

# THE NEW HIGH POWERED GUNS OF THE VICKERS, SONS & MAXIM COMPANY.

Exceptional interest has been aroused in this country in the ordnance manufactured by the firm of Vickers, Sons & Maxim, on account of the purchase by our government for \$200,000 of the right to use and manufacture the Vickers-Maxim breech mechanism, as applied to their rapid-fire guns. Further interest is due to the fact that the energy and rapidity of fire of these weapons places them well in the lead in the keen competition which exists between the leading manufacturers of ordnance.

If we were to mention in their order the most important desiderata in the modern rapid-fire gun, we would name first: The prevention of erosion (that is, the cutting away of the bore of the gun by the hot powdergases); second, rapidity of fire; third, high velocity. The introduction of smokeless powder is more than anything else the cause of the extreme velocity and striking energy developed in modern ordnance, and it has

also contributed not a little to the great rapidity of fire. Unfortunately, however, smokeless powder brought with it a serious element of deterioration, which caused the artillerist considerable anxiety, and promised at one time to materially limit the useful life of the gun; for it was found that the white-hot high pressure gases resulting from combustion acted with a cutting or eroding effect upon the surface of the bore at the base of the shot. This erosion was ascertained to be chiefly due to the imperfect obturation of the copper rifling band which encircles the shell near its base. The object of the band is two-fold: It is intended to enter the grooves of the rifling and impart rotation to the shell, and it also serves as an obturator to seal up the space between the shell and the bore of the gun, and prevent the gases from passing by the shell. While the rifling band is thoroughly effective for the first purpose, it has proved to be a more or less imperfect gas-seal, a certain amount of the gases forcing its way past the shell as it travels up the bore. With the introduction of smokeless powder, the erosion became very marked, and was so serious, indeed, as to render some guns practically unserviceable after a certain number of rounds had been fired. The accompanying illustrations, Figs. 1 and 2, show a system of obturation which has been applied by the Vickers-Maxim firm to the base of the shell with very gratifying results.

Just back of the driving-ring may be observed what might be termed an obturating-ring, and just at the rear of this what might be considered a junk-ring. The obturating-ring is made of copper wire, asbestos yarn, plumbago, and a small percentage of paraffin wax. On firing the gun, the gases, by operating on nearly the whole surface of the junk-ring, force it forward and subject the obturating ring to a pressure about twenty per cent greater per square inch than the gas pressures

in the gun. As the obturating-ring is of a semi-elastic nature, it yields under this enormous pressure, and makes a perfect gas-tight seal or joint between the projectile and the bore of the gun. It has been found in practice that this simple device practically prevents all erosion.

The device was designed by Hiram S. Maxim, assisted by Lieut. Dawson, the artillery expert of Messrs Vickers, Sons & Maxim. We are informed by Mr. Maxim

the block, if divided into eight segments, would have six segments, or three-quarters of its circumference, threaded for meeting the strains of the breech; whereas the ordinary cylindrical breech-block, with thread and plain surfaces alternating, would have only half its circumference threaded, the other half being useless for resisting the back pressure in firing. This enables the block to be shortened by one-third of its length, and of course its weight is proportionately lessened. As this shortening of the block, and therefore of the breech of the gun, takes place at the heaviest end of the gun, it can be seen that there is a very considerable saving of weight.

The shortening of the breech-block, moreover, renders it possible to employ the De Bange obturating pad at the end of the block, the block with obturator attached being still so short that it can be swung clear of the breech at once, on being unlocked, without being first drawn out of the breech-box on a line with the axis of the gun. The employment of the De Bange pad

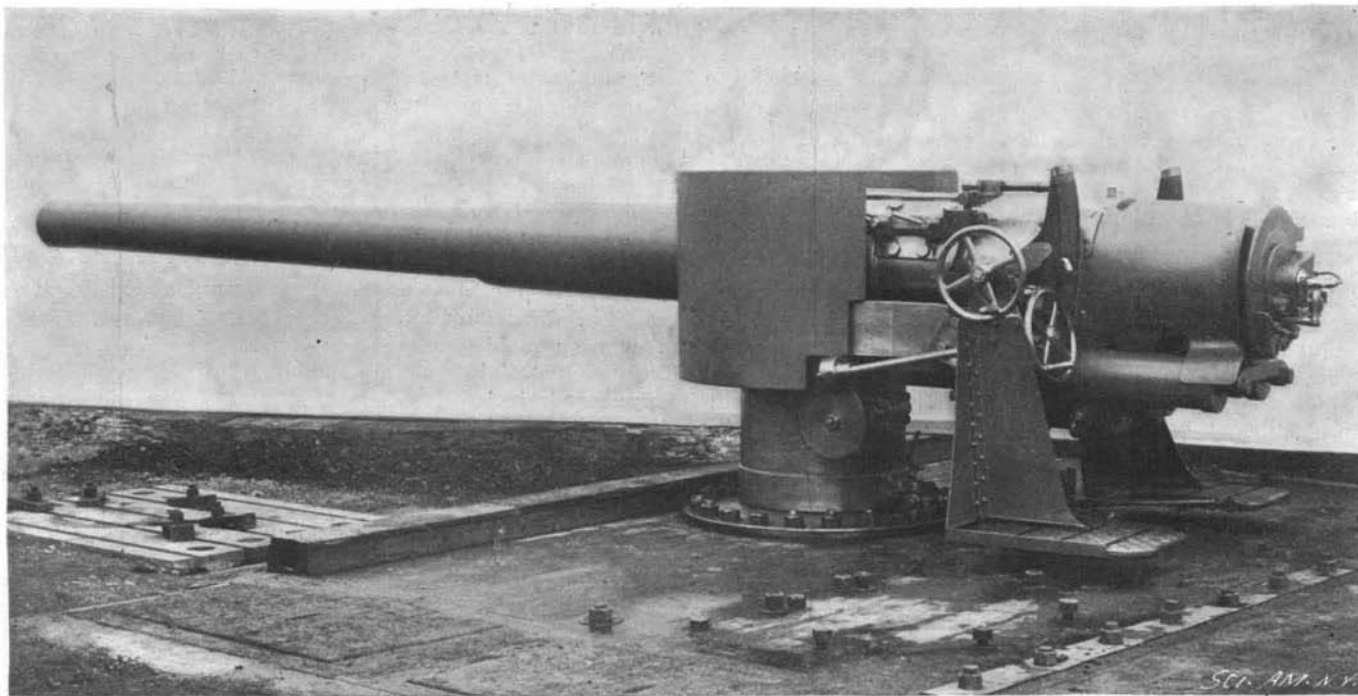
renders the cartridge case unnecessary, and thus the weight and cost of each charge are greatly reduced. The charge, being lighter, is more quickly handled, and a proportionate amount of time is saved. A further saving of cost and time is secured in not having to provide a cartridge-extractor or handle the empty case after the gun is fired.

The advantages of the new breech may be thus summarized:

1. Saving of metal and weight in breech-block and breech of gun.
2. Small degree of rotation of breech-block in unlocking or locking.
3. The elimination of the motion of withdrawal of block in line with axis, rendering only two motions of the block and one swing of the lever necessary.
4. The abolition of the heavy cartridge case, with proportionate reduction in weight and cost of ammunition.
5. The abolition of the cartridge-case extractor, and the time saved in not having to handle the empty cases.

The efficiency of the new mechanism is shown by the fact that the firm has secured a rate of fire of 5 shots per minute from the 8-inch gun and 8 shots per minute from the 6-inch gun.

Next in importance to the prevention of erosion and the provision of rapidity of fire is the question of velocity. Upon the velocity, given a certain weight of shell, depend the energy, penetration, flatness of trajectory, and in a large degree the accuracy. The chief limitation to the use of high velocities has been the necessity of keeping down the powder pressures. High pressure has been attended by rapid erosion of the gun, as already explained. In the Vickers-Maxim gun, by the use of the obturating ring at the base of the shell the high pressure of 17 tons to the square inch is used without any serious wear of the gun, and a



VICKERS-MAXIM 6-INCH RAPID-FIRE GUN.

Length in calibers, 45; total length, 23.3 feet; powder pressure, 17 tons; charge, 25 pounds cordite; weight of projectile, 100 pounds; weight of gun, 7½ tons; velocity, 2,775 feet per second; muzzle energy, 5,340 foot-tons; penetration of iron at muzzle, 21.1 inches; penetration of steel at muzzle, 16.4 inches; rapidity of fire, eight rounds per minute.

that Lieut. Dawson has actually succeeded in applying this system to a gun in which the chamber had been so much worn as to greatly diminish the muzzle velocity of the projectile, with the result that the original velocity was restored.

Rapidity of fire, which we have stated to be second only in importance to the prevention of erosion, has

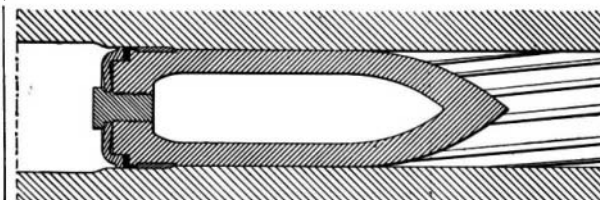


Fig. 1.—Obturating Ring Before Firing.

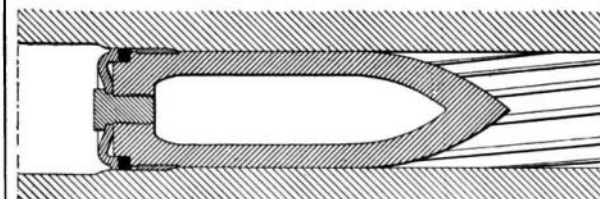
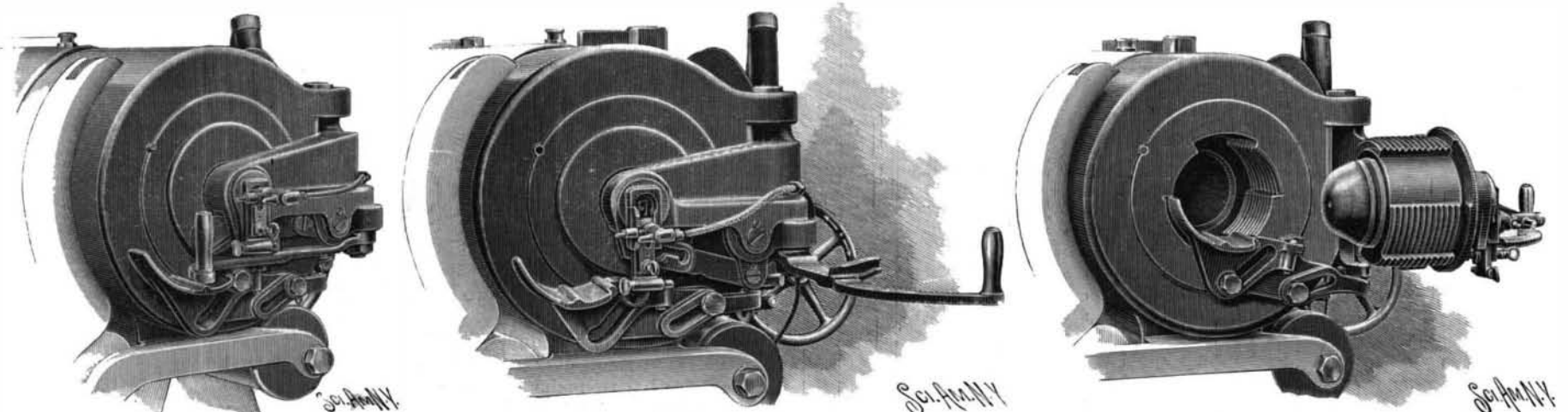


Fig. 2.—Obturating Ring After Firing.

been greatly increased in the case of these guns by the new system of breech mechanism, the rights for which have just been purchased by the United States government. The most interesting feature is the breech-block, which was originally invented by a Swedish engineer, Mr. Alex Welin. The block is made in segmental portions in steps of varying radii, as shown in the accompanying illustrations. By this arrangement



Breech Closed, and Locked Hand-lever Across Breech.

Hand-lever Partly Swung Around, Unlocking Breech-block, and Disconnecting Firing Mechanism.

Hand-lever Swung Completely Around, Breech-block Withdrawn and Tray Thrown Up into Place.

standard velocity of about 2,750 feet per second is secured in the larger guns. With this high velocity it is possible to secure great energy and penetration with a gun that is relatively of small size and weight. Thus the 6-inch gun with a velocity of 2,750 feet per second has an energy of 5,340 foot-tons, as against 2,537 foot-tons for the old pattern English naval gun, which had a velocity of 1,913 feet per second. It will thus be seen that the energy of the new guns per ton-weight of the gun is vastly greater than that of the earlier patterns.

We have chosen the 6-inch gun for illustration. This weapon, like all those manufactured by this firm, is of the wire-wound type. The breech-plug is opened or closed by the horizontal movement of a hand-lever. The same action rotates, locks, or unlocks the breech-block, swings it in or out of the gun round the pivot on which it is mounted, and causes the percussion and electric striker to make or break contact at the required positions during the working of the mechanism. The arrangement consists of a link, one end of which is so pivoted on a pin projecting from the rear face of the breech-plug that the link works in a plane parallel to the breech face of the gun, while the other end is pivoted to a short crank mounted on the block carrier, and around the boss of this crank are formed "skew gear" teeth. The hand-lever for actuating the breech mechanism is pivoted on the block carrier, and moves in a plane at right angles to the breech face of the gun. Around the boss of the hand lever is fitted a skew gear wheel, which gears with the skew teeth formed on the boss of the crank. The whole is arranged and proportioned in such a manner that when the breech is closed, the hand lever lies close up to the breech face of the gun. This arrangement of centers and pivots, together with the relative lengths of the link and crank, provides great power when opening or closing the breech. On swinging the hand lever away from the gun, so as to open the breech, the crank moves the link past the locking center a short distance without causing any perceptible movement of the block. The further movement of the hand-lever causes the crank to turn, and by means of the link rotates the block, at first very slowly (thus obtaining great power) and then more rapidly, until it becomes unscrewed. The carrier then moves with the lever, swinging the block clear of the gun.

A loading-tray is provided, which is automatically moved across the breech face, and raised into the loading position when the breech is being opened, and lowered when it is closing. The firing gear is arranged for firing by electric or percussion tubes, and is operated by the movement of the hand-lever and link. It is so arranged that the first movement of the hand-lever, when unlocking the breech, acts on the firing gear and makes the gun absolutely safe before the breech-plug commences to unscrew. By the continuous movement of the link the empty tube or primer is automatically ejected.

The casemate mounting for these two quick-firing guns only differs in slight details. It consists of a steel top carriage, resting on balls, running on ball-bearings on a steel pivot. The cradle in which the gun slides is a cylinder; attached to the cradle are three cylinders, one to overcome the recoil, and the other two (one on each side of the recoil cylinder) contain the springs for running the gun up to the firing position after the recoil. The connection between these three cylinders and the gun is made by arms projecting from the breech-ring. The whole weight of the moving parts, gun, cradle, and carriage, is taken on the balls above referred to, so that the training is very easy. The ele-

vating and training operations are performed by the rotation of two hand wheels, conveniently placed with regard to the shoulder-piece against which the gunner leans. These two hand wheels are worked on the left side of the mounting, which has also an auxiliary hand wheel on the right side, so that, if necessary, two men can conveniently train the gun. Subjoined we give a table of the weight, velocity, penetration, etc., of the various guns built by this firm.

#### A Swedish Edition of "Magic: Stage Illusions and Scientific Diversions, Including Trick Photography."

We have received the first number of "Magiens Värld," a Swedish edition of our "Magic: Stage Illusions and Scientific Diversions, including Trick Photography." It is gratifying to note the interest which this volume has caused among magicians and publishers abroad, and we are not at all surprised that there should be a translation of this book. This work is published in Swedish by Messrs. Fahlerantz & Company, of Stockholm, Sweden, and it is published by arrangement and with our consent. The translation is made by D. S. Hector, and we are unable to state whether there will be any additional material or not, but the entire book will be published, including all the illusions. We wish the Swedish publishers great success with their new undertaking.

#### A MEDAL AWARDED TO THE SCIENTIFIC AMERICAN.

A token of appreciation is always doubly welcome when no steps are taken to obtain it. We have been greatly gratified by the action of the jury on "Imprimerie et Industries de Livre" of the Brussels International Exposition in awarding the SCIENTIFIC AMERICAN a diploma of merit and a silver medal. We made no exhibit at the Exposition, and without our knowledge Col. George W. Roosevelt, United States consul at Brussels, kindly entered our paper for competition, and it was given the award named above. The medal is two and three-quarter inches in diameter. The



SILVER MEDAL AWARDED TO THE SCIENTIFIC AMERICAN AT BRUSSELS, 1897.

obverse is three figures modeled in high relief. The reverse has two lions rampant supporting a shield surmounted by a coronet, while underneath is the legend "L'Union fait la force" and the space for the name of the recipient. The sculptor was M. Jules Labue. The diploma has a female figure in the Barque of Progress whose attention is directed by another female figure to the Exposition building in the background.

#### American Commission Houses in Germany.

There is a movement on foot to incorporate a company under the laws of Germany, which will be prepared to erect suitable buildings for the display and sale of American products, provided manufacturers and dealers in America show a disposition to aid and encourage such an enterprise. This proposed company will construct buildings as desired by special interests, at an agreed rental, and will also be prepared to contract with the owners of merchandise to handle and sell their goods upon commission, and guarantee the payment of all bills of goods sold by them or their agents.

Germany appreciates our standing as a nation, and, I believe, would be willing to meet us half way in a fair exchange of commodities. Would it not be well for a number of our manufacturers to send over a representative to make a thorough investigation of the field, with a view to making arrangements with parties here for the

housing and handling of their various products? The city of Cologne, from its favorable location, would make an excellent distributing point for all kinds of merchandise. It is a city of nearly 350,000 people, with railway and steamship facilities unexcelled in Europe. Docks and wharves of solid masonry extend for miles along the river banks. There are four railroad depots, the central station being one of the finest in the world, built and equipped at a cost of about \$8,500,000. The chief custom house of the province is also located here. During the year 1897, there arrived at the harbor of Cologne 5,869 steamers, tow boats, and sailing vessels, carrying a total of 558,533 tons. There were shipped from this harbor during the same time 209,766 tons, in 4,765 vessels of all kinds. I am informed that the amount of goods and other merchandise received and shipped by railway in 1897 amounted to nearly 2,000,000 tons, and the value of the freight receipts aggregated \$2,801,970.

JOHN A. BARNES, Consul.

Cologne, August 17, 1898.

#### Alpine Accidents.

The Alps have been this year the theater of the sensational fatalities which have become associated with the dangerous and fascinating pastime of Alpine climbing since the days of the beginning of this sport in the fifties. Within a few weeks five persons have lost their lives uselessly in this diversion. Dr. John Hopkinson, one of the most distinguished of England's men of science, with his son and two daughters, was killed while climbing the Petite Dent de Veisivi, a peak of 10,463 feet in one of the side valleys running up from the central valley of the Rhone. A few weeks later Prof. Masse, a well known surgeon of Berlin, met his death while climbing a peak of 12,000 feet—the Piz Palù.

The death of the Hopkinson family is particularly distressing. Dr. Hopkinson was an experienced Alpine climber, and the peak presented so few difficulties that he dispensed with the aid of a guide. Foolhardy mountain climbing is the cause of most of the serious accidents; and, while it is perfectly true that fatal accidents have happened where guides have been taken along, still there are many accidents which have happened to the unattended which might have been prevented had the services of a skilled guide been engaged. The Hopkinson family were all roped together, and a fatal slip of one of them set in motion the awful machinery for the catastrophe. A single misstep like that which occurred to Mr. Hadow in 1865, which caused the death of Lord Francis Douglas, Hudson himself, and the guide on the Matterhorn during the descent, after the top of the peak had been reached, may have been responsible for this last tragedy. It seems as though, even when the party are roped together with several guides, there is no guarantee of safety, and the ascent of even comparatively safe peaks without guides may be regarded as dangerous in the extreme.

The accident to Prof. Masse was of a different nature. In crossing a crevasse the ice bridge gave way, with the result that Prof. Masse fell down perpendicularly, dragging the guide after him, while his friend Dr. Borchard and the Tyrolean guide had to support the weight of the entire party. Eventually, the guide who was at the end of the rope, having discovered that the bottom of the crevasse was not far off, cut himself loose and scrambled out with the help of his ice ax; but when he came to the rescue of Prof. Masse, he found that the latter's death had been caused by the rope which he himself had insisted upon being tied under his shoulders. The consequence was that the rope was pulled taut and the professor's circulation was suspended.

#### An Exhibition of Snakes.

A curious exhibition will begin in New York on November 12. It is termed the International Snake Exhibition and will open in Grosvenor Hall, East Fifty-second Street, New York. Scientists who are interested in snakes will undoubtedly bring specimens. Mr. R. L. Ditmars, former Assistant Curator of the American Museum of Natural History, who has studied the habits of snakes for many years, is attending to the arrangements for the show. The exhibition will be unique as to size. There have been small displays of snakes in museums and at the World's Fair, but never a comprehensive exhibition. Certificates of merit will be issued for meritorious exhibits. Stuffed snakes and snakes preserved in alcohol will also be shown. It is expected that there will be one hundred and fifty to two hundred varieties of reptiles on exhibition.

WE learn from The Fort Wayne Medical Journal Magazine for September that, at a recent examination before the medical board of Louisiana, Dr. Emma Wakefield, a young negress, passed a successful examination. She is the first woman in the State of Louisiana to study medicine, and the first negress in America to receive a medical diploma.

#### VICKERS, SONS & MAXIM GUNS.

TYPE OF GUN.	Diameter of Bore.	Length of Bore.	Total Length of Gun.	Diameter of Chamber.	Length of Chamber.	Maximum Pressure in Chamber.	Weight of Charge.	Weight of Projectile.	Total Weight of Gun, including Breech Mechanism.	Muzzle Velocity in Feet per Sec.	Energy in Foot-Tons.	Penetration of Wrought Iron Plate by Gallet For m. lb.	Penetration of Steel Plate at 100 yds. For m. lb.	Rounds per Minute.
37 mm.	1.457	43.5	73.75	1.44	2.64	13	0 4 0	1.25	0 4 0 22	1800	72.5	1.9	1.5	300
30 cal.														
37 mm.	1.457	62.0	94.0	1.6	3.78	14	0 3 0	1.25	0 5 1 26	2350	48	3.3	2.6	300
42 cal.														
47 mm.	1.85	73.72	77.95	2.04	12.93	13	0 9 0	3.3	0 4 0 0	2125	103	4.5	3.5	30
40 cal.														
47 mm.	1.85	87.34	91.5	2.04	12.93	13	0 11 0	3.3	0 4 2 6	2400	132	5.3	4.1	30
47.2 cal.														
57 mm.	2.244	95.0	104.4	2.45	16.2	15	0 15 0	6.0	0 6 2 0	2300	220	6.2	4.8	24
42.3 cal.														
57 mm.	2.244	112.2	116.4	2.8	14.2	15	1 4 0	6.0	0 8 0 0	2500	260	7	5.4	28
60 cal. Naval														
76.2 mm.	3.0	135.0	138.0	3.5	19.0	16	2 9 0	12.5	0 14 2 14	2600	586	9.2	7.1	20
45 cal. Naval														
76.2 mm.	3.0	150.0	153.0	3.5	19.0	16	2 9 0	12.5	0 16 3 0	2700	632	9.7	7.5	20
60 cal. Field														
76.2 mm.	3.0	70.5	75.55	3.4	9.6	14	1 0 0	12.5	0 5 2 23	1700	250.4			20
23.5 cal. Mountain														
75 mm.	2.953	51.6	56.85	3.0	4.575	8	0 6 110	12.5	0 2 0 13	918	73			14
101.6 mm.	4.0	180.0	186.1	5.0	21.2	17	6 0 0	25.0	1 13 0 0	2700	1,263	11.6	9.0	15
45 cal.														
101.6 mm.	4.0	200.0	206.0	5.0	21.2	17	6 0 0	25.0	1 16 0 0	2900	1,359	12.3	9.5	15
50 cal.														
12 cm.	4.724	188.98	193.28	6.1	25.5	16	8 8 0	45.0	2 10 0 0	2494	1,940	13.3	10.3	12
40 cal.														
12 cm.	4.724	212.58	217.0	6.5	25.75	17	9 0 0	45.0	2 14 0 0	2600	2,109	14.1	10.9	12
45 cal.														
15.24 cm.	6.0	240.0	249.2	6.8	32.5	16	10 0 0	100.0	6 16 0 0	2550	4,437	18.6	14.4	8
40 cal.														
15.24 cm.	6.0	270.0	279.2	8.5	33.0	17	25 0 0	100.0	7 18 0 0	2775	6,340	21.1	16.4	8
45 cal.														
20.3 cm.	8.0	360.0	371.7	10.0	43.0	17	52 0 0	210.0	18 16 2 0	2750	11,012	26.0	20.2	6
45 cal.														
23.36 cm.	9.2	414.0	426.8	13.5	67.0	17	94 8 0	380.0	26 16 0 0	2750	19,927	34.3	26.6	4
45 cal.														
31.4 cm.	12.0	405.15	420.0	11.6	63.35	17	100 0 0	450.0	28 4 0 0	2380	20,811	32.3	25.0	4
42 cal.														
31.42 cm.	12.0	480.0	496.5	17.5	87.2	17	207 0 0	850.0	50 7 0 0	2750	44,828	45.9	35.5	4
40 cal.														

\* Now under construction.  
All these guns use smokeless powder.