

The contents of this pamphlet
may be disclosed only to officers
of the service and to enlisted
men whose duties require them
to be familiar therewith.

No. 1676.

TABLE

OF

UNITED STATES ARMY CANNON

AND

PROJECTILES.

MARCH 24, 1904.

REVISED AUGUST 9, 1906.

REVISED MAY 10, 1910.

REVISED MARCH 13, 1913.

REVISED MAY 15, 1915.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1915.

DEMO

dimensione ridotta

| Gun. | Weight, pounds. | Total length, inches. | Number manufactured or under manufacture. | Serial Nos. |
|---|-----------------|-----------------------|---|--|
| 1.457-inch pompom, Vickers-Maxim | 410 | 43.5 | 21 | |
| 2.95-inch mountain gun..... | 236 | 35.85 | 120 | {1 to 30 V. M. 31 to 120 Wvt.} |
| 3-inch mountain howitzer, model of 1907..... | 199 | 46 | 1 | 1 |
| 3-inch mountain howitzer, model of 1911..... | 210 | 46.5 | 5 | 1-5 |
| 3-inch field gun, model of 1902..... | 835 | 87.8 | 181 | 1-181 |
| 3-inch field gun, model of 1904..... | 835 | 87.8 | 40 | 1-40 |
| 3-inch field gun, model of 1905..... | 788 | 87.8 | 340 | 1-340 |
| 3.2-inch gun, model of 1885 | 829 | 90.7 | 100 | {1-3 Wvt. 4-15 W. F. F. 1-25 Wvt.} |
| 3.2-inch gun, model of 1897 | 830 | 87.7 | 262 | {1-226 Wvt. 1-36 A. O. C.} |
| 3.6-inch mortar, model of 1890..... | 245 | 24.6 | 76 | 1-76 |
| 3.6-inch gun, model of 1891 | 1,200 | 93.45 | 25 | 1-25 |
| 3.8-inch gun, model of 1905 | | | 1 | 1 |
| 3.8-inch gun, model of 1907 | 1,535 | 111.25 | 8 | 2-9 |
| 3.8-inch howitzer, model of 1908..... | 423 | 48 | 8 | 1-8 |
| 3.8-inch howitzer, model of 1908 M1..... | 432 | 50 | 20 | 9-28 |
| 4.7-inch howitzer, model of 1907..... | 950 | 63 | 5 | 1-5 |
| 4.7-inch howitzer, model of 1908..... | 1,056 | 69 | 54 | 1-54 |
| 4.7-inch howitzer, model of 1912..... | 1,056 | 69 | 53 | 1-53 |
| 4.7-in. how., mod. 1913 (for pedestal mount)..... | 2,100 | 111.4 | 21 | 1-21 |
| 4.7-inch gun, model of 1904 | | | 1 | 1 |
| 4.7-inch gun, model of 1906 | 2,688 | 134.92 | 52 | 2-53 |
| 5-inch siege gun, model of 1890..... | 3,660 | 145.75 | 33 | 1-33 |
| 5-inch siege gun, model of 1898..... | 3,639 | 142.95 | 37 | 1-37 |
| 6-inch howitzer, model of 1908 | 1,925 | 87 | 42 | 1-42 |
| 7-inch siege howitzer, model of 1890 | 3,710 | 101.7 | 40 | 1-40 |
| 7-inch siege howitzer, model of 1898 | 3,650 | 99.2 | 30 | 1-30 |
| 7-inch siege mortar, model of 1892 | 1,715 | 58.3 | 61 | 1-61 |

| Total area of cross section of bore, square inches. | Length of bore, calibers. | Diameter over powder chamber, inches. | Diameter of muzzle, inches. | Diameter of trunnions, inches. | Length of trunnions, inches. | Distance between rimbases, inches. | Distance axis of trunnions from muzzle, inches. |
|---|---------------------------|---------------------------------------|-----------------------------|--------------------------------|------------------------------|------------------------------------|---|
| 1.7275 | 30 | 4 | 2.35 | | | | |
| 6.9936 | 11 | 6.4 | 4 | | | | |
| 7.2793 | 14.33 | 6 | 4 | | | | |
| 7.2793 | 14.5 | 5.9 | 4 | | | | |
| 7.2793 | 28 | 8 | 4.8 | | | | |
| 7.2793 | 28 | 8 | 4.8 | | | | |
| 7.2793 | 28 | 7.7 | 4.7 | | | | |
| 8.4024 | 26 | 9.56 | 4.6 | 3.8 | 2.7 | 9.5 | 60.4 |
| 8.3304 | 25.2 | 9 | 4.6 | 3.8 | 2.7 | 9.5 | 57.35 |
| 10.579 | 5.25 | 7.8 | 5.4 | 3.8 | 2.5 | 9.5 | 14.6 |
| 10.507 | 23.5 | 9.8 | 6 | 3.8 | 3 | 9.5 | 57.25 |
| 11.556 | | | | | | | |
| 11.556 | 28 | 9.5 | 6 | | | | |
| 11.556 | 11.6 | 7.4 | 5.6 | | | | |
| 11.556 | 12.1 | 7.4 | 5.5 | | | | |
| 17.704 | 12.4 | 10.3 | 7 | | | | |
| 17.704 | 13.6 | 10.75 | 6.7 | | | | |
| 17.704 | 13.6 | 10.75 | 6.7 | | | | |
| 17.704 | 22.53 | 11.2 | 7 | | | | |
| 17.704 | | | | | | | |
| 17.704 | 27.5 | 12 | 7 | | | | |
| 20.195 | 27 | 15 | 8 | 5.8 | 3.3 | 15 | 96.25 |
| 20.195 | 27 | 15 | 8 | 5.8 | 3.3 | 15 | 95.8 |
| 28.841 | 13.6 | 13.6 | 8.4 | | | | |
| 39.2696 | 12.7 | 16.7 | 10 | 7 | 4 | 18 | 64.6 |
| 39.2696 | 12.7 | 16.6 | 10 | 7 | 4 | 18 | 64.2 |
| 40.360 | 7 | 13.8 | 10.5 | 7 | 4 | 14.3 | 34.15 |

| Gun. | Powder chamber (or interior of case). | | | |
|--|---------------------------------------|---------------------------|-----------------|-------------------------|
| | Form. | Maximum diameter, inches. | Length, inches. | Capacity, cubic inches. |
| 1.457-inch pompom, Vickers-Maxim..... | Conical..... | 1.409 | 2.79 | 4.86 |
| 2.95-inch mountain gun..... | Conical..... | 3.01 | 5.158 | 34.9 |
| 3-inch mountain howitzer, model of 1907..... | Conical..... | 3 | 5.143 | 34.9 |
| 3-inch mountain howitzer, model of 1911..... | Conical..... | 3 | 5.143 | 31.9 |
| 3-inch field gun, model of 1902..... | Conical..... | 3.068 | 9.4 | 66.5 |
| 3-inch field gun, model of 1904..... | Conical..... | 3.068 | 9.4 | 66.5 |
| 3-inch field gun, model of 1905..... | Conical..... | 3.068 | 9.4 | 66.5 |
| 3.2-inch gun, model of 1885..... | Elliptical..... | 3.8 | 11.508 | 120.6 |
| 3.2-inch gun, model of 1897..... | Cylindrical..... | 3.32 | 5.58 | 50 |
| 3.6-inch mortar, model of 1890..... | Cylindrical..... | 3.8 | 2.835 | 33.2 |
| 3.6-inch gun, model of 1891..... | Cylindrical..... | 3.9 | 12.275 | 148.5 |
| 3.8-inch gun, model of 1907..... | Conical..... | 3.894 | 12.53 | 142.6 |
| 3.8-inch howitzer, model of 1908..... | Conical..... | 3.853 | 6.17 | 70 |
| 3.8-inch howitzer, model of 1908 M..... | Conical..... | 3.853 | 6.17 | 70 |
| 4.7-inch howitzer, model of 1907..... | Conical..... | 4.783 | 6.55 | 114 |
| 4.7-inch howitzer, model of 1908..... | Conical..... | 4.783 | 6.55 | 114 |
| 4.7-inch howitzer, model of 1912..... | Conical..... | 4.783 | 6.55 | 114 |
| 4.7-inch how., mod. 1913 (for pedestal mount)..... | Conical..... | 4.78 | 14.3 | 251 |
| 4.7-inch gun, model of 1906..... | Conical..... | 4.78 | 14.3 | 251 |
| 5-inch siege gun, model of 1890..... | Cylindrical..... | 5.7 | 15.15 | 387.5 |
| 5-inch siege gun, model of 1898..... | Cylindrical..... | 5.7 | 15.15 | 402.5 |
| 6-inch howitzer, model of 1908..... | Conical..... | 6.25 | 9.33 | 285 |
| 7-inch siege howitzer, model of 1890..... | Cylindrical..... | 7.2 | 7.465 | 324.2 |
| 7-inch siege howitzer, model of 1898..... | Cylindrical..... | 7.2 | 7.465 | 316.7 |
| 7-inch siege mortar, model of 1892..... | Cylindrical..... | 7.25 | 4.18 | 182.8 |

| Bore. | Rifling. | | | | | | |
|-------|---|----------|--------------|--------------|-----------------------------------|--|------------------|
| | Capacity, cubic inches, with cartridge case in place. | Grooves. | | | Width lands, inch. | Velocity of rotation at muzzle, r. p. m. | Twist, calibers. |
| | | Number. | Width, inch. | Depth, inch. | | | |
| 74.85 | 12 | 0.322 | 0.0156 | 0.059 | 29,649 | 1 in 30. | |
| 220 | 30 | .23 | .023 | .079 | { 8,981-124 lbs. 7,322-18 lbs. | 1 in 25. | |
| 310 | 24 | .2927 | .03 | .1 | 4,360 min. 8,640 max. | 1 in 25. | |
| 310 | 24 | .2927 | .03 | .1 | 4,360 min. 8,640 max. | 1 in 25. | |
| 610 | 24 | .2927 | .03 | .1 | 15,744 Sh. 16,320 Shr. | 1 in 50 to 1 in 25. | |
| 610 | 24 | .2927 | .03 | .1 | 15,744 Sh. 16,320 Shr. | 1 in 50 to 1 in 25. | |
| 610 | 24 | .2927 | .03 | .1 | 15,744 Sh. 16,320 Shr. | 0 twist to 1 in 25. | |
| 722 | 24 | .3 | .05 | .1188 | 12,637 | 1 in 30. | |
| 676 | 24 | .3 | .04 | .1188 | 15,463 | 1 in 50 to 1 in 25. | |
| 203 | 20 | .4454 | .045 | .12 | { 2,336 min. 5,920 max. | 1 in 40 to 1 in 25. | |
| 910 | 26 | .3162 | .04 | .1188 | 13,600 | 1 in 50 to 1 in 25. | |
| 1,239 | 34 | .2111 | .03 | .14 | 12,884 | 1 in 50 to 1 in 25. | |
| 510 | 34 | .2111 | .03 | .14 | { 4,310 min. 8,526 max. | 1 in 20. | |
| 510 | 34 | .2111 | .03 | .14 | { 4,310 min. 8,526 max. | 1 in 20. | |
| 1,024 | 42 | .2116 | .04 | .14 | { 3,475 min. 6,893 max. | 1 in 20. | |
| 1,130 | 42 | .2116 | .04 | .14 | { 3,475 min. 6,893 max. | 1 in 20. | |
| 1,130 | 42 | .2116 | .04 | .14 | { 3,475 min. 6,893 max. | 1 in 20. | |
| 1,878 | 42 | .2116 | .04 | .14 | { 9,958 max. | 1 in 40 to 1 in 20. | |
| 2,294 | 42 | .2116 | .04 | .14 | 10,417 | 1 in 50 to 1 in 25. | |
| 2,869 | 30 | .3736 | .05 | .15 | 10,540 | 1 in 50 to 1 in 25. | |
| 2,509 | 30 | .3736 | .05 | .15 | 10,540 | 1 in 50 to 1 in 25. | |
| 2,360 | 54 | .2091 | .05 | .14 | { 3,093 min. 6,000 max. | 1 in 18. | |
| 3,519 | 42 | .3736 | .05 | .15 | 4,525 | 1 in 50 to 1 in 25. | |
| 3,525 | 42 | .3736 | .05 | .15 | 4,525 | 1 in 50 to 1 in 25. | |
| 1,958 | 28 | .6354 | .055 | .15 | { 3,265 min. 5,485 max. | 1 in 40 to 1 in 15. | |

dimensione riflette

| Gun. | Muzzle. | | | |
|---|----------------------------|--------------------|----------------------------------|-------------------------------------|
| | Velocity, feet per second. | Energy, foot-tons. | Energy per lb. of gun, foot-ton. | Energy per lb. of powder, foot-ton. |
| 1.457-inch subcaliber gun..... | 2,000 | 29.73 | 0.1679 | 191 |
| 2.95-inch subcaliber gun..... | * 700 | 61.22 | .2616 | 139.93 |
| 8-inch guns, models of 1888, 1888 Mr, and 1888 Mrr..... | 2,200 | 10,615 | .3295 | 127.89 |
| 10-inch guns, models of 1888, 1888 Mr, and 1888 Mrr..... | 2,250 | 21,223 | .3159 | 131 |
| 10-inch guns, models of 1895 and 1895 Mr..... | 2,265 | 21,452 | .3216 | 132.42 |
| 10-inch gun, model of 1900..... | 2,250 | 21,223 | .2762 | 116.61 |
| 10-inch mortar, model of 1890..... | 1,150 | 5,544 | .3313 | 163.06 |
| 12-in. guns, mods. 1888, 1888 Mr, 1888 Mr½, and 1888 Mrr..... | 2,235 | 36,103 | .3081 | 129.65 |
| 12-inch guns, models of 1895 and 1895 Mr..... | 2,250 | 36,754 | .3196 | 131.73 |
| 12-inch gun, model of 1900..... | 2,250 | 36,754 | .2776 | 110.04 |
| 12-inch mortar, model of 1886..... | 1,140 | 6,316 | .1978 | 184.41 |
| | 1,050 | 6,305 | .1975 | 184.09 |
| | 910 | 6,012 | .1883 | 175.53 |
| 12-inch mortar, model of 1886-1890 Mr..... | 1,140 | 6,316 | .2350 | 184.41 |
| | 1,050 | 6,305 | .2346 | 184.09 |
| | 910 | 6,012 | .2236 | 175.53 |
| 12-inch mortars, models of 1890 and 1890 Mr..... | 1,500 | 10,935 | .3755 | 168.23 |
| | 1,300 | 9,665 | .3319 | 165.89 |
| | 1,050 | 8,004 | .2749 | 165.92 |
| 12-inch mortar, model of 1908..... | 1,500 | 10,935 | .6008 | 168.23 |
| | 1,300 | 9,665 | .5311 | 165.89 |
| | 1,050 | 8,004 | .4398 | 165.92 |
| 12-inch mortar, model of 1912..... | 1,800 | 15,742 | .465 | 176.87 |
| | 1,200 | 10,448 | .309 | 174.13 |
| 14-inch gun, model of 1907..... | 2,150 | 53,259 | .476 | 152.60 |
| 14-inch gun, model of 1907 Mr..... | 2,150 | 53,259 | .4487 | 152.60 |
| 14-inch gun, model of 1909..... | 2,350 | 63,637 | .457 | 147.99 |
| 14-inch gun, models of 1910 and 1910 Mr..... | 2,350 | 63,637 | .4589 | 147.99 |
| 16-inch gun, model of 1895..... | 2,250 | 84,328 | .2964 | 126.52 |

* 7 ones 550, 625, and 700.

Penetration formula: Uncapped projectile, $t = \frac{1.5}{d} \times \frac{w}{[0.8354]}$

| Minimum elevation permitted by carriage. | Maximum elevation permitted by carriage and corresponding range. | | Penetration in Krupp cemented armor— | | | | | | |
|--|--|-------------|--------------------------------------|----------|-------------------|------------------|----------------------------|------------------|----------------------------|
| | | | Muzzle. | | 1,000-yard range. | | 5,000-yard range. | | |
| | | | Degrees. | Degrees. | Yards. | Un-capped, inch. | Velocity, feet per second. | Un-capped, inch. | Velocity, feet per second. |
| | | | | 0.57 | 1,016 | 0.23 | 254 | 0.04 | |
| { | -7 | barb. 18 | 14,026 | 12.27 | 2,068 | 11.2 | 1,574 | 7.1 | |
| | -5 | dis. c. 12. | 11,019 | | | | | | |
| { | -7 | barb. 15 | 14,062 | 15.84 | 2,136 | 14.7 | 1,708 | 10.3 | |
| | -5 | dis. c. 12 | 12,259 | | | | | | |
| | | | 12,259 | 15.84 | 2,136 | 14.7 | 1,708 | 10.3 | |
| | | | 12,259 | 15.84 | 2,136 | 14.7 | 1,708 | 10.3 | |
| | | | 10,798 | | | | | | |
| { | -5 | dis. c. 10 | 11,636 | 19.00 | 2,153 | 17.8 | 1,795 | 13.6 | |
| | -7 | barb. 15 | 15,194 | | | | | | |
| | | | 11,636 | 19.00 | 2,153 | 17.8 | 1,795 | 13.6 | |
| | | | 11,636 | 19.00 | 2,153 | 17.8 | 1,795 | 13.6 | |
| | | | 10,500 | | | | | | |
| | | | 9,225 | | | | | | |
| | | | 7,319 | | | | | | |
| | | | 10,500 | | | | | | |
| | | | 9,225 | | | | | | |
| | | | 7,318 | | | | | | |
| | | | 15,291 | | | | | | |
| | | | 12,019 | | | | | | |
| | | | 9,250 | | | | | | |
| | | | 15,291 | | | | | | |
| | | | 12,019 | | | | | | |
| | | | 9,250 | | | | | | |
| | | | 19,319 | | | | | | |
| | | | 11,754 | | | | | | |
| | | | 15 | | | | | | |
| | | | 15 | | | | | | |
| | | | 0° 43' | | | | | | |
| | | | 15 | | | | | | |
| | | | 15 | | | | | | |

Range for 45° elevation.

Capped projectile when $v=1,300$ f. s. and under, $t = \frac{0.3677}{1000} \frac{dv}{v} \times \frac{v+400}{1000} \times \sqrt{\frac{10}{d}}$

Capped projectile when $v=1,300$ f. s. and over, $t = \frac{9d}{7} \times \sqrt{\frac{10}{d^3}} \times \left(\frac{v}{1000} - \frac{2}{3} \right)$

| Gun. | Maximum elevation permitted by carriage and corresponding range. | | Penetration | |
|--|--|----------------------|-------------|--------|
| | | | Muzzle. | |
| | Degrees. | Yards. | Normal. | 30°. |
| 1.457-inch subcaliber gun | | | | |
| 2.95-inch subcaliber gun | | | | |
| 8-inch guns, models of 1888, 1888 Mr, and 1888 Mrr | { barb. 18 dis. 12 | { 16, 286 12, 884 | 12. 52 | 11. 52 |
| 10-inch guns, models of 1888, 1888 Mr, and 1888 Mrr | { barb. 15 dis. 12 | { 16, 290 14, 201 | 15. 99 | 14. 71 |
| 10-inch guns, models of 1895 and 1895 Mr | 12 | 14, 201 | 15. 99 | 14. 71 |
| 10-inch gun, model of 1900 | 12 | 14, 201 | 15. 99 | 14. 71 |
| 10-inch mortar, model of 1890 | | | | |
| 12-in. guns, mods. 1888, 1888 Mr, 1888 Mr $\frac{1}{2}$, and 1888 Mrr | { barb. 15 dis. 10 | { 17, 342 13, 186 | 19. 23 | 17. 69 |
| 12-inch guns, models of 1895 and 1895 Mr | 10 | 13, 186 | 19. 23 | 17. 69 |
| 12-inch gun, model of 1900 | 10 | 13, 186 | 19. 23 | 17. 69 |
| 12-inch mortar, model of 1886 | | | | |
| 12-inch mortar, model of 1886-1890 Mr | | | | |
| 12-inch mortars, models of 1890 and 1890 Mr | | | | |
| 12-inch mortar, model of 1908 | | | | |
| 12-inch mortar, model of 1912 | | | | |
| 14-inch gun, model of 1907 | 15 | 16, 867 | 20. 77 | 19. 11 |
| 14-inch gun, model of 1907 Mr | 15 | 16, 867 | 20. 77 | 19. 11 |
| 14-inch guns, models of 1909, 1910, and 1910 Mr | 15 | 19, 244 | 23. 57 | 21. 68 |
| 16-inch gun, model of 1895 | 15 | 18, 579 | 24. 9 | 22. 9 |

In Krupp cemented armor.

| Velocity, ft. per second. | 1,000 yards. | | 5,000 yards. | | | 10,000 yards. | | | 15,000 yards. | | |
|---------------------------------|--------------|--------|---------------------------------|---------|--------|---------------------------------|---------|--------|---------------------------------|---------|-------|
| | Normal. | 30°. | Velocity, ft. per second. | Normal. | 30°. | Velocity, ft. per second. | Normal. | 30°. | Velocity, ft. per second. | Normal. | 30°. |
| 2, 100 | 11. 71 | 10. 77 | 1, 731 | 8. 62 | 7. 93 | 1, 365 | 5. 63 | 5. 18 | | | |
| 2, 166 | 15. 14 | 13. 93 | 1, 853 | 11. 98 | 11. 02 | 1, 523 | 8. 49 | 7. 81 | | | |
| 2, 166 | 15. 14 | 13. 93 | 1, 853 | 11. 98 | 11. 02 | 1, 523 | 8. 49 | 7. 81 | | | |
| 2, 166 | 15. 14 | 13. 93 | 1, 853 | 11. 98 | 11. 02 | 1, 523 | 8. 49 | 7. 81 | | | |
| 2, 180 | 18. 37 | 16. 90 | 1, 917 | 15. 17 | 13. 96 | 1, 629 | 11. 49 | 10. 58 | 1, 399 | 8. 74 | 8. 04 |
| 2, 180 | 18. 37 | 16. 90 | 1, 917 | 15. 17 | 13. 96 | 1, 629 | 11. 49 | 10. 58 | 1, 399 | 8. 74 | 8. 04 |
| 2, 180 | 18. 37 | 16. 90 | 1, 917 | 15. 17 | 13. 96 | 1, 629 | 11. 49 | 10. 58 | 1, 399 | 8. 74 | 8. 04 |
| 2, 091 | 19. 94 | 18. 35 | 1, 865 | 16. 77 | 15. 43 | 1, 617 | 13. 07 | 12. 03 | 1, 416 | 10. 30 | 9. 48 |
| 2, 091 | 19. 94 | 18. 35 | 1, 865 | 16. 77 | 15. 43 | 1, 617 | 13. 07 | 12. 03 | 1, 416 | 10. 30 | 9. 48 |
| 2, 096 | 22. 7 | 20. 9 | 2, 047 | 19. 4 | 17. 8 | 1, 776 | 15. 1 | 14. 2 | 1, 519 | 12. 1 | 11. 1 |
| 2, 195 | 24. 1 | 22. 2 | 1, 983 | 20. 6 | 18. 4 | 1, 749 | 16. 8 | 15. 5 | 1, 512 | 13. 5 | 12. 4 |

PREPONDERANCE OF

| Seacoast guns. | Average weight of guns. | |
|--|----------------------------------|-------------------------------|
| | Without furniture, pounds. | With furniture, pounds. |
| 5-inch gun, model of 1897, W. A..... | 7,691 | 7,868 |
| 5-inch gun, model of 1900, W. A..... | 11,372 | 11,572 |
| 5-inch gun, model of 1897, Beth..... | 7,691 | 7,868 |
| 6-inch gun, model of 1897 Mr, W. A..... | 15,920 | 15,635 |
| 6-inch gun, model of 1900, W. A..... | 19,673 | 19,968 |
| 6-inch gun, model of 1903, W. A..... | 19,471 | 19,840 |
| 6-inch gun, model of 1905, W. A..... | 20,520 | 20,845 |
| 6-inch gun, model of 1908, W. A..... | 12,257 | 12,500 |
| 6-inch gun, model of 1908 Mr, W. A..... | 12,257 | 12,500 |
| 6-inch gun, model of 1908 Mr, W. A..... | 12,257 | 12,500 |
| 8-inch gun, model of 1888, W. P. F..... | 31,379 | 31,990 |
| 8-inch gun, model of 1888, W. A..... | 31,406 | 32,023 |
| 8-inch gun, model of 1888 Mr, W. A..... | 31,399 | 31,999 |
| 8-inch gun, model of 1888 Mr, W. A..... | 31,434 | 32,044 |
| 8-inch gun, model of 1888 Mr, Beth..... | 31,378 | 31,551 |
| 10-inch gun, model of 1888, W. A..... | 65,787 | 67,035 |
| 10-inch gun, model of 1888 Mr, Beth..... | 66,114 | 67,352 |
| 10-inch gun, model of 1888 Mr, W. A..... | 66,203 | 67,450 |
| 10-inch gun, model of 1888 Mr, W. A..... | 66,235 | 67,488 |
| 10-inch gun, model of 1895, W. A..... | 65,304 | 66,294 |
| 10-inch gun, model of 1895 Mr, W. A..... | 65,477 | 66,535 |
| 10-inch gun, model of 1900, W. A..... | 75,423 | 76,530 |

SEACOAST CANNON.

| At face of— | Preponderance. | | | | | Remarks. |
|-------------|---------------------|---------------------|---------------------|-------------------------|-------------|---|
| | Minimum, pounds. | Maximum, pounds. | Average, pounds. | Number manufactured. | Serial Nos. | |
| | | | | 10 | 1 to 10 | |
| | | | | 21 | 1 to 21 | |
| | | | | 25 | 1 to 25 | |
| Breech..... | 85 | 106 | 96.47 | 30 | 1 to 30 | |
| Muzzle..... | 229 | 229 | 229 | 48 | 1 to 48 | {Preponderance for guns 45, 46, and 48 only. |
| Muzzle..... | 159 | 159 | 159 | 70 | 1 to 70 | |
| Muzzle..... | 288 | 288 | 288 | 34 | 1 to 34 | |
| Muzzle..... | 225 | 225 | 225 | 18 | 1 to 18 | |
| Muzzle..... | 215 | 215 | 215 | 2 | 1 to 2 | |
| | | | | 6 | 1 to 6 | No trunnions. |
| Breech..... | 36 | 74 | 53.36 | 11 | 1 to 11 | |
| Muzzle..... | 0 | 20.31 | 13.72 | 13 | 1 to 13 | |
| Muzzle..... | 25 | 51 | 35.86 | 22 | 14 to 35 | |
| Muzzle..... | 1 | 53 | 15.82 | 22 | 36 to 57 | |
| Muzzle..... | 12 | 54 | 37.94 | 25 | 1 to 25 | |
| Breech..... | 63 | 172 | 103.68 | 24 | 1 to 24 | |
| Breech..... | 23 | 108 | 53.6 | 50 | 1 to 50 | |
| Breech..... | 0 | 137 | 61.68 | 20 | 25 to 44 | |
| Breech..... | 45 | 215 | 130.9 | 23 | 45 to 67 | |
| Muzzle..... | 303 | 610 | 397.1 | 19 | 1 to 19 | |
| Muzzle..... | 573 | 591 | 580.6 | 14 | 20 to 33 | |
| Muzzle..... | 897 | 902 | 900 | 14 | 1 to 14 | |

PREPONDERANCE OF

| Seacoast guns. | Average weight of guns. | |
|---|----------------------------------|-------------------------------|
| | Without fermeture, pounds. | With fermeture, pounds. |
| 12-inch gun, model of 1888, W. A. | 113,711 | 115,724 |
| 12-inch gun, model of 1888 Mt, W. A. | 114,269 | 116,306 |
| 12-inch gun, model of 1888 Mt, W. A. | 114,312 | 116,343 |
| 12-inch gun, model of 1888 Mt, Beth. | 114,256 | 116,280 |
| 12-inch gun, model of 1888 Mt, W. A. | 114,245 | 116,269 |
| 12-inch gun, model of 1895, W. A. | 113,228 | 114,733 |
| 12-inch gun, model of 1895 Mt, Beth. | 112,781 | 114,657 |
| 12-inch gun, model of 1895 Mt, W. A. | 113,239 | 114,740 |
| 12-inch gun, model of 1900, W. A. | 129,585 | 131,414 |
| 14-inch gun, model of 1907, W. A. | 108,927 | 110,640 |
| 14-inch gun, model of 1907 Mt, W. A. | 117,012 | 118,725 |
| 14-inch gun, model of 1909, W. A. | 137,400 | 139,240 |
| 14-inch guns, models of 1910 and 1910 Mt, W. A. | 136,747 | 138,460 |
| 16-inch gun, model of 1895 | 280,648 | 284,500 |
| 12-inch mortar, model of 1886 | 31,437 | 32,468 |
| 12-inch mortar, model of 1890 | 27,850 | 28,960 |
| 12-inch mortar, model of 1886-90 Mt | 25,759 | 26,865 |
| 12-inch mortar, model of 1890 Mt | 27,898 | 29,000 |
| 12-inch mortar, model of 1890 Mt | 27,898 | 29,000 |
| 12-inch mortar, model of 1890 Mt | 27,898 | 29,000 |
| 12-inch mortar, model of 1890 Mt | 27,898 | 29,000 |
| 12-inch mortar, model of 1908, W. A. | 17,365 | 18,160 |
| 12-inch mortar, model of 1912 | 33,071 | 33,860 |

| At face of— | Preponderance. | | | | | Remarks. |
|-------------|---------------------|---------------------|---------------------|------------------------------|-----------------------|---------------|
| | Minimum, pounds. | Maximum, pounds. | Average, pounds. | Number manufac- tured. | Serial Nos. | |
| Breech | 0 | 140 | 61.2 | 16 | 1 to 16 | |
| Muzzle | 41.5 | 61 | 51.25 | 2 | 17 and 18 | |
| Muzzle | 10 | 70 | 39.26 | 19 | 19 to 35 45 and 46 | |
| Muzzle | 10 | 70 | 39.26 | 10 | 1 to 10 | |
| Muzzle | 46 | 93 | 73.78 | 9 | 36 to 44 | |
| Muzzle | 1,100 | 1,440 | 1,378.5 | 41 | 1 to 41 | |
| Muzzle | 1,351 | 1,372 | 1,365.5 | 15 | 1 to 15 | |
| Muzzle | 1,348 | 1,360 | 1,360 | 34 | 42 to 75 | |
| Muzzle | 1,096 | 1,148 | 1,116 | 11 | 1 to 11 | |
| Muzzle | | | 1,486 | 1 | 1 | Wire-wrapped. |
| Muzzle | | | 1,614 | 4 | 1 to 4 | Built-up. |
| | | | | 4 | 1 to 4 | Wire-wrapped. |
| | | | | *16 | 1 to 16 | Wire-wrapped. |
| Muzzle | 188 | 88 | 88 | 1 | 1 | |
| Breech | 585 | 722 | 634 | 73 | 1 to 73 | B. I. F. |
| Muzzle | 29 | 56 | 41 | 8 | 1 to 8 | W. A. |
| Breech | 424 | 576 | 536.87 | 9 | 1 to 9 | |
| Breech | 140 | 191 | 169 | 173 | 9 to 181 | |
| Breech | 140 | 191 | 169 | 55 | 1 to 55 | Bethlehem. |
| Breech | 140 | 191 | 169 | 24 | 1 to 24 | N. T. W. |
| Breech | 140 | 191 | 169 | 55 | 1 to 55 | B. I. F. |
| | | | | 25 | 1 to 25 | Wire-wrapped. |
| | | | | 28 | 1 to 28 | Wire-wrapped. |

* 16 13, 1909; 13 to 16, 1910 Mt.

† Muzzle counter preponderance.

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Table showing ranges beyond which projectiles of the guns stated will not penetrate 12-inch and 7-inch Krupp cemented armor, when placed normally to the trajectory and when placed so that the trajectory makes an angle of 30° with the normal to the plate.

LONG-CAPPED PROJECTILES.

| Caliber of gun, inches. | Muzzle velocity, feet per second. | Weight of projectile, pounds. | 12-inch Krupp armor— | | | | 7-inch Krupp armor— | | | |
|-------------------------|-----------------------------------|-------------------------------|--|--|--|--|--|--|--|--|
| | | | Normal impact. | | Impact at 30° to normal. | | Normal impact. | | Impact at 30° to normal. | |
| | | | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. |
| 6 | 2,600 | 103 | 2,867 | — | 3,056 | — | 1,950 | 3,820 | 2,062 | 3,100 |
| 8 | 2,200 | 323 | 2,136 | 640 | 2,264 | — | 1,550 | 7,444 | 1,615 | 6,425 |
| 10 | 2,250 | 617 | 1,855 | 4,973 | 1,958 | 3,613 | 1,369 | 12,911 | 1,434 | 11,580 |
| 12 | 2,250 | 1,070 | 1,669 | 9,255 | 1,747 | 7,855 | 1,234 | All ranges. | 1,293 | All ranges. |
| 14 | 2,150 | 1,660 | 1,543 | 11,800 | 1,616 | 10,200 | 1,137 | All ranges. | 1,193 | All ranges. |
| 14 | 2,350 | 1,660 | 1,543 | 15,200 | 1,616 | 13,000 | 1,137 | All ranges. | 1,193 | All ranges. |
| 16 | 2,250 | 2,400 | 1,445 | 18,000 | 1,510 | 16,000 | 1,063 | All ranges. | 1,118 | All ranges. |

Formulae: When $v = 1,800$ f. s. and under, $v = 200 \left(\sqrt{1 + \frac{25}{0.3677} t \sqrt{\frac{d}{w}} - 1} \right)$ $t =$ thickness penetrated—*inches*.
 When $v = 1,800$ f. s. and over, $v = 777.8 t \sqrt{\frac{d}{w}} + 667.$ $w =$ weight of projectile—*pounds*.
 $v =$ velocity of projectile—*feet per second*.
 $d =$ diameter of projectile—*inches*.
 For impact at 30° to normal, penetration = 92% of penetration at normal impact.—Hamilton's Ballistics.

Table showing ranges beyond which projectiles of the guns stated will not penetrate 12-inch and 7-inch Krupp cemented armor, when placed normally to the trajectory and when placed so that the trajectory makes an angle of 35° with the normal to the plate.

SHORT-CAPPED PROJECTILES.

| Caliber of gun, inches. | Muzzle velocity, feet per second. | Weight of projectile, pounds. | 12-inch Krupp armor— | | | | 7-inch Krupp armor— | | | |
|-------------------------|-----------------------------------|-------------------------------|--|--|--|--|--|--|--|--|
| | | | Normal impact. | | Impact at 35° to normal. | | Normal impact. | | Impact at 35° to normal. | |
| | | | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. | Velocity required to penetrate, feet per second. | Limiting range for penetration, yards. |
| 6 | 2,600 | 106 | 2,887 | — | 3,154 | — | 1,962 | 1,580 | 2,122 | 1,170 |
| 8 | 2,200 | 316 | 2,152 | 350 | 2,330 | — | 1,552 | 5,191 | 1,656 | 4,280 |
| 10 | 2,250 | 604 | 1,870 | 3,450 | 2,012 | 2,130 | 1,330 | 8,470 | 1,471 | 7,450 |
| 12 | 2,250 | 1,046 | 1,680 | 6,330 | 1,786 | 5,160 | 1,245 | 12,273 | 1,327 | 10,954 |

WAR DEPARTMENT.
 OFFICE OF THE CHIEF OF ORDNANCE,
 Washington, May 15, 1915.

FORM No. 1676.
 March 23, 1904.
 Revised August 9, 1906.
 Revised May 10, 1910.
 Revised March 13, 1913.
 Revised May 15, 1915.
 Ed. May 15-15-1,000.

Formulae: When $v = 1,800$ f. s. and under, $v = 200 \left(\sqrt{1 + \frac{25}{0.3677} t \sqrt{\frac{d}{w}} - 1} \right)$ $t =$ thickness penetrated—*inches*.
 When $v = 1,800$ f. s. and over, $v = 777.8 t \sqrt{\frac{d}{w}} + 667.$ $w =$ weight of projectile—*pounds*.
 $v =$ velocity of projectile—*feet per second*.
 $d =$ diameter of projectile—*inches*.
 For impact at 35° to normal, penetration = 89% of penetration at normal impact.—Hamilton's Ballistics.

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