Ordnance Pamphlet No. 245
(Revised)

8-INCH RANGE TABLE

2,750 F. S. INITIAL VELOCITY TO 22,500 YARDS

LONG-POINTED PROJECTILE, COEFFICIENT OF FORM = .61

WEIGHT OF PROJECTILE, 260 POUNDS

SIACCI'S METHOD

CORRECTED FOR ALTITUDE

INGALLS' BALLISTIC TABLES

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BUREAU OF ORDNANCE CIRCULAR LETTER NO. 78-43

Subject: Range Ballistic Corrections due to curvature and rotation of the earth---method of handling

Reference: (a) O.P. No. 757 - 16" Range Table
(b) Exterior Ballistics, 1935 Edition by E. E. Herrmann
(c) Buord Circular ltr A-175, Ballistics - Effect of rotation of the earth on flight of projectiles

Enclosure: (A) Curvature of Earth Table
(Herewith)

1. It has come to the attention of the Bureau that there is some question as to the proper method of handling certain small corrections in the range ballistic. Although in most cases these corrections are undoubtedly being properly applied by the forces afloat, it is considered advisable to outline them briefly.

2. CURVATURE OF THE EARTH - U. S. Navy range tables are based on the assumption that the gun trunnions and target are in the horizontal plane tangent to the earth's surface at the gun. Thus, when using pointer fire or direct fire in elevation, the range table range should be used without any correction for curvature of the earth. However, when using the stable vertical type of director for indirect fire in elevation, a correction for curvature must be applied to the range table range since the guns are laid with respect to the horizontal, rather than with respect to the line of sight.

3. To determine range correction for curvature of the earth, enclosure (A) should be used in conjunction with column 19 of the range tables, as follows:

$$\text{Correction (Yds.)} = \frac{\text{curvature (ft. from enc.(A))} \times 100}{\text{Column 19}}$$

This correction represents the amount which the range of the projectile exceeds the range as shown in the range table. The correction is thus applicable as a "down" correction.

4. To illustrate a specific example assume a range of 19,800 yds. From enclosure (A) the curvature of the earth at this range is 85 ft.

Using the table on pages 24 and 25 of reference (a), column 19, a correction of range can be computed to compensate for this 85 ft. correction in elevation. Thus $\frac{85}{95} \times 100$ = approximately 89 yds. in range represent the amount which the actual range of the projectile exceeds the range as shown in the range table.

5. Actually the curvature of the earth varies as R^2 (where R = range in yards) so that the correction in minutes varies as R; and the elevation correction for earth's curvature (in minutes of arc) can be sufficiently well approximated as the range in yards divided by 4000. For example, at 19,800 yards, the curvature would be 4.95 minutes which by Column 2b of reference (a) gives a correction of 86 yards as compared with 89 yards for the more accurate calculation above.

6. PARALLAX CORRECTION FOR THE MEAN TRUNNION HEIGHT OF GUNS ABOVE THE WATERLINE - Neither the range table nor the fire control equipment include the correction for the mean trunnion height of the guns above the waterline, and since this height in some battleships is 32 ft., this height should be compensated for and added to the correction as calculated in paragraph 2.

7. To illustrate a specific example assume the same range of 19,800 yds. From pages 24 and 25 of reference (a), Column 19, any change in impact must be made from a horizontal reference plane which has the same height as the mean trunnion height of the guns above the waterline. Assume this height to be 32 ft. Thus if it is desired to have the point of impact at the waterline the following correction should be made

$\frac{32}{95} \times 100$ = Approximately 34 yards in range must be applied as a down correction.

8. Typical Values - In the following table (for a mean trunnion height of 32 ft.) the combined corrections for "earth curvature" and for "trunnion height" in automatic fire are shown for several guns at various ranges. And from this it is interesting to note, for range of 15,000 yds. and over, how the subject correction tends to remain approximately constant.

TABLE I

Range in yds.	16"/50 2700 lb. proj. I.V. = 2500 f.s.	16"/45 2700 lb. proj. I.V. = 2300 f.s.	8"/55 335 lb. proj. I.V. = 2500 f.s.	8"/55 260 lb. proj. I.V. = 2700 f.s.
5000	288 yds.	250 yds.	250 yds.	288 yds.
10000	178	149	134	145
15000	154	129	100	100
20000	147	122	81	79
25000	144	118	69	66
30000	140	111	54	53
35000	134	99		
40000	124			

9. In practice it would possibly be simpler to add trunnion height to earth curvature so as to permit the calculation of the combined corrections in a single operation.

10. EFFECT OF ROTATION OF THE EARTH - This subject has been previously covered by reference (c) and section included in late range tables gives the value of this correction.

W. H. P. BLANDY
Rear Admiral, U.S. Navy
Chief of Bureau

W D Puleston
acting

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EXPLANATORY NOTES.

This table is calculated for a temperature of the atmosphere of 59° F. and a barometric pressure of 29.53 inches, the air being assumed to be half saturated. The powder is assumed to give normal velocity when at 90° F.

Ingalls's Ballistic Tables have been used for computing columns 2, 3, 4, 5, 6, 8, 10, 11, and 12, as well as for computing the altitude factor in the ballistic coefficient.

Alger's formulas were used for computing columns 7, 13, 14, 15, 16, 17, 18, and 19.

De Marre's formula, modified as per reference Naval Gun Factory letter No. 13354–39, Bureau of Ordnance letter No. 31103 (D2), of December 3, 1916, has been used for the computation of column 9.

The penetrations for ranges greater than 22,200 yards should be accepted with caution; they have been determined from the formula which, for lack of facility, has not been tested for angles of fall greater than 30°.

Computations were made for every 500 yards and the columns completed by interpolation.

Columns 1 to 5, 7, and 8 need no explanation.

Column 6 gives the total drift in yards, computed by Mayevski's formula, multiplied by 1.5.

To get change of range for variation of ±10 F. S. I. V., multiply figures given by $\frac{1}{2}$.

To get change of range for variation of 1 per cent in density of air, multiply figures given by $\frac{1}{10}$. The density of the air is assumed to be unity at 59° F. and 29.53 inches barometric height. The density of the air for any temperature and barometric height is given in Table II, Alger's Exterior Ballistics. To dispense with Alger's book, following the Explanatory Notes, there is given a Table II modified.

In the table the same arguments: Temperature in degrees Fahrenheit and barometric pressure in inches of mercury are preserved, but the densities of air are replaced by factors to be used in connection with column 12. Multipliers are given for each degree of temperature and for each barometric height of 28, 29, 30, and 31 inches. For fractions of inch interpolations can be made easily at sight.

To obtain the variation in range take: From the table (multipliers for column 12) the multiplier corresponding to atmospheric conditions, and from the range table the number of yards in column 12, corresponding to the range, multiply both together and the product with the sign of the multiplier, will be the variation in yards due to atmospheric conditions.

Column 12 also represents the effect on the range of a variation of ±10 per cent in the ballistic coefficient, I. V. remaining the same.

Column 11 gives the change of range for a variation of ±5 pounds in weight of projectile, the charge remaining the same.

For a variation of 1 pound multiply figures in column 11 by $\frac{1}{5}$.

In columns 13 to 18 a wind of 24 knots makes twice the effect tabulated.

Column 19 shows how much the point of impact is raised or lowered on a vertical screen by raising or lowering the sight bar 100 yards, the actual range remaining fixed.

The change in range due to a variation of ±1′ in the angle of departure may be deduced directly from the table.

For a variation of ±10° F. in temperature of powder there is caused a corresponding change in the initial velocity of ±20 feet per second approximately.

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ENCLOSURE (A)

CURVATURE OF EARTH, FEET

R.yds.	0	100	200	300	400	500	600	700	800	900
1000	.2	.3	.3	.4	.4	.5	.6	.6	.7	.8
2000	.9	.9	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.8
3000	1.9	2.1	2.2	2.3	2.5	2.6	2.8	2.9	3.1	3.3
4000	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
5000	5.4	5.6	5.8	6.1	6.3	6.5	6.8	7.0	7.2	7.5
6000	7.8	8.0	8.3	8.5	8.8	9.1	9.4	9.7	10.0	10.3
7000	10.6	10.9	11.2	11.5	11.8	12.1	12.4	12.8	13.1	13.4
8000	13.8	14.1	14.5	14.8	15.2	15.6	15.9	16.3	16.7	17.1
9000	17.4	17.8	18.2	18.6	19.0	19.4	19.9	20.3	20.7	21.1
10000	21.5	22	22	23	23	24	24	25	25	26
11000	26	27	27	28	28	29	29	30	30	31
12000	31	32	32	33	33	34	34	35	35	36
13000	36	37	38	38	39	39	40	41	41	42
14000	42	43	44	44	45	46	46	47	47	48
15000	48	49	50	51	51	52	53	53	54	55
16000	55	56	57	58	58	59	60	61	61	62
17000	62	63	64	65	66	66	67	68	69	69
18000	70	71	72	73	73	74	75	75	76	77
19000	78	79	80	81	81	82	83	84	85	85
20000	86	87	88	89	90	91	92	93	94	94
21000	95	96	97	98	99	100	101	102	103	103
22000	104	105	106	107	108	109	110	111	112	113
23000	114	115	116	117	118	119	120	121	122	123
24000	124	125	126	127	128	129	131	132	133	134
25000	135	136	137	138	139	141	142	143	144	145
26000	146	147	148	149	150	152	153	154	155	156
27000	157	159	160	161	162	163	164	165	167	168
28000	169	171	172	173	174	175	177	178	179	180
29000	181	183	184	185	186	188	189	190	192	193
30000	194	195	197	198	200	201	202	203	205	206
31000	207	209	210	211	213	214	215	217	218	219
32000	221	222	224	225	226	228	229	231	232	233
33000	235	236	238	239	240	242	243	245	246	247
34000	249	251	252	253	255	257	258	259	261	263
35000	264	265	267	269	270	272	273	275	276	277
36000	279	281	282	284	286	287	289	290	292	293
37000	295	297	298	300	302	303	305	307	308	309
38000	311	313	315	317	318	319	321	323	325	326
39000	328	329	331	333	335	336	338	340	342	343
40000	345									
R,yds	0	100	200	300	400	500	600	700	800	900

MULTIPLIERS FOR COLUMN 12.

Alger's "Exterior ballistics," Table II, modified. Arguments: Temperature and barometric pressure.

t_F.	28 in.	29 in.	30 in.	31 in.	t_F.	28 in.	29 in.	30 in.	31 in.
0	−0.73	−1.12	−1.50	−1.88	25	−0.17	−0.53	−0.88	−1.25
1	− .71	−1.10	−1.48	−1.86	26	− .15	− .51	− .86	−1.23
2	− .69	−1.08	−1.46	−1.84	27	− .13	− .49	− .84	−1.21
3	− .66	−1.05	−1.43	−1.81	28	− .11	− .47	− .82	−1.19
4	− .64	−1.03	−1.40	−1.78	29	− .09	− .45	− .80	−1.17
5	− .62	−1.00	−1.37	−1.75	30	− .07	− .43	− .78	−1.15
6	− .60	− .98	−1.35	−1.73	31	− .05	− .41	− .76	−1.13
7	− .57	− .95	−1.32	−1.70	32	− .03	− .39	− .74	−1.11
8	− .55	− .93	−1.30	−1.68	33	.00	− .36	− .71	−1.08
9	− .52	− .90	−1.27	−1.65	34	.02	− .34	− .69	−1.05
10	− .51	− .88	−1.25	−1.63	35	.04	− .31	− .66	−1.02
11	− .48	− .86	−1.23	−1.61	36	.06	− .29	− .64	−1.00
12	− .46	− .84	−1.21	−1.59	37	.08	− .27	− .62	− .98
13	− .43	− .81	−1.18	−1.56	38	.10	− .25	− .60	− .96
14	− .41	− .79	−1.16	−1.53	39	.12	− .23	− .58	− .94
15	− .39	− .77	−1.13	−1.50	40	.14	− .21	− .56	− .92
16	− .37	− .74	−1.10	−1.47	41	.16	− .19	− .54	− .90
17	− .35	− .72	−1.08	−1.45	42	.18	− .17	− .52	− .88
18	− .32	− .69	−1.05	−1.42	43	.20	− .15	− .50	− .85
19	− .30	− .67	−1.03	−1.40	44	.22	− .13	− .48	− .83
20	− .28	− .65	−1.01	−1.38	45	.24	− .11	− .46	− .81
21	− .26	− .63	− .99	−1.36	46	.26	− .08	− .43	− .78
22	− .24	− .61	− .97	−1.34	47	.28	− .06	− .41	− .76
23	− .21	− .58	− .94	−1.31	48	.30	− .04	− .39	− .73
24	− .19	− .56	− .91	−1.28	49	.32	− .02	− .37	− .71
25	− .17	−					.00	− .35	− .69

MULTIPLIERS FOR COLUMN 12.

Alger's "Exterior ballistics," Table II, modified. Arguments: Temperature and barometric pressure.

t°	28 in.	29 in.	30 in.	31 in.
50	0.34	0.00	−0.35	−0.69
51	.36	.02	− .33	− .67
52	.38	.04	− .31	− .65
53	.40	.06	− .29	− .63
54	.42	.08	− .27	− .61
55	.44	.10	− .24	− .58
56	.46	.12	− .22	− .56
57	.48	.14	− .20	− .54
58	.50	.16	− .18	− .52
59	.52	.18	− .16	− .50
60	.54	.20	− .14	− .48
61	.56	.22	− .12	− .46
62	.58	.24	− .10	− .44
63	.59	.26	− .08	− .42
64	.61	.28	− .06	− .40
65	.63	.30	− .03	− .37
66	.65	.32	− .01	− .35
67	.67	.34	.01	− .33
68	.69	.36	.03	− .31
69	.71	.38	.05	− .29
70	.73	.40	.07	− .27
71	.75	.42	.09	− .25
72	.77	.44	.11	− .23
73	.79	.46	.13	− .21
74	.81	.48	.15	− .19
75	.83	.50	.18	− .16

t°	28 in.	29 in.	30 in.	31 in.
75	0.83	0.50	0.18	−0.16
76	.85	.52	.20	− .14
77	.87	.54	.22	− .12
78	.88	.55	.23	− .10
79	.90	.57	.25	− .08
80	.92	.59	.27	− .06
81	.94	.61	.29	− .04
82	.96	.63	.31	− .02
83	.97	.65	.33	.00
84	.99	.67	.35	.02
85	1.01	.69	.37	.05
86	1.03	.71	.39	.07
87	1.05	.73	.41	.09
88	1.07	.75	.43	.11
89	1.09	.77	.45	.13
90	1.11	.79	.47	.15
91	1.13	.81	.49	.17
92	1.15	.83	.51	.19
93	1.16	.84	.53	.21
94	1.18	.86	.55	.23
95	1.20	.88	.57	.25
96	1.22	.90	.59	.27
97	1.24	.92	.61	.29
98	1.26	.94	.63	.31
99	1.28	.96	.65	.33
100	1.30	.98	.67	.35

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RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectile corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
1,000	22.8	24	1.12	2,609	.....	1,000	5	12.9	35
1,100	25.2	26	1.24	2,595	.....	1,100	6	12.8	38
1,200	27.6	29	1.35	2,582	.....	1,200	7	12.7	41
1,300	30.0	31	1.47	2,568	.....	1,300	8	12.6	44
1,400	32.4	34	1.58	2,555	.....	1,400	10	12.5	47
1,500	34.8	36	1.70	2,541	.5	1,500	12	12.4	50
1,600	37.2	39	1.82	2,528	.5	1,600	14	12.3	53
1,700	39.7	41	1.94	2,514	.6	1,700	16	12.2	56
1,800	42.2	44	2.06	2,501	.7	1,800	18	12.2	59
1,900	44.7	47	2.18	2,487	.8	1,900	20	12.1	62
2,000	47.2	50	2.30	2,474	.9	556	22	12.0	65
2,100	49.7	53	2.42	2,460	1.0	520	24	11.9	68
2,200	52.2	56	2.54	2,447	1.1	486	26	11.8	71
2,300	54.8	59	2.66	2,434	1.2	454	29	11.7	74
2,400	57.4	1 02	2.79	2,421	1.3	425	32	11.6	77
2,500	1 00.0	1 05	2.91	2,408	1.4	399	35	11.5	80

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
13	1	.....	7	8	.....	7	8	2
14	2	.....	8	9	.....	8	9	2
15	3	.....	9	10	.....	9	10	2
16	4	.....	9	10	.....	9	10	3
17	5	.....	10	11	.....	10	11	3
18	6	1	11	12	.....	11	12	3
19	7	1	12	13	.....	12	13	3
20	8	1	12	14	.....	13	14	3
21	9	2	13	14	.....	13	14	4
22	10	2	13	15	.....	14	15	4
23	12	2	14	16	1	15	16	4
24	14	2	15	17	1	16	17	4
25	15	2	15	18	1	17	18	5
25	17	3	16	18	1	17	18	5
26	18	3	16	19	1	18	19	5
27	20	3	17	20	1	19	20	6

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure = angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of +50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
2,500	1 00.0	1 05	2.91	2,408	1.4	399	35	11.5	80
2,600	1 02.6	1 08	3.04	2,395	1.5	376	38	11.4	83
2,700	1 05.2	1 11	3.16	2,382	1.7	356	41	11.3	86
2,800	1 07.9	1 14	3.29	2,369	1.8	338	44	11.3	89
2,900	1 10.6	1 17	3.41	2,356	2.0	322	47	11.2	92
3,000	1 13.3	1 21	3.54	2,343	2.1	308	51	11.1	95
3,100	1 16.0	1 24	3.67	2,330	2.3	295	55	11.0	98
3,200	1 18.8	1 28	3.80	2,318	2.4	282	59	10.9	101
3,300	1 21.6	1 31	3.93	2,306	2.6	270	63	10.8	104
3,400	1 24.4	1 35	4.06	2,293	2.7	259	67	10.7	107
3,500	1 27.2	1 38	4.19	2,280	2.9	248	71	10.6	109
3,600	1 30.0	1 42	4.32	2,268	3.1	238	75	10.5	112
3,700	1 32.9	1 45	4.46	2,255	3.3	229	80	10.4	115
3,800	1 35.8	1 49	4.59	2,243	3.5	220	85	10.4	118
3,900	1 38.7	1 53	4.73	2,230	3.7	212	90	10.3	121
4,000	1 41.6	1 57	4.86	2,218	3.9	205	95	10.2	123

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
27	20	3	17	20	1	19	20	6
28	22	3	18	21	1	20	21	6
29	24	3	18	22	1	21	22	6
29	26	4	19	22	2	21	22	7
30	28	4	19	23	2	22	23	7
31	30	4	20	24	2	23	24	7
32	32	4	21	25	2	24	25	8
32	35	4	21	26	2	24	26	8
33	37	5	22	27	3	25	27	8
33	40	5	22	28	3	25	28	9
34	42	5	22	29	3	26	29	9
35	45	5	24	30	3	26	30	9
35	47	6	24	31	3	27	31	10
36	50	6	25	31	4	28	31	10
36	52	7	25	32	4	29	32	10
37	55	7	26	33	4	30	33	11

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RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated. 230 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure=angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
4,000	1 41.6	1 57	4.86	2,218	3.9	205	95	10.2	123
4,100	1 44.6	2 01	5.00	2,205	4.1	198	100	10.1	126
4,200	1 47.6	2 05	5.13	2,193	4.3	192	106	10.0	128
4,300	1 50.6	2 09	5.27	2,181	4.6	186	112	10.0	131
4,400	1 53.6	2 13	5.41	2,169	4.9	180	118	9.9	133
4,500	1 56.6	2 17	5.55	2,157	5.2	174	124	9.8	136
4,600	1 59.7	2 21	5.69	2,145	5.5	169	130	9.7	139
4,700	2 02.8	2 25	5.83	2,133	5.8	164	137	9.6	141
4,800	2 05.9	2 29	5.97	2,121	6.1	159	144	9.6	144
4,900	2 09.0	2 34	6.12	2,110	6.4	154	151	9.5	146
5,000	2 12.2	2 38	6.26	2,098	6.7	149	158	9.4	149
5,100	2 15.4	2 43	6.41	2,087	7.0	145	165	9.3	152
5,200	2 18.6	2 47	6.55	2,075	7.3	141	173	9.2	154
5,300	2 21.8	2 52	6.70	2,064	7.7	137	181	9.2	157
5,400	2 25.1	2 56	6.84	2,052	8.1	133	189	9.1	159
5,500	2 28.4	3 01	6.99	2,041	8.5	130	197	9.0	162

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of +10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of +100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
37	55	7	26	33	4	30	33	11
37	58	7	27	34	4	31	34	11
38	61	8	27	35	4	32	35	11
38	63	8	28	36	5	32	36	12
39	66	9	28	37	5	33	37	12
39	69	9	29	38	5	34	38	12
39	72	9	30	39	5	35	39	13
40	75	10	30	40	5	35	40	13
40	78	10	31	41	6	36	41	13
40	81	11	31	42	6	36	42	14
40	84	11	32	43	6	37	43	14
40	87	11	33	44	6	37	44	14
41	90	12	33	45	6	38	45	15
41	94	12	34	45	7	39	45	15
41	97	13	34	46	7	40	46	15
41	100	13	35	47	7	41	47	16

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles, corrected for angle of fall.	Change of range for variation of +50 foot-seconds in initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
5,500	2 28.4	3 01	6.99	2,041	8.5	130	197	9.0	162
5,600	2 31.7	3 05	7.14	2,030	8.9	126	206	8.9	164
5,700	2 35.0	3 10	7.29	2,018	9.3	123	215	8.8	167
5,800	2 38.4	3 15	7.44	2,007	9.7	120	224	8.8	169
5,900	2 41.8	3 20	7.59	1,995	10.1	117	233	8.7	172
6,000	2 45.2	3 25	7.74	1,984	10.5	114	242	8.6	174
6,100	2 48.6	3 30	7.89	1,973	10.9	111	252	8.5	176
6,200	2 52.1	3 35	8.05	1,962	11.4	108	262	8.5	179
6,300	2 55.6	3 40	8.20	1,951	11.9	106	272	8.4	181
6,400	2 59.1	3 46	8.36	1,940	12.4	103	282	8.4	184
6,500	3 02.6	3 51	8.51	1,929	12.9	101	293	8.3	186
6,600	3 06.2	3 57	8.67	1,918	13.4	98	304	8.2	188
6,700	3 09.8	4 02	8.82	1,908	13.9	96	315	8.1	190
6,800	3 13.4	4 08	8.98	1,897	14.4	94	326	8.1	193
6,900	3 17.0	4 13	9.14	1,887	14.9	92	338	8.0	195
7,000	3 20.7	4 19	9.30	1,876	15.4	90	350	7.9	197

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form −.61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
41	100	13	35	47	7	41	47	16
41	103	14	35	48	7	42	48	16
42	107	14	36	49	7	42	49	17
42	110	15	36	50	8	43	50	17
42	114	15	37	51	8	43	51	17
42	117	16	37	52	8	44	52	18
42	121	16	38	53	8	44	53	18
42	125	17	38	54	8	45	54	19
42	128	17	39	55	9	46	55	19
43	132	18	39	56	9	47	56	20
43	136	19	40	57	9	48	57	20
43	140	19	40	58	9	49	58	21
43	144	20	41	59	10	50	59	21
43	148	20	41	61	10	50	61	22
43	153	21	42	62	11	51	62	22
43	157	21	42	63	11	52	63	23

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RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	Seconds.	Foot-seconds.	Yards.	Yards.	Feet.	Inches.	Yards.
7,000	3 20.7	4 19	9.30	1,876	15.4	90	350	7.9	197
7,100	3 24.4	4 25	9.46	1,866	15.9	88	362	7.8	199
7,200	3 28.1	4 31	9.62	1,855	16.4	86	375	7.8	201
7,300	3 31.9	4 37	9.78	1,845	17.0	84	388	7.7	203
7,400	3 35.7	4 43	9.94	1,834	17.6	82	401	7.7	205
7,500	3 39.5	4 49	10.11	1,824	18.2	80	414	7.6	207
7,600	3 43.4	4 55	10.27	1,813	18.8	78	428	7.5	209
7,700	3 47.3	5 02	10.44	1,803	19.4	77	442	7.5	211
7,800	3 51.2	5 08	10.61	1,793	20.0	75	456	7.4	213
7,900	3 55.1	5 15	10.78	1,783	20.6	74	470	7.4	215
8,000	3 59.1	5 21	10.95	1,773	21.3	72	485	7.3	217
8,100	4 03.1	5 28	11.12	1,763	22.0	71	500	7.2	219
8,200	4 07.2	5 34	11.29	1,753	22.7	69	516	7.1	221
8,300	4 11.3	5 41	11.49	1,743	23.4	68	532	7.1	223
8,400	4 15.4	5 47	11.64	1,733	24.1	66	548	7.0	225
8,500	4 19.6	5 54	11.81	1,724	24.8	65	564	6.9	227

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile. 11	Change of range for variation of density of air of ±10 per cent. 12	Change of range for wind component in plane of fire of 12 knots. 13	Change of range for motion of gun in plane of fire of 12 knots. 14	Change of range for motion of target in plane of fire of 12 knots. 15	Deviation for lateral wind component of 12 knots. 16	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots. 17	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots. 18	Change in height of impact for variation of ±100 yards in sight bar. 19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
43	157	21	42	63	11	52	63	23
43	162	22	42	64	11	53	64	23
43	166	22	43	65	12	53	65	24
43	171	23	43	66	12	54	66	24
43	175	23	44	67	13	54	67	25
43	180	24	44	68	13	55	68	25
43	184	25	44	69	13	55	69	26
43	189	26	45	70	14	56	70	26
42	194	26	45	72	14	57	72	27
42	199	27	46	73	15	58	73	27
42	204	28	47	74	15	59	74	28
42	209	29	47	75	15	60	75	29
42	214	29	48	76	16	61	76	29
41	219	30	48	78	16	61	78	30
41	224	30	49	79	17	62	79	30
41	229	31	49	80	17	63	80	31

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of Ives-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of 50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
8,500	4 19.6	5 54	11.81	1,724	24.8	65	564	6.9	227
8,600	4 23.8	6 01	11.99	1,714	25.6	63	581	6.8	229
8,700	4 28.0	6 08	12.16	1,705	26.4	62	598	6.8	231
8,800	4 32.3	6 15	12.34	1,696	27.2	61	616	6.7	233
8,900	4 36.6	6 22	12.51	1,686	28.0	60	634	6.7	235
9,000	4 40.9	6 30	12.69	1,677	28.8	59	652	6.6	237
9,100	4 45.3	6 37	12.87	1,668	29.7	58	671	6.5	239
9,200	4 49.7	6 45	13.05	1,659	30.6	57	690	6.5	241
9,300	4 54.1	6 53	13.23	1,650	31.5	56	709	6.4	243
9,400	4 58.5	7 01	13.41	1,641	32.4	55	729	6.4	245
9,500	5 03.0	7 09	13.60	1,632	33.3	54	749	6.3	246
9,600	5 07.5	7 17	13.78	1,623	34.3	53	770	6.2	248
9,700	5 12.1	7 25	13.97	1,615	35.3	52	791	6.2	250
9,800	5 16.7	7 33	14.16	1,607	36.3	51	812	6.1	252
9,900	5 21.3	7 42	14.35	1,599	37.3	50	834	6.1	254
10,000	5 26.0	7 50	14.54	1,591	38.3	49	856	6.0	255

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
41	229	31	49	80	17	63	80	31
41	234	32	49	81	18	64	81	31
41	239	33	50	82	18	65	82	32
40	244	33	50	84	19	65	84	33
40	249	34	51	85	19	66	85	34
40	255	35	51	86	20	67	86	35
40	260	36	51	87	20	68	87	36
39	266	37	52	88	21	69	88	36
39	271	37	52	90	21	69	90	37
38	277	38	53	91	22	70	91	37
38	282	39	53	92	22	71	92	38
38	287	40	54	93	23	72	93	38
37	293	41	54	94	23	72	94	39
37	298	41	55	96	24	73	96	40
36	304	42	55	97	24	73	97	41
36	309	43	56	98	25	74	98	42

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure=angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
10,000	5	26.0	7	50	14.54	1,591	38.3	49	856	6.0	255
10,100	5	30.7	7	59	14.73	1,582	39.4	48	879	6.0	255
10,200	5	35.5	8	07	14.92	1,574	40.5	47	902	5.9	259
10,300	5	40.3	8	16	15.11	1,566	41.6	47	926	5.9	261
10,400	5	45.1	8	24	15.30	1,558	42.7	46	950	5.8	263
10,500	5	50.0	8	33	15.50	1,550	43.8	45	974	5.8	264
10,600	5	54.9	8	42	15.69	1,542	45.0	44	999	5.7	266
10,700	5	59.9	8	51	15.89	1,534	46.2	43	1,024	5.7	268
10,800	6	04.9	9	00	16.09	1,526	47.4	43	1,050	5.6	270
10,900	6	09.9	9	10	16.29	1,518	48.6	42	1,076	5.6	272
11,000	6	14.9	9	19	16.49	1,510	49.8	41	1,103	5.5	273
11,100	6	20.0	9	29	16.69	1,502	51.1	40	1,130	5.4	275
11,200	6	25.1	9	38	16.89	1,494	52.4	40	1,158	5.4	276
11,300	6	30.3	9	48	17.10	1,487	53.7	39	1,186	5.3	278
11,400	6	35.5	9	57	17.30	1,479	55.0	39	1,215	5.3	279
11,500	6	40.7	10	07	17.51	1,472	56.4	38	1,244	5.2	281

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
36	309	43	56	98	25	74	98	42
36	315	44	56	99	25	74	99	43
35	320	45	57	101	26	75	101	43
35	326	45	57	102	26	76	102	44
34	331	46	58	104	27	77	104	44
34	337	47	58	105	27	78	105	45
34	343	48	58	106	28	79	106	45
33	349	49	59	108	28	80	108	46
33	355	50	59	109	29	80	109	47
32	361	51	60	111	29	81	111	48
32	367	52	60	112	30	82	112	49
31	373	53	60	113	31	82	113	50
31	379	54	61	115	31	83	115	51
30	385	55	61	116	32	83	116	52
30	391	56	62	118	32	84	118	53
29	397	57	62	119	33	85	119	54

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .31.

Range.	Angle of departure = angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
11,500	6	40.7	10	07	17.51	1,472	56.4	38	1,244	5.2	281
11,600	6	46.0	10	17	17.71	1,464	57.8	37	1,274	5.2	283
11,700	6	51.3	10	27	17.92	1,457	59.2	37	1,304	5.1	284
11,800	6	56.6	10	37	18.13	1,450	60.6	36	1,335	5.1	286
11,900	7	02.0	10	47	18.34	1,443	62.1	36	1,366	5.0	287
12,000	7	07.4	10	58	18.55	1,436	63.6	35	1,397	5.0	289
12,100	7	12.9	11	08	18.76	1,429	65.1	34	1,429	4.9	291
12,200	7	18.4	11	19	18.97	1,422	66.7	34	1,462	4.9	292
12,300	7	24.0	11	30	19.19	1,415	68.3	33	1,495	4.8	294
12,400	7	29.6	11	41	19.40	1,408	69.9	33	1,529	4.8	295
12,500	7	35.2	11	52	19.62	1,402	71.6	32	1,563	4.7	297
12,600	7	40.9	12	03	19.83	1,395	73.3	32	1,598	4.7	299
12,700	7	46.6	12	14	20.05	1,389	75.0	31	1,633	4.6	300
12,800	7	52.4	12	25	20.27	1,382	76.8	31	1,669	4.6	302
12,900	7	58.2	12	36	20.49	1,376	78.6	30	1,705	4.5	303
13,000	8	04.0	12	48	20.71	1,370	80.4	30	1,742	4.5	305

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
29	397	57	62	119	33	85	119	54
28	403	58	63	120	34	86	120	55
28	409	59	63	122	34	87	122	56
27	415	60	63	123	35	88	123	57
27	421	61	64	125	35	88	125	58
26	427	62	64	126	36	89	126	59
25	433	63	64	127	37	89	127	60
25	439	64	65	129	37	90	129	61
24	445	65	65	130	38	91	130	61
24	451	66	66	132	38	92	132	62
23	458	67	66	133	39	93	133	63
22	464	68	66	134	40	94	134	64
22	470	69	67	136	41	95	136	65
21	476	70	67	137	41	95	137	66
21	483	71	68	139	42	96	139	67
20	489	73	68	140	43	97	140	68

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.	Angle of fall.	Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Changed range for variation of ±50 foot-seconds initial velocity.
1	2	3	4	5	6	7	8	9	10
Yards.	° ′	° ′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
13,000	8 04.0	12 48	20.71	1,370	80.4	30	1,742	4.5	305
13,100	8 09.9	12 59	20.93	1,364	82.3	29	1,779	4.4	306
13,200	8 15.8	13 11	21.15	1,358	84.2	29	1,817	4.4	308
13,300	8 21.8	13 23	21.37	1,353	86.1	28	1,855	4.3	309
13,400	8 27.8	13 35	21.60	1,347	88.1	28	1,894	4.3	311
13,500	8 33.9	13 47	21.83	1,342	90.1	27	1,934	4.2	312
13,600	8 40.0	13 59	22.06	1,336	92.2	27	1,976	4.2	313
13,700	8 46.1	14 12	22.29	1,331	94.3	26	2,018	4.1	315
13,800	8 52.3	14 24	22.52	1,326	96.4	26	2,061	4.1	316
13,900	8 58.5	14 37	22.75	1,321	98.6	25	2,105	4.0	318
14,000	9 04.8	14 49	22.98	1,316	100.8	25	2,150	4.0	319
14,100	9 11.1	15 02	23.21	1,311	103.1	25	2,195	4.0	320
14,200	9 17.4	15 14	23.44	1,306	105.4	24	2,241	3.9	322
14,300	9 23.8	15 27	23.68	1,301	107.7	24	2,287	3.9	323
14,400	9 30.2	15 40	23.92	1,296	110.1	23	2,333	3.8	325
14,500	9 36.7	15 53	24.16	1,292	112.5	23	2,380	3.8	326

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form =.81.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
20	489	73	68	140	43	97	140	68
19	496	74	68	142	44	98	142	69
19	502	75	69	143	45	99	143	70
18	509	76	69	145	45	99	145	71
18	515	77	70	146	46	100	146	72
17	522	78	70	148	47	101	148	74
16	529	79	70	150	48	102	150	75
15	535	80	71	151	49	103	151	76
15	542	81	71	153	49	103	153	77
14	548	82	72	154	50	104	154	78
13	555	84	72	156	51	105	156	80
12	562	85	72	158	52	106	158	81
12	568	86	72	159	53	107	159	82
11	575	87	73	161	53	107	161	83
11	581	88	73	162	54	108	162	84
10	588	90	73	164	55	109	164	86

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of +50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
14,500	9	36.7	15	53	24.16	1,292	112.5	23	2,380	3.8	326
14,600	9	43.2	16	06	24.40	1,287	115.0	23	2,428	3.8	327
14,700	9	49.7	16	19	24.64	1,283	117.5	22	2,476	3.7	329
14,800	9	56.3	16	32	24.88	1,279	120.0	22	2,525	3.7	330
14,900	10	02.9	16	46	25.12	1,275	122.6	22	2,575	3.6	332
15,000	10	09.6	16	59	25.36	1,271	125.2	22	2,625	3.6	333
15,100	10	16.3	17	13	25.60	1,267	127.9	21	2,676	3.6	334
15,200	10	23.0	17	26	25.84	1,263	130.6	21	2,728	3.5	336
15,300	10	29.8	17	40	26.09	1,259	133.3	21	2,780	3.5	337
15,400	10	36.6	17	53	26.33	1,256	136.1	21	2,833	3.4	339
15,500	10	43.5	18	07	26.58	1,252	138.9	20	2,887	3.4	340
15,600	10	50.4	18	21	26.82	1,249	141.8	20	2,942	3.4	341
15,700	10	57.3	18	35	27.07	1,245	144.7	20	2,998	3.3	342
15,800	11	04.3	18	49	27.32	1,242	147.6	20	3,054	3.3	344
15,900	11	11.3	19	03	27.57	1,238	150.6	20	3,110	3.2	345
16,000	11	18.4	19	17	27.82	1,235	153.6	19	3,167	3.2	346

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of +10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of +100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
10	588	90	73	164	55	109	164	86
9	595	91	74	166	56	110	166	87
8	601	92	74	167	57	111	167	88
8	608	93	74	169	57	111	169	89
7	614	94	75	170	58	112	170	90
6	621	96	75	172	59	113	172	92
5	628	97	75	174	60	114	174	93
5	634	99	76	175	61	115	175	94
4	641	100	76	177	61	115	177	95
4	647	102	76	178	62	116	178	96
3	654	103	77	180	63	117	180	98
2	660	104	77	182	64	118	182	99
1	667	105	77	183	65	119	183	101
1	673	106	78	185	66	119	185	102
0	680	107	78	186	67	120	186	103
−1	686	109	79	188	68	121	188	105

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectile corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
16,000	11	18.4	19	17	27.82	1,235	153.6	19	3,167	3.2	346
16,100	11	25.5	19	31	28.07	1,232	156.7	19	3,225	3.2	347
16,200	11	32.6	19	45	28.32	1,229	159.8	19	3,284	3.2	349
16,300	11	39.8	19	59	28.57	1,226	162.9	19	3,344	3.1	350
16,400	11	47.0	20	13	28.83	1,223	166.1	19	3,405	3.1	352
16,500	11	54.3	20	28	29.08	1,221	169.3	18	3,466	3.1	353
16,600	12	01.6	20	42	29.34	1,218	172.6	18	3,528	3.1	354
16,700	12	08.9	20	57	29.59	1,216	175.9	18	3,591	3.1	356
16,800	12	16.3	21	11	29.85	1,214	179.3	18	3,655	3.0	357
16,900	12	23.7	21	26	30.10	1,212	182.7	18	3,720	3.0	359
17,000	12	31.2	21	40	30.36	1,210	186.1	17	3,785	3.0	360
17,100	12	38.7	21	55	30.62	1,208	189.6	17	3,851	3.0	361
17,200	12	46.2	22	09	30.88	1,206	193.2	17	3,918	3.0	363
17,300	12	53.8	22	24	31.14	1,204	196.8	17	3,986	3.0	364
17,400	13	01.4	22	38	31.40	1,203	200.5	17	4,055	3.0	366
17,500	13	09.0	22	53	31.66	1,201	204.2	16	4,124	3.0	367

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of burst for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
— 1	686	109	79	188	68	121	188	105
— 2	692	110	79	190	69	122	190	106
— 2	699	112	80	192	70	123	192	108
— 3	705	113	80	193	70	123	193	109
— 3	712	115	81	195	71	124	195	111
— 4	718	116	81	197	72	125	197	112
— 5	724	117	81	199	73	126	199	114
— 6	731	119	82	200	74	127	200	115
— 6	737	120	82	202	75	127	202	117
— 7	744	122	83	203	76	128	203	118
— 8	750	123	83	205	77	129	205	120
— 9	756	124	83	207	78	130	207	121
— 9	763	126	83	209	79	131	209	123
—10	769	127	84	210	80	131	210	124
—10	776	129	84	212	81	132	212	126
—11	782	130	84	214	82	133	214	127

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
17,500	13	09.0	22	53	31.66	1,201	204.2	16	4,124	3.0	367
17,600	13	16.7	23	08	31.92	1,200	208.0	16	4,194	3.0	368
17,700	13	24.4	23	22	32.18	1,198	211.8	16	4,265	3.0	369
17,800	13	32.1	23	37	32.44	1,197	215.6	16	4,337	3.0	371
17,900	13	39.8	23	51	32.71	1,195	219.5	16	4,410	3.0	372
18,000	13	47.6	24	06	32.97	1,194	223.5	15	4,483	3.0	373
18,100	13	55.4	24	20	33.24	1,193	227.5	15	4,557	3.0	374
18,200	14	03.2	24	35	33.50	1,192	231.6	15	4,632	3.0	376
18,300	14	11.1	24	50	33.77	1,191	235.7	15	4,708	2.9	377
18,400	14	19.0	25	05	34.03	1,190	239.9	15	4,785	2.9	379
18,500	14	26.9	25	20	34.30	1,189	244.1	15	4,862	2.9	380
18,600	14	34.9	25	35	34.56	1,188	248.4	15	4,940	2.9	381
18,700	14	42.9	25	50	34.83	1,187	252.8	15	5,019	2.9	383
18,800	14	50.9	26	05	35.10	1,186	257.2	14	5,099	2.9	384
18,900	14	58.9	26	20	35.37	1,185	261.6	14	5,180	2.9	386
19,000	15	07.0	26	35	35.64	1,184	266.0	14	5,261	2.9	387

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Feet.
−11	782	130	84	214	82	133	214	127
−12	789	131	85	216	83	134	216	128
−13	795	133	85	218	84	135	218	130
−13	801	134	85	219	84	135	219	131
−14	807	136	86	221	85	136	221	133
−15	813	137	86	223	86	137	223	134
−16	820	138	86	225	87	138	225	136
−16	826	140	87	227	88	139	227	137
−17	832	141	87	228	89	139	228	139
−17	838	143	87	230	90	140	230	140
−18	844	144	88	232	91	141	232	142
−19	850	146	88	234	92	142	234	144
−20	856	147	88	236	93	143	236	145
−20	862	149	89	237	94	143	237	146
−21	868	150	89	239	95	144	239	148
−22	874	152	90	241	96	145	241	150

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure = angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 30 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of +50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
19,000	15	07.0	26	35	35.64	1,184	266.0	14	5,261	2.9	387
19,100	15	15.1	26	49	35.91	1,183	270.5	13	5,343	2.9	388
19,200	15	23.7	27	04	36.18	1,183	275.1	13	5,426	2.9	389
19,300	15	31.3	27	19	36.45	1,182	279.8	13	5,510	2.9	391
19,400	15	39.5	27	34	36.73	1,182	284.5	13	5,595	2.9	392
19,500	15	47.7	27	48	37.00	1,181	289.3	13	5,680	2.9	393
19,600	15	55.9	28	03	37.28	1,181	294.2	13	5,766	2.9	394
19,700	16	04.2	28	17	37.55	1,181	299.1	12	5,853	2.9	396
19,800	16	12.5	28	32	37.83	1,180	304.1	12	5,941	2.9	397
19,900	16	20.8	28	46	38.10	1,180	309.1	12	6,030	2.9	399
20,000	16	29.1	29	01	38.38	1,180	314.2	12	6,120	2.9	400
20,100	16	37.5	29	16	38.65	1,180	319.4	12	6,210	2.9	401
20,200	16	45.9	29	30	38.93	1,180	324.6	12	6,301	2.9	403
20,300	16	54.3	29	45	39.20	1,180	329.9	12	6,393	2.9	404
20,400	17	02.7	29	59	39.48	1,180	335.3	12	6,486	2.9	406
20,500	17	11.2	30	14	39.76	1,180	340.7	11	6,580	2.9	407

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±6 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of +100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	Feet.
−22	874	152	90	241	96	145	241	150
−23	880	153	90	243	97	146	243	151
−24	886	155	90	245	98	147	245	153
−24	892	156	91	246	98	147	246	155
−25	898	158	91	248	99	148	248	156
−26	904	159	91	250	100	149	250	158
−27	910	161	92	252	101	150	252	160
−27	916	162	92	254	102	151	254	162
−28	922	164	92	255	103	152	255	163
−28	928	165	93	257	104	153	257	165
−29	934	167	93	259	105	154	259	167
−30	940	169	93	261	106	155	261	168
−30	946	170	94	263	107	156	263	170
−31	952	172	94	265	108	156	265	172
−31	958	173	94	267	109	157	267	173
−32	963	175	94	269	110	158	269	175

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure = angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±30 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
20,500	17	11.2	30	14	39.76	1,180	340.7	11	6,580	2.9	407
20,600	17	19.7	30	29	40.04	1,180	346.2	11	6,675	2.9	408
20,700	17	28.2	30	43	40.32	1,180	351.8	11	6,770	2.9	410
20,800	17	36.7	30	58	40.60	1,181	357.4	11	6,866	2.9	411
20,900	17	45.2	31	12	40.88	1,181	363.1	11	6,963	2.9	413
21,000	17	53.7	31	27	41.16	1,181	368.8	11	7,061	2.9	414
21,100	18	02.3	31	41	41.44	1,181	374.6	11	7,160	2.9	415
21,200	18	10.9	31	56	41.72	1,182	380.5	11	7,260	2.9	417
21,300	18	19.5	32	10	42.00	1,182	386.4	11	7,361	2.9	418
21,400	18	28.1	32	24	42.28	1,183	392.4	11	7,462	2.9	420
21,500	18	36.7	32	38	42.57	1,183	398.5	10	7,564	2.9	421
21,600	18	45.4	32	53	42.85	1,184	404.6	10	7,667	2.9	422
21,700	18	54.1	33	07	43.13	1,184	410.8	10	7,771	2.9	424
21,800	19	02.8	33	21	43.41	1,185	417.1	10	7,876	2.9	425
21,900	19	11.5	33	35	43.70	1,186	423.4	10	7,982	2.9	427
22,000	19	20.2	33	49	43.98	1,187	429.8	10	8,088	2.9	428

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pounds in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
−32	963	175	94	269	110	158	269	175
−33	969	176	95	271	111	159	271	177
−33	975	178	95	273	112	160	273	179
−34	981	179	95	274	113	161	274	180
−34	986	181	95	276	114	162	276	182
−35	992	182	96	278	115	163	278	184
−36	998	184	96	280	116	164	280	186
−36	1,003	185	96	282	117	165	282	187
−37	1,009	187	96	284	118	165	284	189
−37	1,014	188	97	286	119	166	286	190
−38	1,020	190	97	288	120	167	288	192
−38	1,026	192	97	290	121	168	290	194
−39	1,031	193	98	292	122	169	292	196
−39	1,037	195	98	293	123	170	293	197
−40	1,042	196	98	295	124	171	295	199
−40	1,048	198	99	297	125	172	297	201

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Range.	Angle of departure—angle of elevation plus jump.		Angle of fall.		Time of flight.	Striking velocity.	Drift.	Danger space for a target 20 feet high.	Maximum ordinate.	Penetration of face-hardened armor with capped projectiles corrected for angle of fall.	Change of range for variation of ±50 foot-seconds initial velocity.
1	2		3		4	5	6	7	8	9	10
Yards.	°	′	°	′	*Seconds.*	*Foot-seconds.*	*Yards.*	*Yards.*	*Feet.*	*Inches.*	*Yards.*
22,000	19	20.2	33	49	43.98	1,187	429.8	10	8,088	2.9	428
22,100	19	28.9	34	03	44.26	1,187	436.3	10	8,195	2.9	430
22,200	19	37.6	34	17	44.55	1,188	442.8	10	8,303	2.9	431
22,300	19	46.4	34	31	44.83	1,189	449.4	10	8,412	3.0	433
22,400	19	55.2	34	45	45.12	1,190	456.0	10	8,522	3.0	434
22,500	20	04.0	34	58	45.41	1,191	462.7	10	8,633	3.0	436

RANGE TABLE FOR 8-INCH GUN.

Weight of projectile for which this table is calculated, 260 pounds. Initial velocity, 2,750 foot-seconds. Coefficient of form = .61.

Change of range for variation of ±5 pound in weight of projectile.	Change of range for variation of density of air of ±10 per cent.	Change of range for wind component in plane of fire of 12 knots.	Change of range for motion of gun in plane of fire of 12 knots.	Change of range for motion of target in plane of fire of 12 knots.	Deviation for lateral wind component of 12 knots.	Deviation for lateral motion of gun perpendicular to line of fire, speed of 12 knots.	Deviation for lateral motion of target perpendicular to line of fire, speed of 12 knots.	Change in height of impact for variation of ±100 yards in sight bar.
11	12	13	14	15	16	17	18	19
Yards.	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Yards.*	*Feet.*
−40	1,048	198	99	297	125	172	297	201
−41	1,054	200	99	299	126	173	299	203
−41	1,059	201	99	301	127	174	301	204
−42	1,065	203	99	303	128	175	303	206
−42	1,070	205	100	305	129	176	305	208
−43	1,076	207	100	307	130	177	307	210

NAVY DEPARTMENT,
BUREAU OF ORDNANCE,
January, 1918.

RALPH EARLE,
Chief of Bureau.