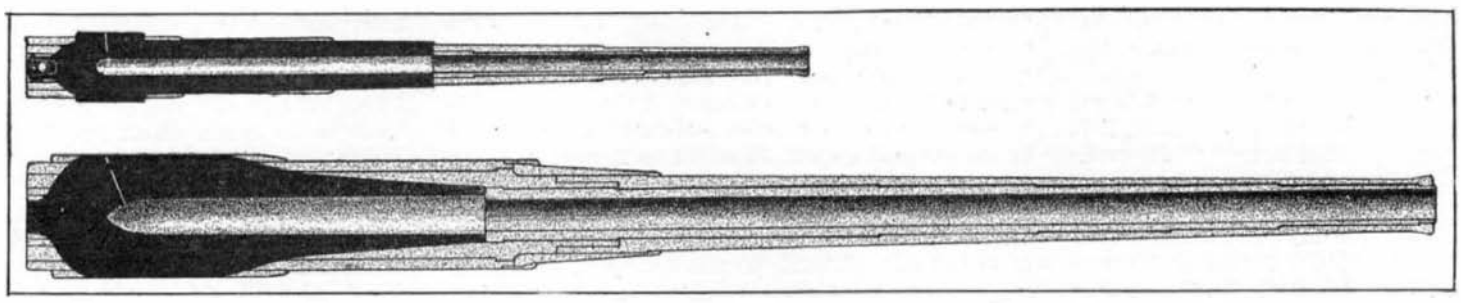
OUR NAVAL GUNS IN THE CIVIL WAR AND TO-DAY.

Naval ordnance has made greater strides in the forty years that have intervened since the civil war than in several centuries preceding. As proof of this it is enough to look at the striking comparison shown in the accompanying cut. The smaller illustration represents a Parrott 100-pounder of 1862, superimposed upon a modern 100-pounder, or to be correct, a 6-inch 50-caliber, rapid-fire rifle, of the year 1902; the lower diagram represents a 15-inch smooth bore of the civil war superimposed upon a 12-inch breech-loading 45-caliber rifle of to-day. The comparison might be carried out at greater length throughout all the various calibers that constitute the batteries of naval ships, but it is sufficient to compare the main battery of the "Monitor" with the main battery of the modern battleship, and what might be called the secondary battery of the frigates of 1862 with the standard secondary battery gun of the battleship of to-day.



The Parrott 100-Pound Rifle and the 15-Inch Smooth-bore (Period of Civil War) Compared with the 50-Caliber 6-Inch and the 45-Caliber 12-Inch Rifles of 1902. Civil War Guns in Black.

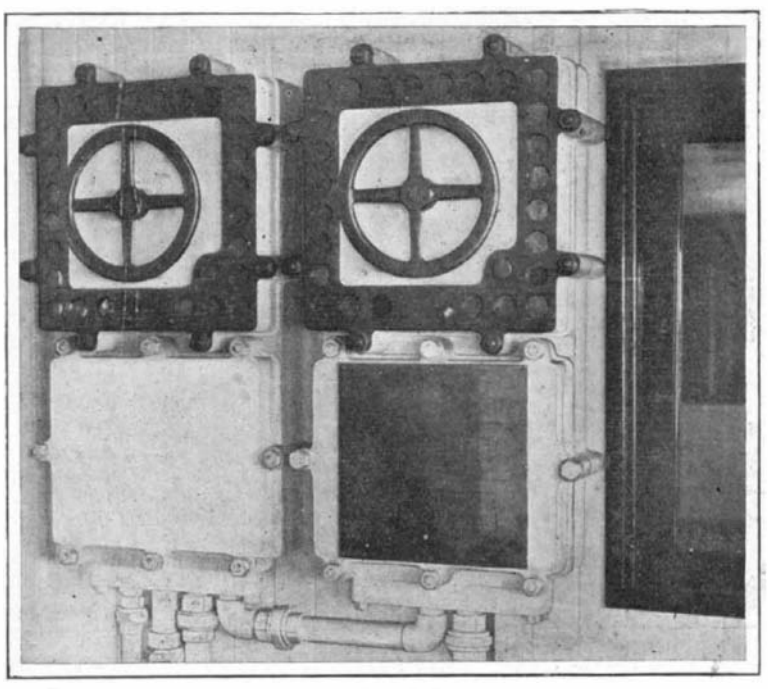
OUR NAVAL GUNS IN THE CIVIL WAR AND TO-DAY.

The heaviest piece carried in the civil war was the 15-inch smooth bore. This gun weighed 42,000 pounds; its length over all was 15 feet 1 inch; its maximum diameter at the breech was 4 feet, and with an ordinary charge of 35 pounds of black cannon powder, it fired a spherical shell weighing 350 pounds. According to the ordnance regulations, under extraordinary conditions, these guns might be fired 20 rounds "at ironclads at close quarters," using 100 pounds of hexagonal or cubical powder and a solid shot weighing 450 pounds. Under these conditions the respectable muzzle velocity of 1,600 foot-seconds was obtained, with a corresponding muzzle energy of 7,997 foot-tons. It would be interesting to know what the powder pressure was under these conditions, for the velocity and energy are something truly remarkable for a cast-iron gun. It is little wonder that only 20 rounds were allowed under the severe stresses imposed by these ballistics.

Now, compare these results with the most powerful gun in our navy to-day, namely, the 12-inch, 45-caliber rifle, which weighs 53.4 tons, has a total length of 45 feet, and with a charge of 360 pounds of smokeless powder fires an 850-pound shell with a muzzle velocity of 2,800 foot-seconds, and a muzzle energy of 46,246 foot tons. The true basis of comparison of the relative efficiencies of the two guns is the amount of energy developed per ton of the weight of the gun, and on this basis we find that the old 15-inch, smooth-bore gun when fired with 100 pounds of powder, developed 427 foot-tons of energy per ton of gun, as against 872 foot-tons of energy per ton developed by the modern 12-inch gun.

If we take account of the durability of a gun the advantage will be strongly on the side of the modern piece, for whereas the 15-inch smoothb-bore was limited to twenty rounds under the given conditions, the modern 12-inch rifles, judging from the small amount of erosion developed with nitro-cellulose powders, should have a useful life of at least half a thousand rounds. Moreover, it must be remembered that the modern elongated shell will hold its velocity much longer than the old spherical shell of the smooth-bore, and, consequently, the respective muzzle velocities and energies are not an exact criterion of efficiency.

The gun of 1862 that answers to the modern secondary battery, 6-inch rifle, is the Parrott muzzle-loading rifle, a cast-iron gun which was strengthened at the breech over the powder chamber by shrinking thereon an iron hoop. The bore of the gun was 6.4 inches. It weighed 4.35 tons, was 12 feet 4 inches in length and with a charge of 10 pounds of powder it fired a 100-pound shell with an initial velocity of 1,080 foot-seconds and a muzzle energy of 810 foot-tons. Compare this with the modern 6-inch rifle, which weighs 8.5 tons, is 25 feet in length, and with a charge of 40 pounds of smokeless powder fires a 100-pound shell with an initial velocity of 2,900 feet per second and an initial energy of 5,838 foot-tons. Compared on the basis of energy per ton of gun, we find that the 100-pounder Parrott muzzle loader developed 186 foot-tons of energy per ton of gun, whereas the modern 6-inch breech-loading rifle develops 784½ foot-tons of energy per ton of gun.



Emergency Station in the Pilot House.

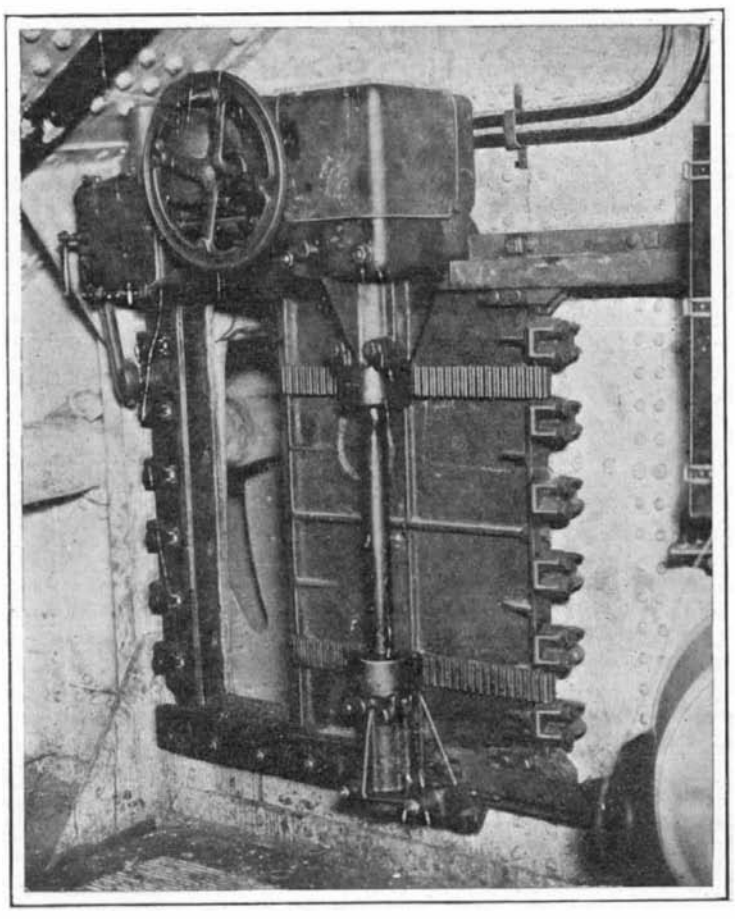
ELECTRICAL CONTROL OF BULKHEAD DOORS ON WARSHIPS.

Electricity has now finally supplanted hydraulic and pneumatic pressure in the control of bulkhead doors and armored hatches on the ships of the American navy. The armored cruiser "Colorado" just completed, is the first vessel in any navy to be equipped with a full complement of water-tight doors, electrically controlled. The new system is entirely an American development, although it is understood that the admiralty offices of several foreign nations are interesting themselves in it.

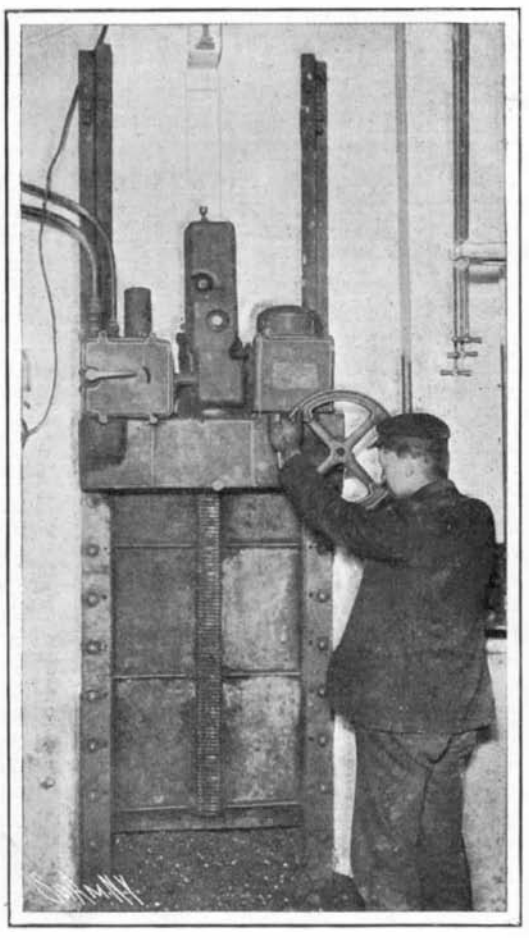
The installation on the "Colorado" was in accordance with Navy Department specifications stipulating that "each such door or hatch must be capable of permitting operation on the spot by power or by hand from either side of the bulkhead or deck, and all such doors are to be capable of being closed by power, simultaneously, from the emergency station. During any period of simultaneous or emergency closing full control must be maintained for opening any individual door on the spot, either by power or by hand, from either side of the bulkhead, and after any individual opening the emergency closing must repeat itself automatically. Approved means must be adopted to indicate continuously at the emergency station, during every emergency period when each door is shut and locked."

These requirements were based on a long series of experiments with hydraulically-controlled doors on the cruiser "Chicago" and pneumatically-controlled doors on the battleships "Maine" and "Missouri," as well as several other cruisers. It was found that the older methods of control were vitally deficient in their failure adequately to provide for local control or to prevent doors from closing suddenly and without warning. This defect tended to create hostility toward the apparatus on the part of the man whose duties might require him to pass through the door or who might become imprisoned in a compartment in case of accident. The pneumatic and hydraulic doors also leaked and were an unending source of annoyance aboard the ship. Having ever in mind, however, the lessons taught by the sinking of the British man-of-war "Victoria" (whose doors were open at the critical moment), the Navy Department has encouraged the development of a door which would effectually safeguard the man and equally effectually insure the safety of the ship.

The present system consists of a central emergency station connected with the controller on each door and hatch gear by one twin conductor. The working parts of the emergency station are located in a water-tight brass case which is installed on the wall of the pilot house, the bridge, or in some other place convenient to the officer of the deck. The essential parts of the station are: (1) the mechanism for controlling the circuits running to each door or hatch



A Horizontally Closing Door, Showing the Motor, Rack, Hand Controller and Hand Gear.



Closing a Vertically-Operating Bunker Door by Hand Gear.

ELECTRICAL CONTROL OF BULKHEAD DOORS ON WARSHIPS.