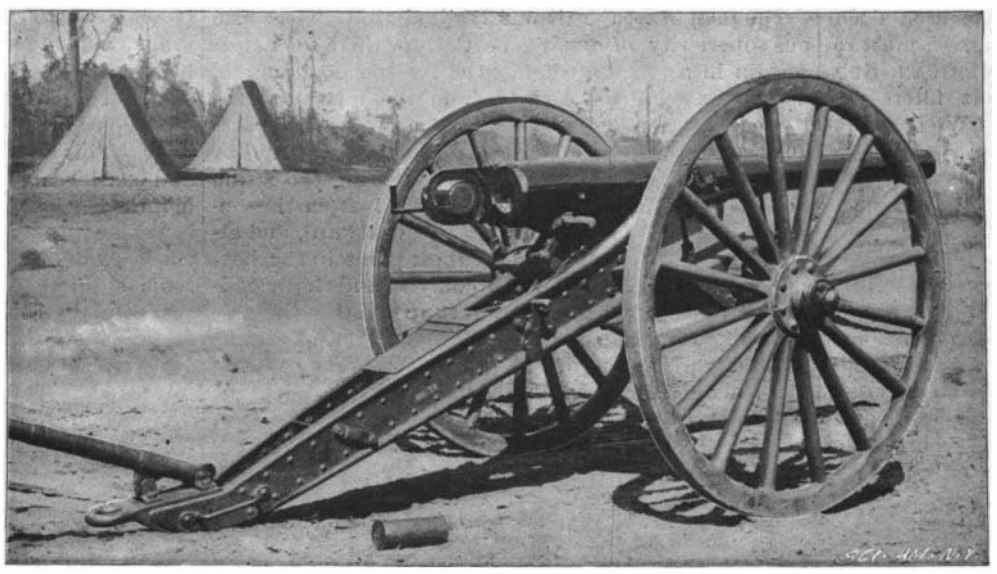
THE 3·2-INCH DRIGGS-SEABURY FIELD-GUN.

In the accompanying illustration we show a 3·2-inch field-gun with Driggs-Seabury improved breech-mechanism, mounted on a carriage designed by Colonel Buffington.

The 3·2-inch gun is a favorite field weapon, and is capable of great execution when firing shrapnel against bodies of troops. The gun weighs 805 pounds, is 7·31 feet long and has a bore 25·20 calibers in length. The shell weighs 13·5 pounds and the charge 3·5 pounds. The muzzle velocity is 1,685 feet per second, the muzzle energy 266 foot-tons, and the penetration through steel 3·8 inches. The breech-mechanism, which is shown swung back clear of the breech in the opened position, is of remarkable compactness and simplicity—two most important features in field artillery. Unlike the naval and coast defense guns, which are always within easy reach of a forge, if not of a machine shop, the field-guns usually go into action at a considerable distance from any extensive repair facilities, and their disablement will probably put them out of action indefinitely. It is of the highest importance that their parts should be few, simple, and easily repaired. The breech-mechanism of the gun under consideration is an improved form of the old Driggs-Seabury mechanism, and as may be seen from the cut, it is remarkably compact and free from complication.



3·2-INCH FIELD-GUN ON BUFFINGTON GUN-CARRIAGE.

Weight of shell, 13·5 pounds; powder, 3·5 pounds; muzzle velocity, 1,685 feet per second; muzzle energy, 266 foot-tons; penetration, 3·8 inches steel.

If the reader will refer to the SCIENTIFIC AMERICAN ARMY AND COAST DEFENCE SUPPLEMENT, he will notice in the chapter on rapid-fire guns that there are usually three distinct motions of the breech-block in opening the breech. It is first rotated to unlock the threads, then withdrawn onto a hinged carrier tray or ring, and finally swung clear of the breech to make way for the next operation of loading. The Driggs-Seabury breech-mechanism embodies an improvement which is designed to do away with the second movement, and reduce the operation to two, namely, the rotation of the block and its withdrawal on the hinged tray. In the old three-motion mechanism, it was necessary to withdraw the block onto the hinged tray on a line with the axis of the gun, because the circular path described by the tray prevented the block from being swung to the right or left directly from its seat in the breech-box. In the new type the breech-box is curved to the circle described by the block, and the withdrawal of the block on the axial line of the gun is thereby rendered unnecessary.

The opening and closing lever is hinged at the center of the carrier-plate. The first movement of the lever rotates the block, the rear end of which is threaded into a ring in the carrier-plate. The rotation is accomplished by means of a short lever which is formed at the inner end of the opening lever, where it is hinged to the carrier-plate. The short lever has a ball and socket engagement with the outer end of the breech-block, and as the opening lever is swung across the breech, the breech-block is given one-sixth of a turn. The further motion of the lever causes the breech-block and tray to swing clear of the breech into the position shown in our cut.

The Buffington carriage is constructed of plate steel. To stiffen the axle, it is inclosed between two plates of steel, which are firmly riveted together. The width of the plates is so placed that they take the bending strain of the recoil which would otherwise come upon the axle. The flasks are formed of sheet steel riveted together, and they are so placed as to give great lateral and vertical stiffness to the carriage. The elevation of the gun is accomplished by means of a set of jointed levers known as "lazy tongs," which will be noticed beneath the breech of the gun. The "trail hand-spike," by which the gun is traversed, will be noticed inserted in the trail-piece of the stock where the carriage rests on the ground.

When it is not in use the hand-spike is folded forward against the trail and held in place by a catch. Two gunners can be seated on the axle. Two hundred of these guns are now under construction for the government.

A GROUP OF NAVY PROJECTILES.

The projectiles in use by our navy may be classed as solid shot, shell, and shrapnel. Although some excellent solid shot is still manufactured, such as the Johnson fluid compressed shot, a description of which is given in our COAST DEFENCE SUPPLEMENT, solid shot have given place to shell as the standard projectiles of the navy.

Shell is formed with an interior cavity of considerable dimensions, in which is placed a charge of powder or high explosive. It is provided with a fuse for the ignition of the charge, which is of the percussion or time-fuse type. The former acts at the instant of striking; the latter is set to explode the shell a certain length of time after the shell has left the muzzle of the gun.

Shrapnel is the modern form of the old case shot, which consisted of a large number of balls put up in a case, or envelope, which merely served to hold them together until they left the muzzle of the gun. In the case of shrapnel the envelope is made sufficiently strong to bear the shock of discharge, and a time-fuse is provided.

The best armor-piercing projectiles are now made of chrome steel, the small admixture of chromium serving to impart to the steel a remarkable amount of toughness. The projectiles are cast, forged, and carefully annealed and tempered, the hardening being confined to the point or nose. The latter is ogival in form, the point being struck with a radius which is two or three times the diameter of the shell. The point has to be sharply pointed to insure its penetration of the hard face of the armor; but if it is made too fine, it will lack the necessary resisting power and will be fractured before it can get through. The best proportion of radius is found to lie between two and three times the diameter.

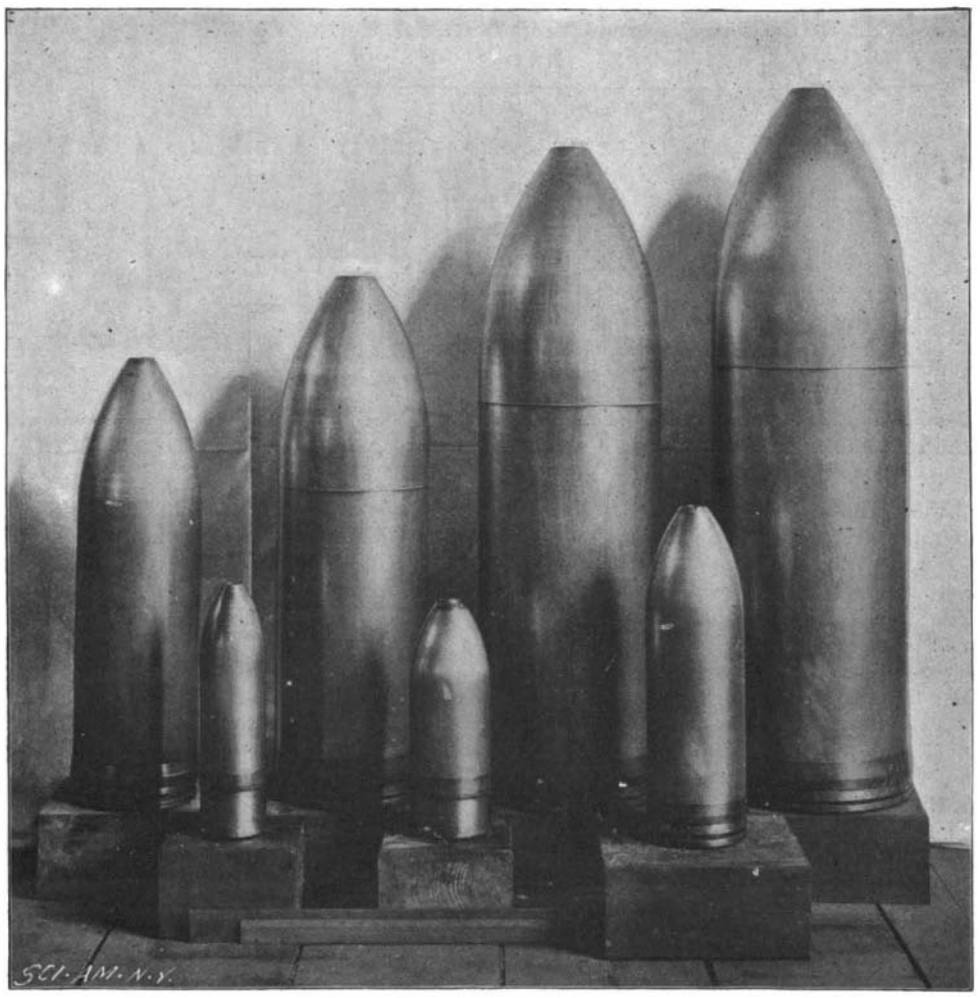
There are two kinds of armor-piercing projectiles: The first is made solid, or practically so, a small core being formed to give the best results in the forging process; the other type is known as semi-armor-piercing. It is formed hollow with a core of moderate dimensions, large enough to hold an explosive charge that will insure the bursting of the thick walls of the projectile. It is made of chrome steel, and requires in its manufacture to be treated with great care to secure the combined hardness and toughness to enable it to pierce solid armor without fracturing and carry its explosive charge intact into the interior of the ship. When such shell is filled with common powder, the heat engendered by passing through the armor is depended on to explode the shell just within the ship; no fuse is used.

The object at which projectile makers are aiming just now is to make a shell which can carry a charge through the best armor and burst on the inner side of the armor. It is already possible to put solid shot through plate that is as much as one and one-half the diameter of the shot in thickness, and the success of the projectile makers is such as to make it likely that before long a bursting shell can be made to perform the same feat. The Wheeler-Sterling shells are steadily improving in quality, and give promise of equaling the penetration of solid projectiles without breaking up.

It will be evident that penetration of the armor belt by a shell will be vastly more destructive to the ship than penetration by solid shot. The damage wrought by the latter will be confined to its direct path, whereas the zone of destruction of a shell will be almost as extensive, if it is of the larger calibers, as the whole area of the deck on which it strikes. The effects, moreover, will be greatly augmented if a high-explosive bursting charge be substituted for common powder, although the sensitiveness of such charges renders it very difficult to carry them through armor plate and burst them on the inside. Excellent results, however, have been achieved in this direction against armor of moderate thickness.

The group of shells shown in our engraving includes one of each of the sizes used on our warships, from the 4-inch 33-pound shell up to the 13-inch 1,100-pound shell of our largest guns. They are all of the class known as "common shell," and are used against fortifications and earthworks and against the unarmored or lightly armored portions of warships. They are usually formed of cast iron, though sometimes of cast steel, and the interior cavity is large, enabling a big bursting charge to be carried. Unlike the forged chrome steel shell, they are unfit for armor-piercing, not having the necessary strength to carry them through the plates.

The particulars of these shells are given in the following table:



8-inch 10-inch 12-inch 13-inch
4-inch 5-inch 6-inch

GROUP OF COMMON SHELL AT THE WASHINGTON NAVY YARD.

Diameter.	Length.	Bursting Charge.
4-inch	1 foot 4 inches.	2 pounds.
5 "	1 " 3 "	3 "
6 "	1 " 9 "	4 "
8 "	2 " 6 "	10 "
10 "	3 " 0 "	22 "
12 "	3 " 8 "	42 "
13 "	4 " 0 "	70 "

It will be noticed that the point of the shell is cut off. It is here that the percussion fuse is inserted. The fuse consists of a hollow threaded brass case, which is screwed into a hole bored through into the interior of the shell. Inside the case is a cylindrical lead plunger, in the center of which is a fulminate and a priming charge. When the gun is fired, the plunger