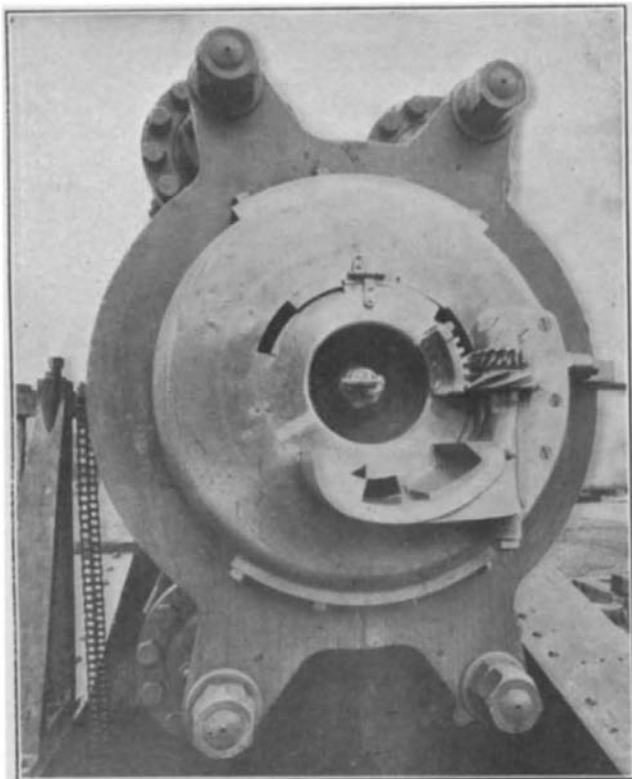


seconds and 17 tons pressure; while with a 50-pound projectile and a chamber pressure of 16.4 tons, the remarkable velocity of 3,380 foot-seconds was obtained. This is the piece that will form the main armament of the cruisers of the "Denver" class.

GUN-MOUNTS AND BREECH MECHANISMS.

The increased rate of fire of the new guns is chiefly due to the improved gun-mounts and breech mechanism.

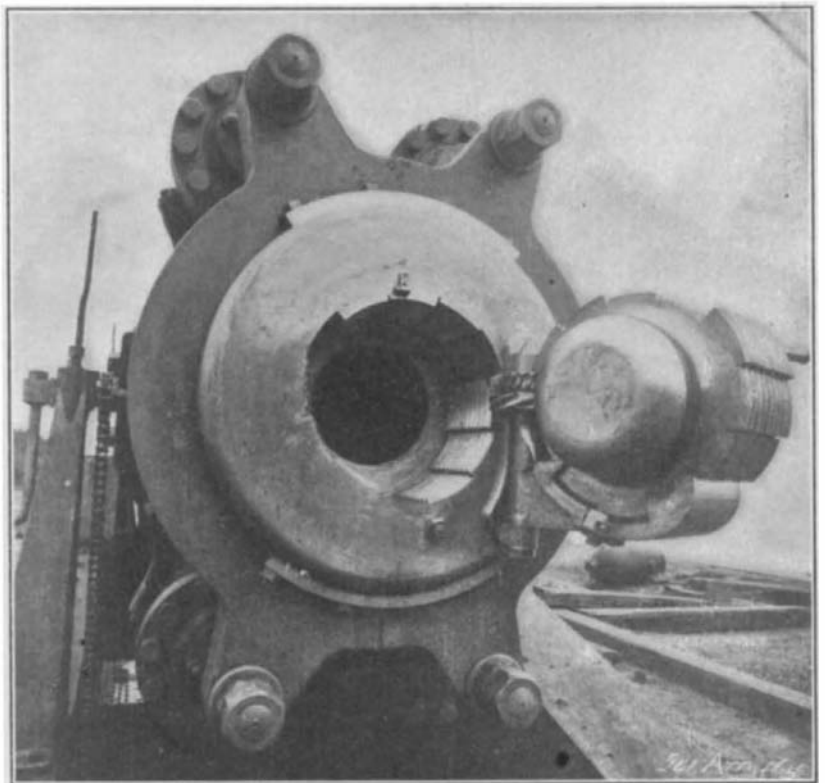


Breech of New 12-Inch Rifle Closed.

with a crank, as the plug is too heavy and the swing is too great for opening with a lever. The time consumed in opening and closing the breech, however, is but a minute fraction of that required for the service of the gun; it is loading and pointing that take the most time.

In the case of the 12-inch guns, the continued movement of the crank first rotates or unlocks the plug, which is followed by its withdrawal and the swinging round of the plug. It takes about $7\frac{1}{2}$ turns of the crank to open or close the breech of a 12-inch gun, which can easily be performed in less than 5 seconds. The 8-inch gun breech is practically the same, but being lighter, can be handled more quickly.

The recoil of the 12-inch gun is taken up by four hydraulic cylinders placed symmetrically around the gun, but attached to the sleeve or non-recoiling part. A yoke on the rear end of the gun serves as an attachment for the piston rods, which work in the recoil cylinders, and recoil is checked by the escape from the pressure to the reverse side of the piston of the liquid contained in the cylinders. The escape orifices for the fluid are grooves cut in the walls of the cylinders, which are wide enough to give a full opening at the beginning of recoil, gradually contracting in area until the proper limit of recoil is reached, when the grooves come to a point and thus cut



Breech of 12-Inch Rifle Open.

isms. In the first place, all guns recoil in a sleeve which carries the trunnions. Upon this sleeve are mounted the telescopic sights, and the man who traverses and elevates the gun, in the case of the large rapid-fire pieces, stands on a platform which is supported from this sleeve. He is thus able to keep the gun steadily upon the target, and is not affected by the recoil. His position, with his hands upon the traversing and elevat-

off any further flow of liquid. The recoil of the 12-inch guns for the "Maine" and class and for the monitors is 33 inches. Inside each recoil cylinder is a series of heavy triple-spiral springs (about one ton in weight), which are put in the cylinders under an initial tension sufficient to prevent the gun from moving when the ship rolls, or when the gun is elevated to its maximum limit. When recoil takes place these springs are fur-

of the new guns above 4 inches in caliber uses the brass cartridge case, but the powder is put up in bags. The guns of and above 7 inches in caliber have the charge in two sections, as one section would be too heavy and too large to handle conveniently. In turret guns of large caliber the elevating, training, hoisting ammunition, and loading are all done by machinery operated by electric power. Guns of and below 7 inches in caliber are handworked. They are mounted on pedestal mounts, turn on ball bearings, and are balanced in their sleeves. Hence they can be elevated or depressed with great ease. In the case of the 6 and 7-inch guns, the gun-pointer stands on a platform attached to and turning with the gun. All guns above 3 inches in caliber are fitted with telescopic sights, also with open day and night sights and with electric and percussion firing gear.

It may be well to add a word of explanation, just here, on the question of rapidity of fire. The rates of fire given in the accompanying comparison of the "Oregon" and the "Georgia" will, doubtless, appear to some of our readers to be very low; but they must remember that these are *practicable* and not *ideal* rates of fire. Lieut. Meigs, ordnance officer of the Bethlehem Steel Works, in his recent address before the Society of Naval Architects in New York, quoted approvingly a record recently made by an English ship of 8 shots from a 6-inch gun in one minute, all of which struck a target 15 feet high, at a range of 1,500 yards. Here, the conditions were doubtless ideal, the ammunition being

probably piled ready close at hand. The 3.5 rounds per minute, given in the table, represents actual conditions, in which the ammunition is being brought, round by round, from the magazines, and all the death and destruction of a sea-fight is present. Even 3.5 rounds per minute could be maintained for a few minutes only, since the heating up of the gun, alone, would necessitate a rest.

COMPARISON OF TOTAL ENERGY OF FIRE IN FIVE MINUTES OF BATTLESHIPS OREGON (IN 1898) AND GEORGIA

OREGON IN 1898.				GEORGIA.			
Gun.	Muzzle Energy of Gun.	*Rate of Fire per Minute.	Muzzle Energy in Five Minutes.	Gun.	Muzzle Energy of Gun.	*Rate of Fire per Minute.	Muzzle Energy in Five Minutes.
4 13-inch.	33,627 foot-tons	0.4	239,016 foot-tons	4 12-inch.	46,246 foot-tons	0.66	610,447 foot-tons
8 8-inch.	8,011 "	1.0	320,440 "	8 8-inch.	13,602 "	1.2	652,896 "
4 6-inch.	2,990 "	2.0	119,600 "	12 6-inch.	5,838 "	3.5	1,225,980 "
20 6-pounders.	128 "	8.0	110,400 "	12 3-inch.	709 "	6.5	276,510 "
Total energy all guns in five minutes....			819,456 "	Total energy all guns in five minutes...			2,765,833 "

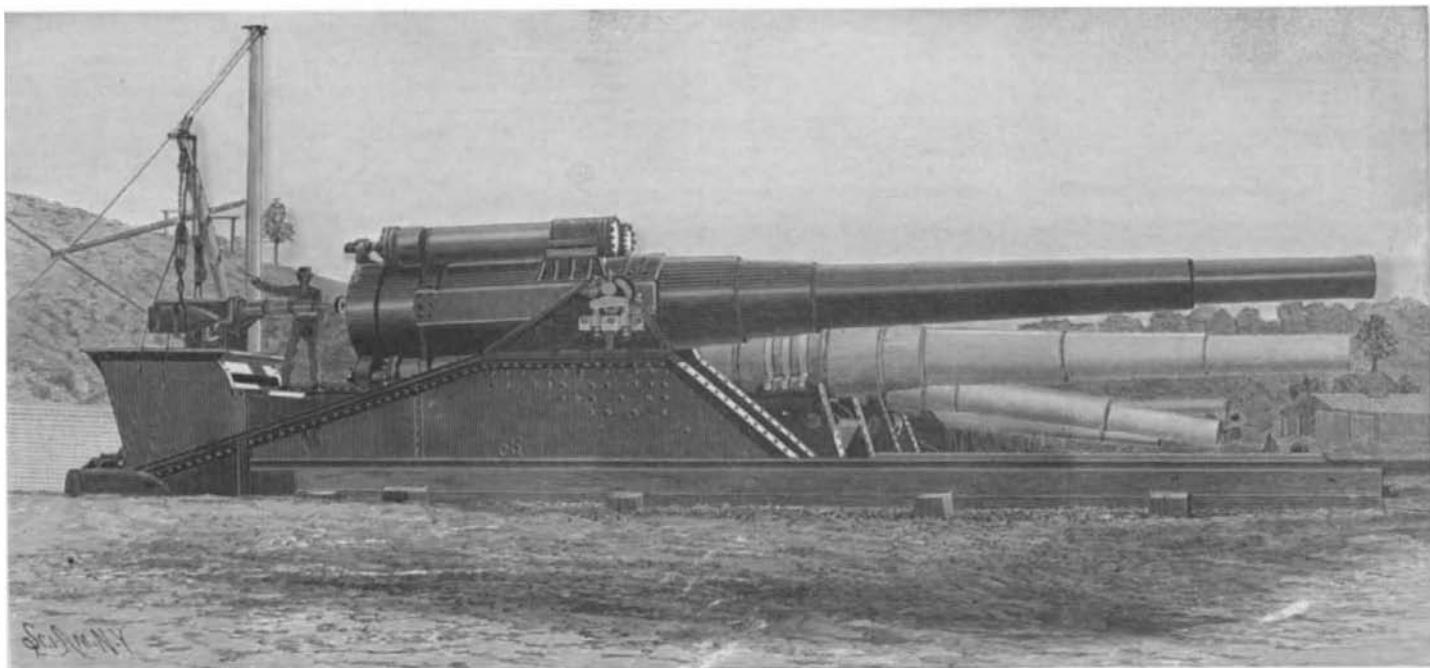
*This is the *practicable* number of *carefully aimed* shots that could be fired per minute for a few minutes, as given by Rear-Admiral O'Neil, Chief of the Bureau of Ordnance.

ing handwheels and his eye at the telescopic sights, is shown clearly in the photograph of the 6-inch gun. All guns from 3-inch up are fitted with the "Welin" patent breech-plug, the rights for which were purchased for several hundred thousand dollars from the Vickers-Maxim firm. The thread is cut in steps of varying radius—a device which reduces the amount of cutting away of the thread and also the depth of the plug and the distance it must travel before it is fully inserted.

The 7-inch and all calibers below open the breech with a horizontal lever. One sweep of the lever unlocks the thread, withdraws the plug, and swings it clear of the breech, as shown in the illustration.

The 8-inch rifle and all calibers above this open

ther compressed, and they exert sufficient force to return the gun to the firing position as soon as recoil ceases. As the force exerted by these springs is great enough to return the gun to battery at extreme elevation, it follows that they have an excess of power to return the gun at level, and hence it would run out with great violence, probably injuring the mount, were it



Maximum Muzzle Velocity, on trial, 2854 foot-seconds. Muzzle Energy, 47,994 foot-tons. Foot-Tons Energy per Ton Weight of Gun, 893. Chamber Pressure, 16.5 tons per square inch.

NEW NAVAL 12-INCH. 40-CALIBER GUN.