MODERN BRITISH ORDNANCE.

BY WALDON FAWCETT.

It is generally admitted that of the convictions which have been brought home to the British military authorities by the conflict in South Africa, none has been impressed more forcefully than the necessity

12-POUNDER ARMY FIELD GUN.

for the infusion of a more liberal and more progressive policy in the ordnance department. The artillery branch of the army service has had to bear perhaps more than its share of the brunt of the Boer-Briton struggle, and the forces of the United Kingdom, if not actually outclassed by the equipment of heavy weapons in the possession of the Boers, have at least been brought to a realization that their sinews of war of this class are scarcely in keeping with the prestige of the military establishment with which they are connected.

If the British guns have ever been at fault in efficiency, however, certainly the artillery complement has not been lacking in variety of weapons. It is doubtful if any other force which engaged in operations of warfare during the century which has just closed brought into the field so many different classes of ordnance. An enumeration of other than the principal designs would prove burdensome. The Royal Field Artillery placed its chief reliance on the 15-pounder breech-loading gun of three inches caliber and a range of 4,000 yards with shrapnel. These guns are a trifle over seven feet in length and are rifled with eighteen grooves. Six guns make up a battery, and each with ammunition carriage and ammunition weighs in the neighborhood of two tons. The breech mechanism includes the De Bange pad for preventing the escape through the breech of a portion of the gases generated by the explosion. Shrapnel was used almost exclusively in the 15-pounders in service in South Africa, but case-shot was also used to some extent. Capable military critics have declared that the failure to furnish common shell to the 15 pounders was one of the serious mistakes of the South African campaign, inasmuch as the common shell not being restricted in usefulness by the burning time of a fuse would have increased the range of the guns to fully 6,500 yards.

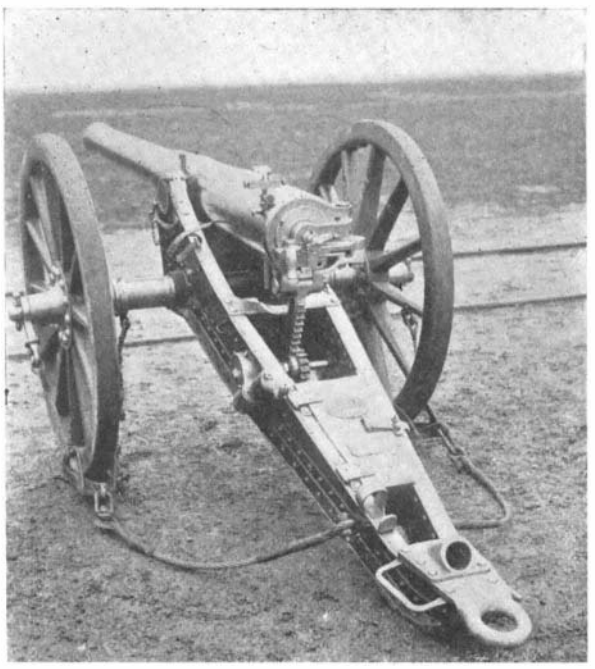
The work of the naval 4.7-inch guns which were unshipped from the "Terrible" and other British men-of-war and provided with ingenious field mountings in order that they might be used to reply to the 6-inch guns of Creusot manufacture within the Boer trenches has been fraught with much interest for students of military science. These naval guns are 16 feet in length, more than twice that of the 15-pounders previously mentioned, and are rifled in twenty-two grooves. These weapons are of the quick-firing type, being capable of discharging ten rounds per minute. They throw a shell weighing 45 pounds by the explosion of a charge of slightly more than 5 pounds of cordite. Telescopic range finders were used in the manipulation of these guns in the field, and they time and again demonstrated their ability to do effective work at 8,000 yards, the ranges frequently exceeding that distance and amounting in some instances to fully 14,000 yards.

In the operations against the Boers as in other conflicts the British authorities manifested great confidence in the howitzers which are also included in the equipment of the field artillery. This weapon is, of course, a short gun, of low velocity, and 5-inch bore. Shrapnel is used almost exclusively, the maximum charge being about 50 pounds. Fifty-pound lyddite shells can also be used in these guns with good results in the bombardment of trenches and fortifications at comparatively close range.

Owing to the character of the country in South Africa, the war against the republics there has afforded exceptional opportunities for a study of the possibilities of mountain guns. The chief arm in use by the British Horse Artillery is a 12-pounder weapon very similar in many respects to the 15-pounder of the field service. The maximum range is 4,000 yards. The approved type of British mountain gun is made in two parts, each of which may be carried on a single pack animal and can be screwed together at short notice. These destructive little weapons may be charged as circumstances may dictate with shrapnel, common or star shell.

Great Britain has not had occasion to use siege guns to any great extent in any of her military operations during recent years, although a few of the 6-inch breech-loading howitzers which are capable of throwing a 119-pound shell were shipped to South Africa at the outbreak of the war. A weapon which was introduced to some extent in the operations in the Transvaal is the 12-pounder quick-firer, which in general design is identical with some of the naval guns previously mentioned. These guns are thirteen feet in length, weigh considerably more than the 15-pounder in the field artillery and have a range of 10,000 yards with a 12-pound shell.

Whatever may be said of any other grade of ordnance of British manufacture, it must be admitted that the United Kingdom stands in the front rank of nations in the production of machine guns of automatic operation. This was convincingly demonstrated by the display of war material at the Paris Exposition. Such has been the development of the manufacture of weapons of this type within recent years that instead of the automatic principle being confined to guns of rifle caliber we now have 1, 3, 6 and 14-pounder auto-

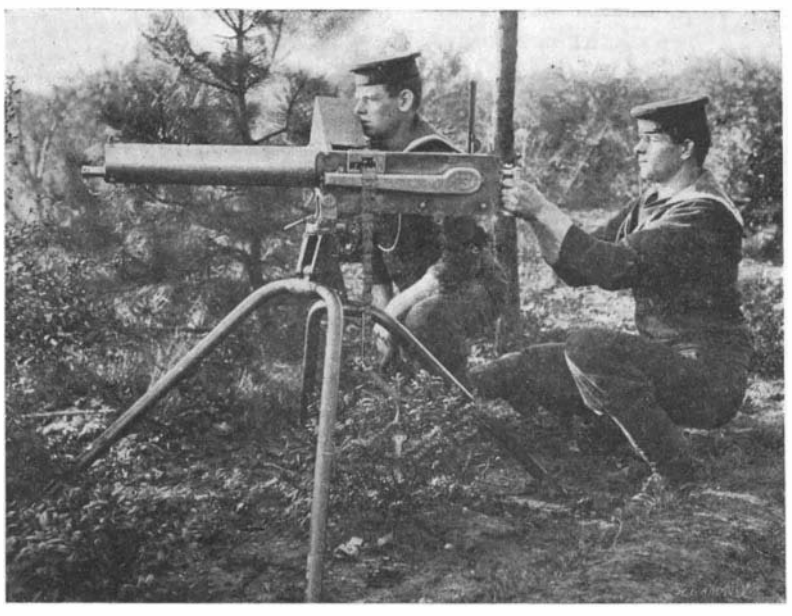


12-POUNDER NAVAL FIELD GUN.

matic fire:s, or Maxims, as they are still designated in some quarters. The 1-pounder, which became famous during the earlier days of the Boer war under the nickname "pom-pom," is capable of delivering three hundred rounds per minute; the 3-pounder, 35 shots; the 6-pounder, 50 rounds; while the 14-pound is capable of delivering 25 shells per minute. The velocity of the projectiles in the cases of these various weapons ranges from 1,800 to 2,500 feet per second, and their destructiveness has been immensely increased by the discovery of the practicability of charging the missiles with high explosives. These heavier rapid-firers are characterized by a similarity of automatic equipment. The breech block instead of being screwed into the breech works in a vertical plane, restricted by guides, and the motive force for the operation of the block is furnished by the recoil of the gun at its discharge. This is accomplished by the compression of a spring which pulls downward a lever connected with the bottom of the block, which in turn actuates a small clip which extracts the cartridge case. The only responsibility resting on the gunner is for the insertion of fresh charges and projectiles. In the "pom-poms," belts of projectiles are provided, and by an ingenious arrangement of levers the successive recoils are made to extract the empty cartridge cases, fix the new charge and fire the gun. In the case of this gun, as will be seen, the gunner's sole task is to train the gun and set the mechanism in operation.

The manufacture of munitions of war under governmental auspices is probably carried out on a more extensive scale in Great Britain than anywhere else on the globe. The ordnance factories employ, all told, close to 18,000 men; pay out in wages nearly $8,000,000 annually, and turn out more than $15,000,000 worth of work each twelvemonth. The Royal Gun Factory alone gives employment to 2,400 men whose work consists chiefly of guns of every caliber, and is estimated to represent an aggregate annual valuation of $2,250,000.

While admitting some of the faults cited against their ordnance, the British authorities have laid stress upon its superiority in the matter of mobility. The weight of the 4.7-inch gun, for instance, is when taken together with the carriage but slightly in excess of 5,000 pounds, while the field guns—14-pounders, 6-pounders, 3-pounders and 1-pounders — have respective weights of 2,350 pounds, 1,900 pounds, 1,750 pounds, and 1,150 pounds. The 12-inch gun turned out by the Vickers-Maxim firm has a muzzle energy of 39,843 foot-tons and the regular British naval gun of that caliber develops 33,020



LATEST PATTERN NAVAL MAXIM GUN.

SIX-INCH HOWITZER, FOR HIGH-ANGLE FIRE.

foot-tons muzzle energy, as against 30,750 foot-tons by the guns in the French navy and 25,985 foot-tons by the heavy ordnance on the American men-of-war.

MAKING LARGE PLASTER CASTS.

BY J. H. COLLINS.

In the making of monumental sculpture such as that used for the decoration of great exposition buildings or public edifices everything is done on a large scale. The sculptor has for his studio some lofty room with height enough to accommodate figures eighteen or twenty feet tall and space enough for barrels of clay and bins of plaster. He does his modeling from scaffolding and stepladders and thinks nothing of shaping a head half as high as himself or an arm as large around as his body.

The sculptor's first step however, is to fashion a miniature model out of a handful of clay. This is his rough sketch. It serves merely to embody, in a general way, the artist's conception and to present the mass and outline of the composition.

Next in the process comes the construction of a wooden skeleton, heavily made and able to sustain the weight of the clay that is to be laid upon it. For the joints of this skeleton some sculptors use an ingenious iron contrivance which permits change of attitude without loss of rigidity. Sculptor Bock, photographs of whose work illustrate the present article, is the inventor of an adjustable joint for this purpose. This wooden skeleton is adjusted to the desired attitude and braced upon a frame made of two uprights and a crossbar reaching about two-thirds the height of the figure. At this stage of the process everything is sacrificed to strength, as the weight of the clay to be sustained is great. The completed clay model of a single monumental figure sometimes weighs as much as ten tons.

To secure as much lightness as possible it is common to lay a foundation of excelsior and plaster about the wooden skeleton, roughly approaching in form the general outline of the figure. Over this is placed a thick coating of pure plaster indicating yet more clearly the main lines of the figure. This completes what may be termed the core of the model and upon it is laid the wet modeling clay, in huge and almost meaningless masses, to be shifted into form by the sculptor and his assistants.

In taking the plaster mold of the completed model, the first step is to coat the clay all over with soft soap. This prevents the plaster from sticking. Small strips of tin are then inserted upright into the clay, their purpose being to separate and outline the sections into which the mold is to be made. The number and size of these sections depend entirely upon the form of the figure. If the figure is a complicated one, the sections must be numerous and small accordingly. The mold of a simple, erect, draped figure like that in the illustration may be taken in comparatively few sections.

The arms of Mr. Bock's figure, for instance, were molded in two pieces, longitudinally. The head required several sections, while the straight, flowing drapery was made in a few large sections.

A layer of clay is now placed along the edges of the tin strips so that they may be easily located after the plaster has been applied.

Two coatings of plaster comprise the mold. The first is colored with yellow ocher and is applied all over the figure to the depth of about a quarter of an inch. The coloring is to warn the sculptor when the cast has been made and the mold is being chipped away. When his chisel lays bare the yellow plaster, the sculptor knows that the cast is close beneath. The rest of the mold is made of uncolored plaster, which is poured over the figure by the pailful, rapidly and with apparent recklessness. Just before the plaster sets it is braced with strips of wood which not only strengthen the mold, but also serve as handles by which the section of the mold may be removed.

When the plaster has set and before it becomes completely dry—for moist plaster is handled more easily than dry—the tin strips are located and the work of removing the mold in sections is begun. As a rule, the pieces come off easily. Occasionally some deeply-indented portion is removed with difficulty. The front and bottom piece over the drapery in the figure illustrated had to be pried off with a piece of 2 x 4 joist, and it took the combined strength of five men to start it. Even then it was broken at one corner and chipped at the edges. This, however, was easily repaired with a little clay.

When the several pieces of the mold have been removed they are thoroughly cleaned of any clay adhering to them with balls of clay and an application of soap and water.

The figure is cast in sections. The central figure of Mr. Bock's group was made in five castings, the two arms, the head, the torso, and the drapery from the waist down forming each a separate piece.

In making the castings, the mold is put together and a thin layer of plaster of fine quality is poured into it and splashed about until every crevice is filled to the thickness of a quarter of an inch or more. As this coating is to be the outside of the completed statue, it may be colored any shade desired. The rest of the cast is made of uncolored plaster mixed with strong hemp fiber. This composition, commonly known as "staff," is applied in successive layers as rapidly as possible until the cast has reached the desired thickness.

The mold is not removed from the cast in sections as from the clay model. Having now served its purpose it may be chopped away with hatchet and chisel, and destroyed. The sculptor and his assistants go about this with a vigor and carelessness which startle the casual spectator. But when the yellow plaster immediately incasing the cast is reached, greater care is exercised, and the final layer is chipped off inch by inch.

When the several parts of the figure have been cast, they are fitted together. Strips of fiber dipped in plaster are used to fasten them together, the strips being placed along the inside seams. On the outside

MODEL OF MR. BOCK'S STATUE OF "PEACE."

THE COMPLETED CLAY FIGURE.

INSERTING THE TIN STRIPS.

THE FIRST PLASTER CAST.

THE PLASTER JACKET.

TAKING OFF THE SECTIONS.