

**THE WASHINGTON, D. C., NAVY YARD.**

On the 25th of February, 1799, the United States Congress appropriated \$1,000,000 for the building of six ships of war of the largest size. The Navy Department having in mind the creation of a permanent navy bought, in the latter part of the same year, ground for six navy yards—at Portsmouth, N. H., Boston, Mass., New York, N. Y., Philadelphia, Pa., Washington, D. C., and Norfolk, Va. The Washington yard is situated on the banks of the Eastern Branch of the Potomac River. It is now principally devoted to the manufacture of ordnance. Only one ship was ever built in it, and no ships as a rule lie at its wharves and bulkheads. The buildings were destroyed by fire on August 22, 1814, on the approach of the British, under General Ross. Two years later they were rebuilt and the yard once more was in running order.

During the Civil War, ships were repaired and refitted in the yard, and ordnance and ordnance stores were dealt with. By order of Secretary Whitney, dated April 14, 1886, the yard was transferred to the care of the Bureau of Ordnance. It now has a \$2,000,000 plant for manufacturing ordnance. The gun shop is considered the best equipped in this country, and perhaps in the world.

The yard is entered through an archway which passes through the marine barracks. This body of naval troops, whose merits, discipline and services have so often been acknowledged and commented on, have one of their principal stations here. The first illustration shows their barracks as seen from within the yard. The wide avenue, like the rest of the thoroughfares in the yard, named after a distinguished naval officer, runs right through the yard almost to the river's edge, terminating at the commandant's office. In the cut at the lower left hand corner of the first page of this issue, the commandant's office is seen in the distance at the extreme end of Dahlgren Avenue. More than thirty naval officers have successively been in command of the Washington Navy Yard. Rear Admiral Norton is now in charge, an officer of forty-seven years' service, who entered Annapolis in 1851.

A squad of the marines drilling forms the subject of one of the cuts. Great attention is being given to the arming of the corps. The most improved small caliber low trajectory rifle has been selected by the department for this service.

Recurring to the first cut, a flag staff is seen rising in the center of the line of Dahlgren Avenue. The same flag staff is seen in the other view of the same avenue. Near its base hangs the well known yard bell. On this are sounded at half-hour intervals the ship's bells, one bell to eight bells, in regular nautical fashion, for the twenty-four hours of each day. The bell is one of the minor though interesting features of the yard.

As the visitor passes down Dahlgren Avenue he has the gun shops on his right, a small wooden stairway taking the visitor into the building. We have recently described in some detail the process adopted for manufacturing guns, and have given, in former issues, several views taken in the gun shop.

The gun shops are in charge of Commander Edwin C. Pendleton, whose portrait will be found on the front page. He entered the service on October 10, 1863, received his commission as commander March 21, 1897, and was assigned to duty as superintendent of the gun shop on May 31, 1897. He is an important factor in the present war, so much of his work having been devoted to the finishing of guns now in place on the ships in service in the present war.

On this page we also give a view of the ammunition stores, in which are stowed away the powder, projectiles and cartridge cases for the guns. On the lower floor are seen 6-inch, 8-inch and 10-inch shells, the larger

ones in the background. At the present day solid projectiles are not generally used for heavy ordnance.

The utmost refinements in design, manufacture and composition of the steel are applied in the making of shells. A single armor-piercing shell for the 13-inch gun costs nearly \$600.

On the upper floor of the ordnance storage building are seen a number of rectangular boxes. Each of these contains ten cartridge cases for 4-inch and 5-inch guns. The cylindrical boxes standing on the floor are powder cases, such as used for large guns. They are made of copper with waterproof lids and joints. The brown powder used in heavy guns is put into sacks, a couple of which are shown by the side of the cylindrical tanks. After they are filled the sacks of powder are kept in the tanks.

The 13-inch gun is the largest size made for naval use. Such a piece weighs 137,000 pounds and lacks one inch of being forty feet long. It discharges a projectile weighing 1,100 pounds, and its charge of brown powder weighs 550 pounds. Such a shell will penetrate nearly two feet of steel at a distance of one mile from the gun.

The extreme ranges of guns are estimated on a rough basis of one mile to each inch of diameter. Thus the 13-inch gun is credited with a range of thirteen miles. These extreme ranges are not likely to be used in practice, so the statement of their length is rather in the nature of a concession to popular interest.

kept stationary in a stream of flowing water and the stress determined. To observe the action on the water of the passage of the vessel, threads held at one end and immersed in the water near the model take a position coincident with the direction of the currents due to the motion of the model, and show the deflection of the water. The threads act like long flags or streamers in a breeze.

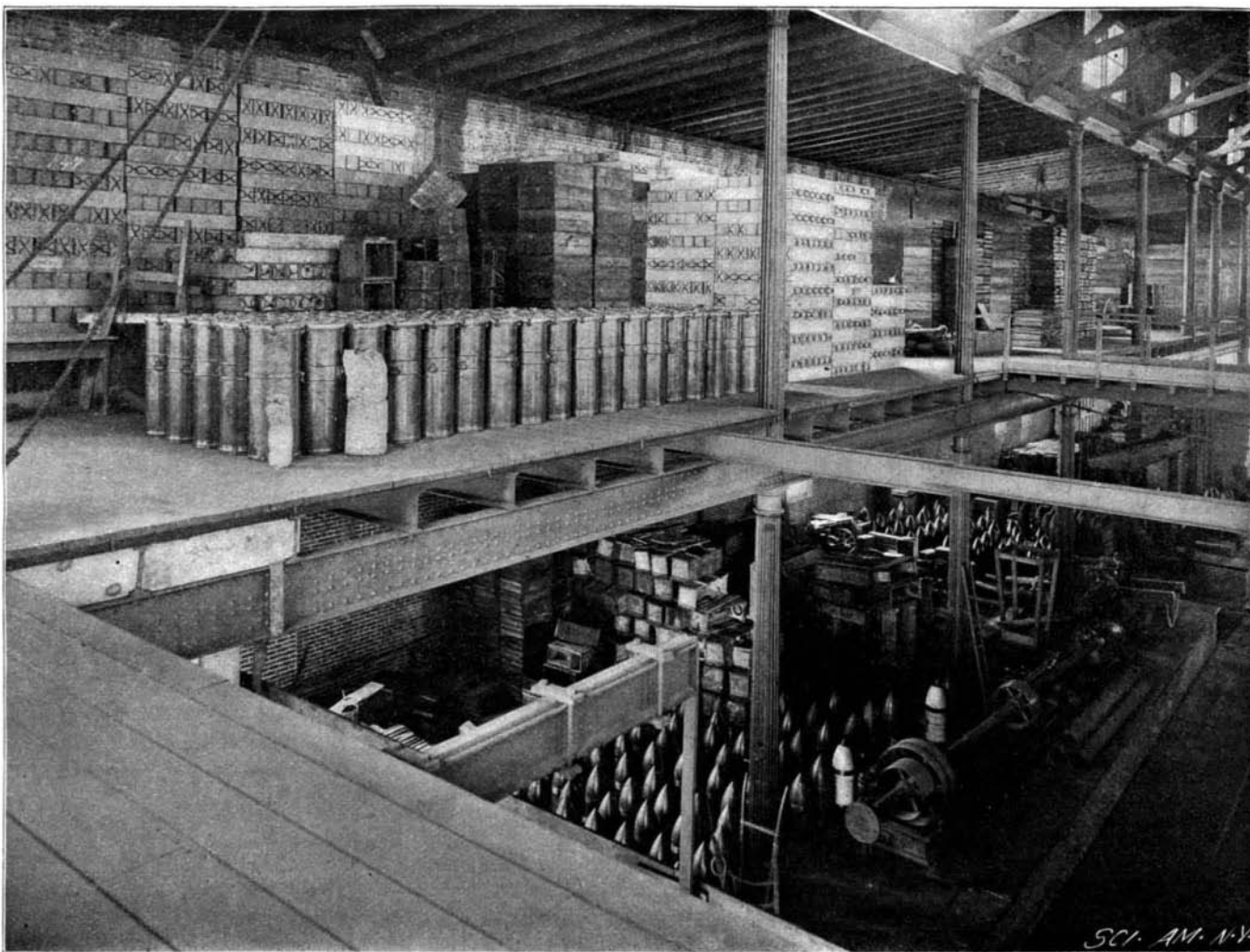
The models have been variously made. Paraffin wax has been one of the favorite materials. It can be cast of the desired shape and can be modified by cutting down or building up until the best shape is experimentally determined.

The establishment of a model testing tank is under the charge of the Bureau of Construction; it indicates a return to a certain extent to the original functions of the yard.

The illustration shows in the foreground the end of the tank from which the models are to be started. The tank is built of concrete and is 470 feet long. The water is to be spanned by a moving bridge running on a railroad the length of the tank. The models will be towed through the water from the bridge, the towing mechanism being operated by electricity. Dynamometers will indicate the pull required to draw the models along at speeds accurately regulated and measured by the apparatus. A building 500 feet long and 50 feet wide is to cover the tank. Perfect quiescence of air and water are thus to be insured. From

data ascertained with models, perhaps 15 or 20 feet long, operated at slow speed, data for full sized high speed vessels may be deduced.

The tank has to have a relatively large depth and width to prevent the waves generated by the motion of the models from interfering with the results. An actual ship generates waves under all conditions of motion and depth of water, but their effect on her progress is greatly dependent on the body of water in which she moves. In shallow water the waves are modified by the bottom and the vessel goes slower. In a high speed ship of large size, very deep water is required to enable her to develop her full speed. The relatively slow speed of the models in the



ORDNANCE STORES—WASHINGTON D. C. NAVY YARD.

The cylindrical powder tanks shown in the cut are for 10-inch gun charges, and are of special interest as being identical with those on the "Maine." Two hundred and fifty lb. of powder is required for a charge for the 10-inch gun, and the 500 lb. projectile is capable of piercing about 16 inches of steel at a distance of a mile. This is the type of gun which was on the "Maine."

In old times when guns were abandoned they were rendered useless either by driving a file or hard steel plug into the vent, or by inserting a plug far down into the bore. This plug was so constructed as to jam itself more firmly with every attempt to withdraw it. On abandoning guns of the present type, they can be dismantled by carrying off the breech mechanism. This it is reported was done in the case of the "Maine."

The lower right hand cut shows the experimental model tank. In spite of all the refinements of modern mathematics, the designing of ship models is far from being an exact science. The abandonment of old theories with regard to the preponderating influence of certain factors in the production of fast models and the acceptance of the theory of skin-friction have undoubtedly simplified the problem. But after all it remains to a considerable extent a matter of trial. The results of a specified model cannot be predicted with certainty—the model has to be tried.

Already very extensive trials of shapes of vessels have been made in various countries by the use of small models. These may be towed through still water and the force required to propel them may be determined by a dynamometer, or the models may be

model tank will eliminate this influence, as the wave factor will be diminished in relative importance by the slow motion.

The tank was designed by Naval Constructor D. W. Taylor, who is superintendent of its construction also. It will supply data much needed in the present time, when high speed is so important a quality in ships of war.

#### To Watch Plants Grow.

To observe plants growing under the microscope, The American Monthly Microscopical Journal says: "Procure a little collomia seed. Take one of the seeds and with a razor cut off a very tiny slice, place it on a slide, cover with a cover glass and place under the microscope. The instrument must be in a vertical position. When it is well focused and lighted, moisten it with a drop of water. The seed will absorb the moisture and throw out a very large number of spiral fibers, giving the appearance of veritable germination. Beginners will find it easier if one applies the moisture while the other looks through the instrument."

A CURIOUS accident was reported from Dayton, O., recently, in which water caused a fire. The Craig-Reynolds shops in North Dayton were flooded with ten feet of water, which reached some packages of carbide of calcium. This formed acetylene gas, causing several explosions and a fierce blaze. The fire department had to fight the flames from boats. The damage was \$10,000.

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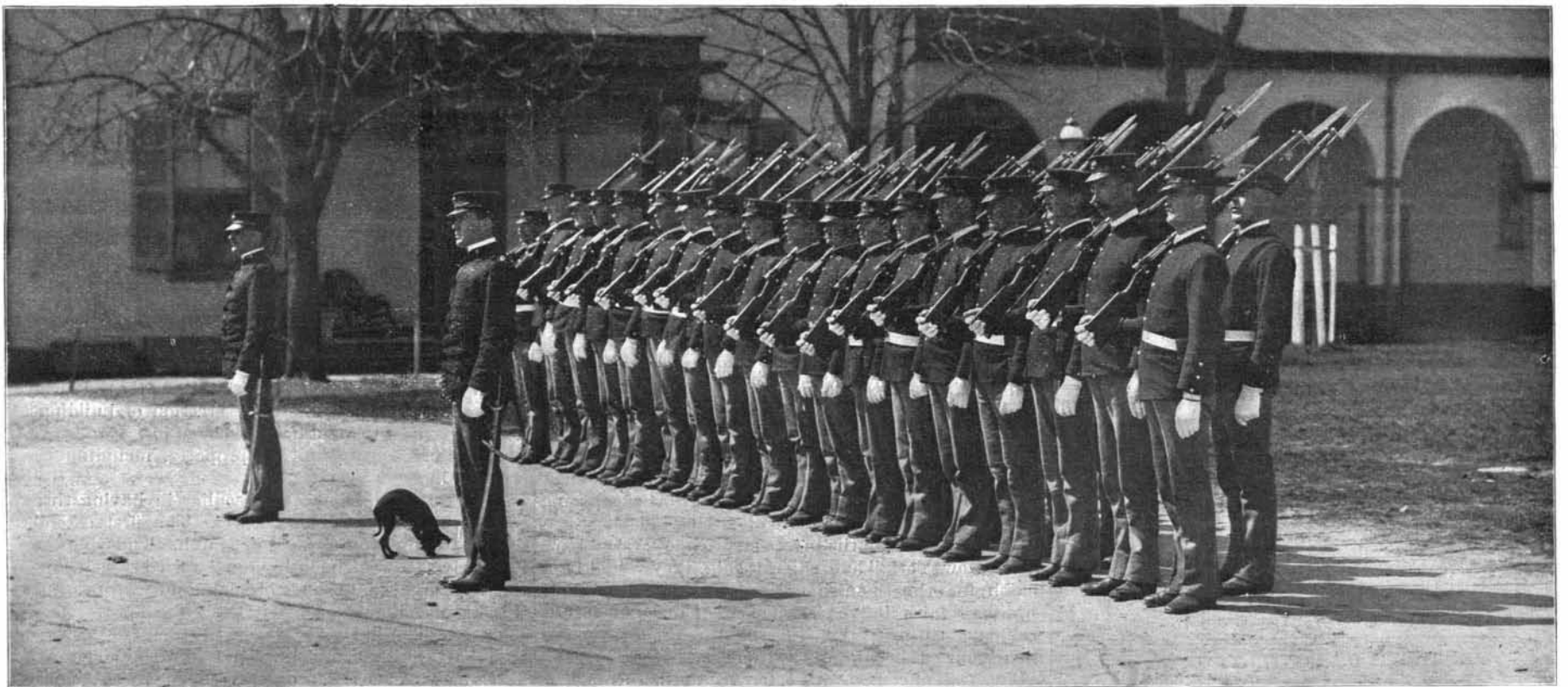
[\$3.00 A YEAR.  
WEEKLY.]



DAHLGREN AVENUE AND MARINE BARRACKS.



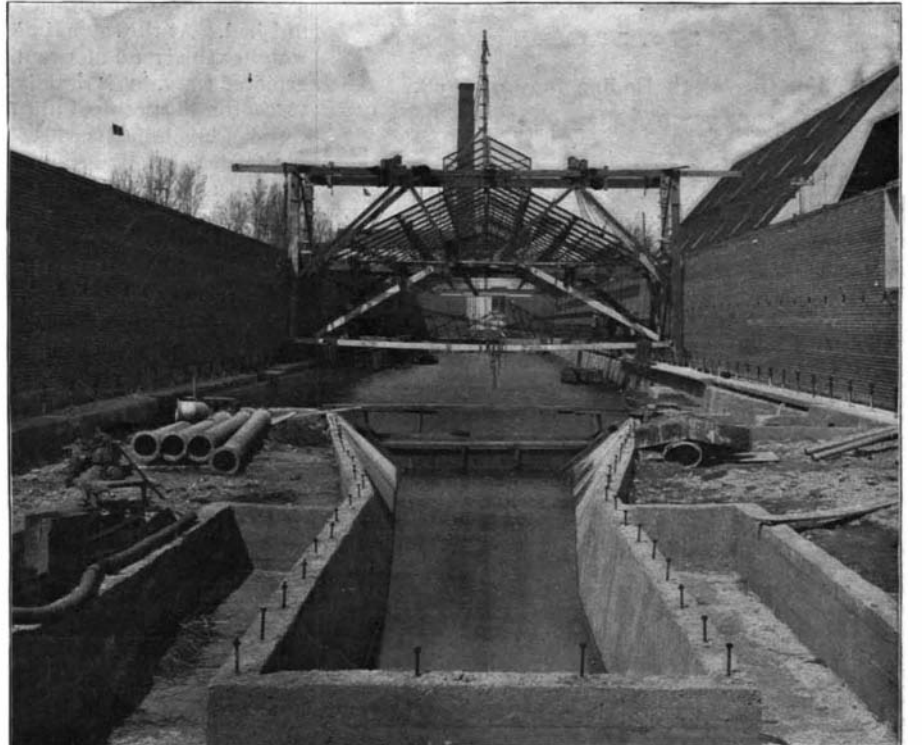
COMMANDER EDWIN C. PENDLETON.



MARINES DRILLING.



DAHLGREN AVENUE.



EXPERIMENTAL MODEL TANK.

GUN SHOPS.  
THE WASHINGTON, D. C., NAVY YARD.—[See page 295.]