraft and tanks, although he doubts the suitability of these guns for that purpose because he demands, as the third gun of the division, as artillery for anti-tank purposes, a 4 to 4.5-cm. gun with seven hundred meters initial velocity. Two sections of the two regiments are to be armed with the principal gun while the third section would consist of three batteries each of 7.5-cm. howitzers and one battery of six 4 or 4.5-cm. guns. The journal *Le Fere* concurs decidedly with the demand that the range of the field guns should give way to mobility because otherwise the artillery would be unable to follow the infantry everywhere on the mountainous theater of war operations in Italy.

### The "Potentiel de Guerre"

In a communication published in the *Militär-Wochenblatt*, Lieut. Col. Dr. Regele, German army, takes up a discussion of the "Potentiel de Guerre" that is now engaging the attention of the League of Nations in its efforts of finding a "yard stick" for determining the relative military strength of nations of the league as a precedent to consideration of reductions of armaments that may be found to be in excess of requirements.

The author contends that equipments can be restricted by voluntary mutual agreements between nations to a very limited extent only. A general far-reaching reduction of armaments can be attained only by compulsory reduction on a scale of measurement applicable to all states and the preparatory conference has taken up consideration of a key, scale or measure that will fix the Potentiel de Guerre that will include not only numerical statistics of men, animals, material, weapons and such like, but will also embrace a formula that will give expression to the aggregated war power of the state and shall include every source of its war power.

living and latent. He classifies these powers into tangible and intangible. Among the former are numbers of fighting and working men and women, geographical and geophysical defensive elements, mountains, rivers, physical features of the land, means of communications, fortifications systems, resources of raw materials, horses, motor vehicles and numerous other items within the range of tangibles. But the group of intangible elements is much greater than the discoverers of the *Potentiel de Guerre* have ever been able to consider. Among them are: effect of treaties, open and secret, entered into with other nations, obligations entered into, standing and bearing of the population, racial characteristics of the population, and so on *ad infinitum*, all of which come into consideration in an estimate of the war power of the nation. But who can give to each or any or all of them together a definite mathematical valuation for comparison of one with another?

The natural and inevitable conclusion is that fixing the *Potentiel de Guerre* of any nation for comparison with that of another is a practicable impossibility. But the investigations of the League in this domain have nevertheless been fruitful because they have, in reality, given impulse to a more detailed computation of the fighting powers and powers of resistance of a nation and have taken from the soldier the implication that he alone is impeding reduction of armaments by espousing the cause of the greatest possible increase of defensive power. The League of Nations has also plainly established the fact that a great compulsory reduction of armaments is an impossibility and this is one of its most important achievements up to this time.

## BOOK REVIEWS

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*The Incredible Borgias.* By Klabund. Translated from the German by Louise Brink. New York: Horace Liveright. 1929. 5¾" x 9". 253 pp. \$2.50.

The word "incredible" is well chosen, but it is not so applicable to the Borgia family as to this story. The Borgias of the Renaissance were, without doubt, a family of infamous memory, nevertheless they were intensely human and if they were noted for their immorality, even in a period of extreme moral laxity, it was merely the result of the energy with which they attacked all problems. They were energetic above their contemporaries in their achievements as well as in their immoralities. It is, therefore, impossible to believe the story Klabund has woven under the guise of history.

The opening chapters are typical of all. Here the author traces the ancestry of the Borgias back to the Centaurs, those creatures, half-men and half-horses, who, according to Greek mythology, were the offspring of Ixion and a cloud masquerading as Juno. On a slender historical foundation Klabund builds a story of similar myths. Every unconfirmed rumor whispered of a Borgia, provided it be dishonorable, every suspicion directed at one of that name, is here narrated as a fact and the author has drawn on his imagination to fill in and embellish the various incidents of a more or less sordid character.

There is no crime against good morals which is not included in this volume. Good old-fashioned murder was entirely too tame apparently for a Borgia, so we have parricides, uxoricides and murder by the basest treachery, reaching the climax when the Borgian Pope kills his victim by the administration of the Holy Mass, poisoned. Then, of course, we have cases of rape, incest, adultery and sex perversion. And with it all no redeeming qualities are granted to the family until the well-known Lucrezia reforms after the deaths of her father, Pope Alexander VI, and her brothers. Caesar Borgia is represented as a monster of wickedness, without the semblance of character, whereas in fact, Caesar was a capable, if too ambitious, administrator.

Later came St. Francis Borgia, yes, actually there was a saint in the Borgia family, but Klabund mentions no good of him, he was canonized merely to offset the evil in the name of Borgia. The last words of the book state that St. Francis was "the last Borgia." Even here Klabund is wrong. St. Francis left children, legitimate children they were, too, and the line continued for several generations, without being particularly noted for either good or evil.

For those who enjoy such erotic literature, this book will make good reading, but it is fiction, like the Decameron or *Les Contes Drolatiques*, not history, and it is to be hoped that it is not typical of the post-war German historian, or the shade of von Ranke will have a hectic time.

R. E. W.

*American Pistol Shooting.* By Maj. William D. Frazer, Coast Artillery Corps, U. S. Army. E. P. Dutton and Co., Inc. 1929. 8¼" x 5¼". III. 326 pp. \$5.00.

As explained by the author in the Foreword to his work, his main purpose in writing this book was to provide a means of instruction in all forms of pistol practice in vogue in America today. In this laudable attempt Major Frazer has succeeded in a high degree. Having been actively connected with the pistol shooting game for many years in the capacity of coach and shooter on Coast Artillery National Match teams and a shooting member of championship International

and Olympic pistol teams, and in addition been a keen and progressive student of the difficult art of pistol shooting in its many and varied phases, no one is more qualified to write with authority than he. No rifle or pistol shot of today commands a greater respect among his fellow shooters than does Major Frazer for his keen ability as a pistol shot and for his progressive ideas on shooting.

The book has an appeal to all people interested in shooting whether they are experts or novices at the truly American art of pistol shooting. The use of the pistol and revolver is synonymous with the history and romance of our country, particularly of the West, and even today when the last frontier has faded away with the Indian and the buffalo, red-blooded Americans are proud of their ability to shoot straight.

The various chapters of the book deal with all the ins and outs of pistol shooting, including the selection of pistols for various kinds of shooting, shooting form, the aiming problem, holding and squeezing, shooting against time, free pistol shooting, aerial practice, defensive shooting and quick drawing, suggestions for police officers, exhibition shooting, shooting psychology, competitive shooting, coaching, instructing ladies, game and long range pistol shooting, use of the service automatic, holsters, ammunition hints and accessories.

Each of the above subjects is completely covered in a chapter by itself and not merely by a few pages. The chapters on Aerial Practice, Quick Draw, Exhibition Shooting and Shooting Psychology are outstanding and cover an entirely new and original field. Those on Competitive Shooting, Coaching and Teamwork and the Service Automatic will prove of decided benefit to riflemen as well as pistol shooters, and especially to team captains and coaches. The chapter which deals with the instruction of the fair sex in the intricacies of the shooting game should be of immense value to anyone who is concerned with the task of teaching the ladies. The subjects of Game Shooting, Long Range Pistol Shooting and Holsters and Accessories are covered in a manner which will satisfy even the most exacting handgun user.

The entire volume is a detailed and original work on a live and interesting subject, and is not duplicated in any other work. It should not only prove of great interest and benefit to all those who are interested in shooting for the sake of the sport, but to all persons, whether in the military service or civilian life, who are called upon to instruct others in the use of weapons.

Numerous excellent photographs illustrate the various points of the instruction matter of the book and greatly help the reader in following the directions. The photographs which show the positions of the body during the firing, particularly during fancy shooting and quick draw shooting, as well as in the more orthodox manner of shooting, are particularly valuable. In addition, illustrations are given of practically all makes and models of pistols and revolvers. The book is non-technical, easy to read and well written, and entirely free from the pedantic touch of most works of instruction. It is a decided asset to any library.

A. C. C.

*My First Two Thousand Years.* By George Sylvester Viereck and Paul Eldridge. New York: The Macauley Company. 5¼" x 8". 501 pp. \$2.50.

"Been reading anything lately?" asked my friend Jack.

"About three books a week," I guessed.

"That makes a respectable total in a year. What have you enjoyed most in that time?"

"My First Two Thousand Years.' I liked it so much I read it twice and then added it to my personal library."

"Sounds like the proof of the pudding," Jack said. "Do you think I would like it too?"

"I think that anyone whose literary diet is not confined exclusively to detective stories would like it. If you want nothing beyond sophisticated entertainment, you will have that; but if you are not careful you will discover yourself thinking before you know it."

"What is it about, anyway?"

"Well, superficially it is the story of the Wandering Jew who was condemned by Jesus to tarry until His return. Actually it is something more, or at least the authors cleverly suggest that it is something more by means of a Prologue and an Epilogue. Incidentally, I think you would enjoy the book more if you read both these short sections first. In that case it becomes clear that Cartaphilus may be considered as a symbol. One of the characters in the Epilogue says that his story 'sheds a new and colorful light on history, religion, sex, morality, occultism, rejuvenation, reincarnation, and recurrence of type'."

"Sounds a bit highbrow. I'd rather be amused than instructed."

"So would I, boy. But if you aren't amused you can have a rain check. This chap Cartaphilus may have had the time and opportunity to learn all languages and sciences to say nothing of accumulating untold wealth, but he received his doctorate in the arts of love. His interest in Mary Magdalene, Salome, Poppaea and sundry other delectable ladies throughout the centuries was not purely academic."

"You encourage me," murmured Jack.

"And his encounters," I went on, "with historical characters—Pilate, Nero, Marcus Aurelius, Attila, Mohammed, Charlemagne, Don Juan, Bluebeard, Leonardo da Vinci, Pope Alexander VI, Luther, Bacon, Spinoza, Peter the Great, Rothschild, Frederick the Great, Voltaire, Franklin and many others more or less famous—will not cause a revision of texts in schools. But that is all the more reason for meeting them here for it is ten to one that henceforth you will think of these people as you have known them in this book. They cease to be names and become amusing or revolting.

"The Prologue lays the foundation for the story. Two Harvard scientists wait at a monastery on Mount Athos for a visa to their passport. Heralded by mystic happenings, two other strangers, master and servant, appear. After supper the conversation turns to psychoanalysis and eventually the stranger suggests that he be the subject for such a time-consuming experiment since time was something they didn't have anything else but. He is placed in the proper hypnotic state and that which follows is supposed to be the carefully arranged record of the investigation. Starting with the trial of Jesus when Cartaphilus, though a Jew, was a captain in the Legions of Rome, it explains why he was bidden by Jesus to "tarry until I come," thereby leaving him a man of thirty, immune to wrinkles, gray hair, death, and children since his reproductive powers supposedly prolonged his own life. Well under way by this time, the story never lags but rather grows in interest, wit, epigram, satire, humor, erudition, or what have you. He acquires a servant named Kotikokura—

"Sounds like the prototype of Cuticura," Jack interrupted.

"Keep quiet. Prototype is no word for a lowbrow and besides you aren't paid to advertise that article. —His servant acquires immortality by sucking the blood of the master after a snake bite. The servant becomes a symbol in the development of the story.

"Cartaphilus ironically achieves godhood himself with the aid of a camel, a parrot, and a bit of phosphorus while Kotikokura becomes his high priest and most faithful believer.

"These two discover that there is one other immortal wandering about, none other than the little cutie over whom John the Baptist lost his head so completely. Salome winds her alluring way through the pages to the very end, a symbol of the Eternal Feminine."

"What did you say the Wandering Jew himself symbolized?" Jack asked.

"Well," I replied, "he suggested to Spinoza on page 424 that perhaps the Wandering Jew was no myth and Spinoza replied, 'The Wandering Jew is truth whether considered as a living entity or a personification of his race. He is the symbol of restlessness and search. Some day he will find what he seeks, and will no longer wander.' 'What does he seek?' asked the W. J. himself. 'God. Everyone, everything seeks God as every drop of rain seeks, and ultimately finds, the sea'."

"What about this Epilogue you want me to read immediately after the Prologue?" Jack asked.

"Cartaphilus, or Isaac Laquedem, as he is also known to the boys in the monastery, receives two peculiar telegrams in a mysterious manner and he leaves suddenly, without farewells, in an airplane. Fortunately for us his story was chronologically complete but the investigators were of several minds as to whether he was the Wandering Jew, a Russian spy and conspirator, merely an erudite man who may have told them an honest subconscious story or one who hoaxed them to a fare you well. That's why I say read it before the story and it will help you to make a decision for yourself."

"So there is a bit of detective flavor after all," said Jack. "Well, wrap it up and I'll take it along."

G. B. R.

*Leaders of the French Revolution.* By J. M. Thompson, Fellow of Magdalen College, Oxford. New York: D. Appleton & Co. 5¾" x 8¾". Illustrated. 267 p. \$3.00.

It is difficult for most readers to get a clear impression of the French Revolution; it seems a mad jumble of events precipitated by brutal leaders continually quarreling among themselves, but united in terrorizing the people by an unending stream of tumbrils to feed the guillotine. To such Mr. Thompson's book should be welcome as it enables the reader to bring order out of chaos, to separate the different parties and perceive their objectives, and to obtain a better idea of the motives and characters of the leading participants than is possible from a running account of the events which took place.

This book contains sketches of the lives of eleven men prominent in those stirring times: the Abbe Sieyes, "a philosophic reformer" and "the most representative man of the age"; the aristocratic Mirabeau, "a man of immense driving power" who dominated the first two years of the revolution; Brissot, who led the Girondin party, and Louvet, his follower; Fabre d'Eglantine, actor and playwright; General Dumouriez, who became an emigré when he found he could not become a dictator; Lafayette, who left less impress on the French than on the American Revolution; St. Just, the fearless associate of Robespierre, and the well-known trio, Danton, Marat and Robespierre himself.

Mr. Thompson analyzes their characters, shows their virtues and their failings and the part that each played in the progress of the revolution. And let it not be supposed that their virtues were negligible. It will doubtless surprise many to find that all were well educated members of the learned professions and

with a certain amount of refinement. Not one could be described as an atheist or a communist, even Robespierre desired to "enroll the people under a banner with a double device—God and the immortality of the soul," while St. Just's objective was to "give life to laws which destroy anarchy and which give the people the call to republican virtue." Marat "thought equality of property an impracticable ideal. His socialism, like Robespierre's, was of the old-fashioned kind that would leave the rich man in his castle and the poor man at his gate, but would tax the superfluities of the one to relieve the necessities of the other." Not very different from what most countries are doing today.

It is interesting to see how the antecedent life of each is reflected in his revolutionary activities. Both Mirabeau and Lafayette, members of the nobility, with army training, bent their energies to the establishment of a limited monarchy. The actions of Brissot, Louvet and Fabre, all authors, were colored by the imagination of the writer. Marat, a doctor of high reputation, "had an unrivalled knowledge of the pathology of politics" and dissected the problems of government with the same scientific thoroughness that a surgeon employs in the operating room. Robespierre was a criminal judge before the revolution which trained him for his work on the Committee of Public Safety in 1793-4.

"To the popular mind the Revolution means the Terror and the Terror means Robespierre," thus Mr. Johnson approaches the greatest figure of the revolution, at whose head the execrations of the world have been flung for over a hundred years, yet Mr. Johnson considers him more sinned against than sinning. His objective was "a democracy based on public virtue." In Robespierre's own words his "aim was the quiet enjoyment of liberty and equality. We desire an order of things in which all base and cruel passions are enchained and all beneficent passions awakened by the laws." To accomplish this he, assisted by St. Just, Marat and Danton, inaugurated the Reign of Terror, to destroy the "enemies of popular government." "Virtue, without which Terror is disastrous and Terror, without which Virtue is powerless" was his constant refrain. It is necessary to read Mr. Thompson's work in order to appreciate the apparent inconsistency of Robespierre's position.

The author also takes issue with the popular conception of the Reign of Terror. "The word (terror) suggests a whole population living in fear, in fact it is doubtful whether the provisional government of 1793 and 1794 was a heavier tyranny than the government under which France carried through the Great War one hundred and twenty years later. Its policy was intimidation, but its result was not terror. It was a war government and therefore punished spies and those who carried on unauthorized correspondence with foreigners and refugees. It was a national government and therefore punished aristocrats, royalists and other counter-revolutionaries. It was a government of virtue and therefore punished profiteers, food-hoarders, dishonest or corrupt officials. . . . There were not many even in the capital city of seven hundred thousand who felt themselves seriously threatened by these measures. The very guillotine was chosen for humanitarian reasons and to popularize the aristocratic privilege of decapitation." Mr. Thompson then relates what took place in France during the coup d'état of 1852; during the Commune of 1871 and during the World War, the liberties that were suspended and the lives that were sacrificed by tribunals. He states that the "Revolutionary Tribunal of Paris, of sinister memory, pronounced about twenty-five hundred condemnations up to the ninth Thermidor" (the day of Robespierre's fall), while the "number of those rehabilitated" as having been unjustly condemned during the World War already stands at twenty-seven hundred and hardly a week passes without one's being informed of the names of condemned persons who were shot by mistake."

It seems strange to talk about "a government of virtue" in connection with the French Revolution, yet Mr. Thompson's book will show the reader that the leaders were, in general, animated by a high type of virtue and those that were not paid the penalty. Danton, Fabre d'Eglantine and Camille Desmoulins all suffered on the guillotine for being connected with financial graft.

It is a pity that that fiery revolutionist, Camille Desmoulins, is not included in this book. He had a colorful career, well worthy of Mr. Thompson's pen. Another omission is the Duke of Orleans, self-named Philippe Egalite, a singular blend of aristocrat and sans-culotte. It is to be hoped that the author will include these two in any subsequent edition.

It is difficult to give too much praise to this book. It is both scholarly and readable, a rare combination, and by its dissection of the characters of the leaders it enables one to get an excellent picture of the revolution. When the leaders of the Russian Revolution are treated in the same way, the comparison will be most interesting. The author quotes so freely from contemporary writings and speeches that the book can be used by the research student as source material.—R. E. W.

*English Political Portraits of the Nineteenth Century.* By G. K. Stirling Taylor. Boston: Little, Brown & Co. 1929. 6" x 9". Illustrated. 320 p. \$3.00.

Six Prime Ministers and one sovereign are portrayed by Mr. Taylor in this work. The political lives of the Duke of Wellington, George Canning, Lord Melbourne, Sir Robert Peel, Disraeli and Gladstone very completely cover the last century, and Queen Victoria's influence was most important throughout her long reign of sixty-four years.

The word "portrait" in the title is excellently chosen, as these sketches are in no sense biographies, either political or personal; they are character studies, based, it is true, on political career, but the hereditary tendencies, education and previous training of the subjects are all given full weight in the portraits drawn by the author.

The most outstanding characteristic of these portraits, taken as a whole, is the sarcastic cynicism with which Mr. Taylor treats English political leaders, especially their abilities and motives. This notwithstanding the fact that Mr. Taylor is himself an Englishman, possibly it is because of that fact. Undoubtedly none of us are free from the idea that politics and straightforwardness rarely go together, but it is not often that we see in cold print such a statement as "In January, 1806, Pitt (the younger) did his greatest service to his country—he died." Or the following, "In politics and finance the ranks were filled with men who had all the quick mental agility of the cardsharp and the professional rogue." Rather harsh words.

Mr. Taylor finds all the six Ministers whose characters he analyzes guilty in a more or less degree of double dealing and hypocrisy, with the single exception of the Duke of Wellington. In his characterization of that famous man he runs counter to the general opinion of historians, and, in some respects, shows an astonishing inconsistency. "It was clear that he (Wellington) was a far greater civil administrator than a soldier." Diametrically opposite to the usual viewpoint. Further Mr. Taylor says that the Duke "had two qualities, honesty and straightforward simplicity, that were almost as useless in political life as a bolster would be in a cavalry charge." How could he then have become such a great civil administrator? "It was the blunder of his life that Arthur Wellesley ever went into the army." This notwithstanding the fact that Wellington's share in defeating Napoleon is fully acknowledged, in fact, possibly overrated.

Although in all the other "portraits" Mr. Taylor carefully traces his subjects' characteristics back to their early training, he fails to give the Duke's army service any credit for his "honesty and straightforward simplicity." Evidently he fails to appreciate the fact that those are essential military qualities, which is the reason why so few generals have become successful statesmen. In fact the author evinces little understanding of the military mind. "He (Wellington) only cared enough about soldiering to beat everybody who crossed his path." What soldier cares for more? "From the beginning he had an intense dislike of war." Is not that universally true of the soldier who knows what war is? "Wellesley was one of the few soldiers since Julius Caesar whose brain was of first class quality" and "men of brains are somewhat rare in the military profession—just as men of delicate artistic tastes rarely become rat catchers." These quotations help to explain why Mr. Taylor's estimate of the Duke of Wellington is so greatly at variance with other historians.

The author is more at home with his other subjects, none of whom had any military service, although in Sir Robert Peel he is again not afraid to oppose the public verdict. His final estimate of Peel is worth repeating: "Some simple-minded historians have persisted in believing that he was one of the best and most unselfish Prime Ministers that Britain has ever possessed." This of the man who put through the Catholic Emancipation Act, who established the famous London Metropolitan Police Force, was one of the moving spirits behind the repeal of the Corn Laws and who established the income tax, all truly constructive measures which have lived to the present day, and three of them in opposition to his own class.

Americans will be interested in Mr. Taylor's account of the establishment of the Monroe Doctrine, following a suggestion made by George Canning to President Monroe. In sarcastic vein the author says, "George Canning, not George Washington, was the real founder of the United States as a world power. . . . The Monroe Doctrine was his greatest success."

The sketch of Queen Victoria is perhaps the most interesting in the book. Mr. Taylor gives her the greatest praise, and the numerous examples which he gives of her active participation show the wonderful forethought and ability of Britain's great queen. In 1875 she wrote to her daughter, then the Crown Princess of Prussia, "No one will tolerate any power wishing to dictate to all Europe. . . . This country, with the greatest wish to go hand in hand with Germany, cannot and will not stand it." It was at least a generation later before even thoughtful and practical Englishmen saw the danger in Germany's policies.

His final summation of the queen forms an interesting comparison between the monarch and her ministers, most of whom are mentioned in the other sketches. "One is inclined to believe that if she had been her own Prime Minister and Cabinet also, from her succession to her death, her nation would have been a freer, happier, more peaceful and more prosperous country." Truly a eulogy, especially coming from Mr. Taylor's caustic pen.

From the above criticisms, it may be thought that this is a good book to leave alone. On the contrary it will well repay the reading. The very fact that it differs so greatly from other historians renders it the more worth while, as a new viewpoint, obtained by a different approach, is presented. The book is illustrated by excellent portraits of all the subjects.—R. E. W.

*Elements of Radio Communication.* By John H. Morecroft. New York: John Wiley & Sons. 1929. 6¼" x 9¼". 268 p. Il. \$3.00.

This a more elementary treatise than Morecroft's "Principles of Radio Com-

munications." It is prepared for those who want something more comprehensive, than many of the popular texts now on the market. It is not heavily loaded with mathematics, and does not use, or require, more than a working knowledge of algebra to understand it. It gives some good practical applications in the problems, such as the approximate solution of the steady and pulsating voltage outputs of a "B" eliminator filter.

It covers the elementary theory and simple laws of electrical circuits. It also gives the special radio applications of resonant circuits with the specific application of these principles. It contains a good chapter on vacuum tubes, including the latest A. C. types. It gives a general treatment of the different receiving sets from the crystal to the superheterodyne receiver. It contains chapters on radio telephone and broadcasting, and explains a typical modern broadcast receiver, giving the circuit diagram.

This text is very good for the beginner, or those who are interested in radio, and desire something sound and thorough, but do not have the time or preparation for the more advanced or technical books. No Morecroft text needs any recommendation, but this one is exceptionally good for the beginner who is primarily interested in broadcast reception.—C. L. W.