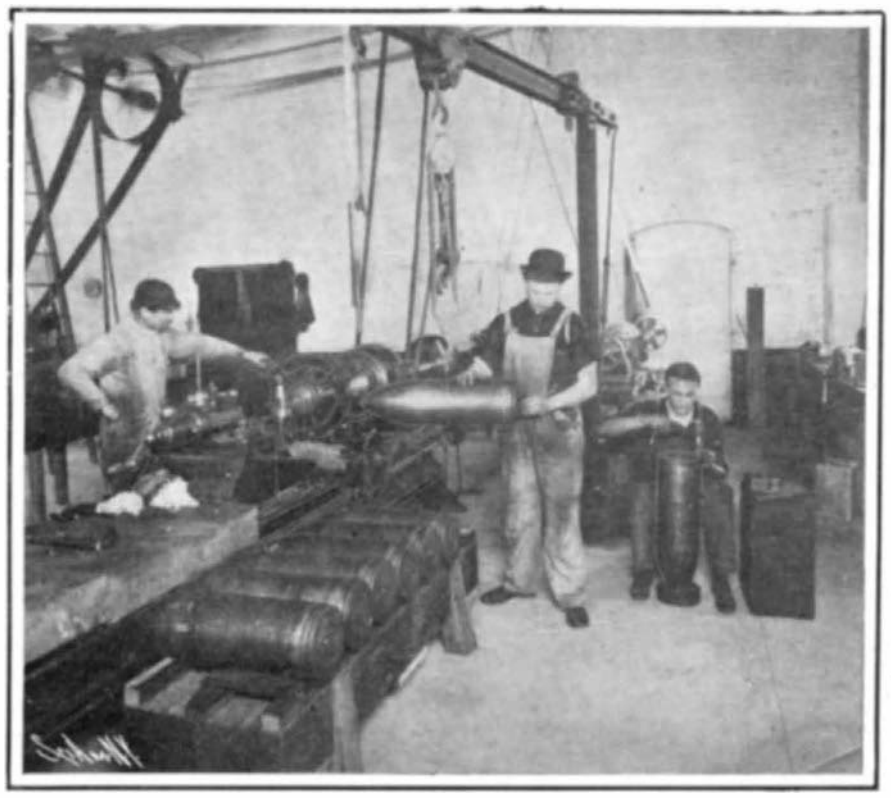
THE IONA NAVAL MAGAZINE.—I.

BY WALTER L. BEASLEY.

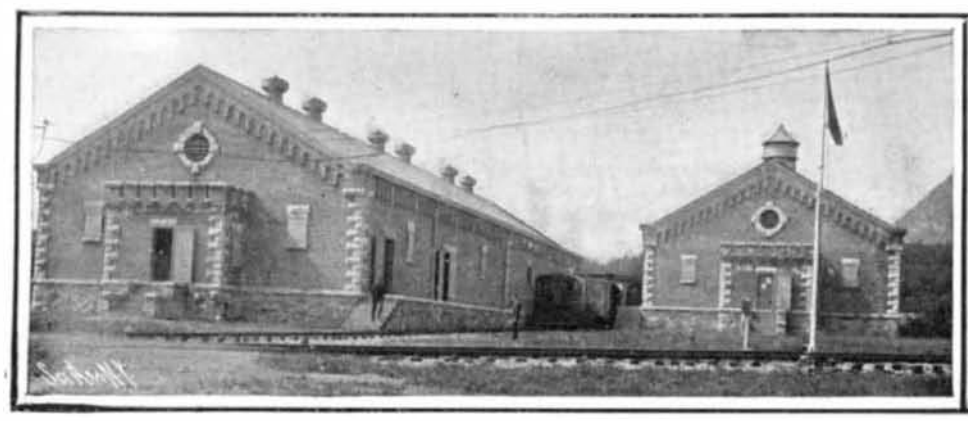
One of the most important ordnance centers of the government is undoubtedly the great naval magazine and ammunition plant at Iona Island, N. Y., some forty miles up the Hudson. Here, as the chief naval equipment base for the Atlantic coast, all the battleships are furnished with their thousands of shells and bags of smokeless powder charges. Through the courtesy of Admiral Coghlan and Commander M. L. Wood, the commandant at Iona, the writer was tendered exceptional privileges for obtaining data and a series of typical photos for the pages of the SCIENTIFIC AMERICAN, showing the comparatively little-known method of the preparation and manipulation of ammunition. The reservation covers 116 acres, and was purchased by the government in 1900 for $160,000. The place, which was formerly used as an excursion and picnic resort, and the grounds, from a wild, rocky, and neglected condition, by skillful engineering work carried out mainly under the direction of Chief Gunner A. T. Whitney, U. S. N., has been all regraded and leveled, and it now contains dozens of imposing edifices consisting of magazines, shell houses, a large power house, a handsome stone administration building and dwelling for the commandant, railroads, electric, compressed air, and telephone plants, waterworks, a fire system and a magnetic clock watch service. Commander Wood has introduced several new equipment features, notable among these being a modern telephone system with underground conduits and fifty-five stations, and the employment of compressed-air locomotives for hauling material to and fro. About one million dollars has been expended in perfecting and equipping the Iona magazine. Nearly 125 men are employed in the various departments; these are paid from $2 to $4 per day and they are a corps of unusually careful and skillful workmen. The vast quantity of war material and ordnance supplies, about three million pounds of smokeless powder and over one million of black, together with many thousands of shells, are housed in six brick and stone powder magazines 150 by 50 feet, four shell houses 200 by 50, two fixed ammunition houses, and two general storehouses. The powder magazines all have four separate fireproof walls and compartments in order to prevent a conflagration or explosion from reaching or destroying the entire contents. The power house is 160 feet long, and contains the compressed-air engine, electric generators, telephone central station, and ordnance machine shop. In the latter the copper-plate gas checks, one-fourth inch thick, for the base of the shells are put on. These have been recently adopted, and are intended to prevent premature explosion of the projectile in the gun from the interior gases. They



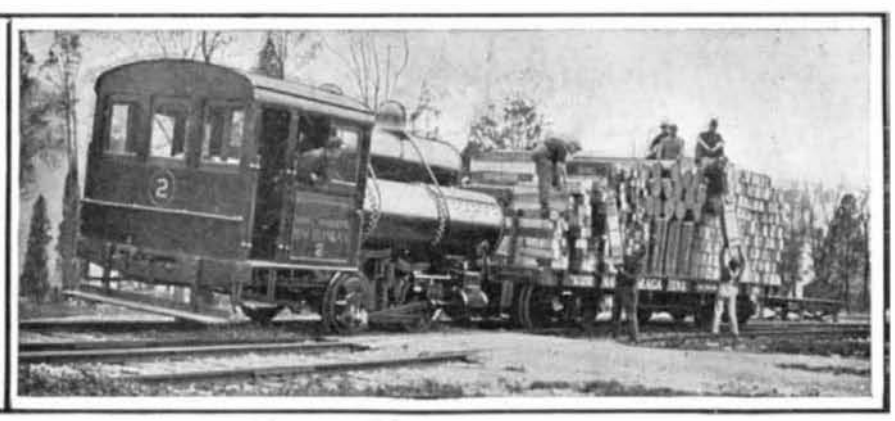
Turning Groove in the Shell for the Copper Gas-Check in the Machine Shop Power House.

are fitted in a groove turned in the base of the shell over a thin lead plate. There is an adequate water supply for fire fighting, the pressure being over 60 pounds per square inch. There are ten fire alarm stations, and fire drills are held every Saturday afternoon. A water standpipe, 80 feet high by 20 in diameter, with a capacity of 188,000 gallons, is filled from a reservoir on the west side of the reservation. The reservoir is a natural depression in the rock, walled in, and it holds about 250,000 gallons. The supply of water comes from surface seepage and springs. A system of roof drainage from the principal buildings has been arranged to flow into this reservoir, thus reinforcing the original supply. An artesian well over 100 feet deep furnishes water for drinking and domestic use.

Owing to the rapid increase of the navy, the station is taxed to its capacity to keep abreast with the demand to furnish new war vessels and old ones with their quota of ammunition. Just now the recently returned North Atlantic fleet, which exhausted its allotted ammunition in target practice, has been supplied with new shells and powder charges. To be prepared for any emergency, each ship is required, on returning to the navy yard, to restock as soon as possible her empty magazines. Also, in many instances the powder charges have to be altered. Then the bags are sent up to Iona Island, opened again, and the powder reweighed, diminished, or increased. For this work the ordnance tugs, "Apache" and "Pontiac," go alongside the vessels and take off the hundreds or more cans of powder to be changed, and also take on new unloaded shells from the Brooklyn navy yard. These are packed on lighters flying a red flag, and towed up to Iona Island. On reaching the landing the material is transferred to railroad cars on the wharf and taken to one of the storehouses or magazines. The train is pulled by a little sparkless, compressed-air locomotive. The engineer, when he wants more power, steps down from his cab at three different points, and connects the storage tank with an air pipe running from the power house. Seven hundred pounds pressure is taken on, which is allowed to run down to 50 pounds before recharging. These compressed-air locomotives cost in the neighborhood of $5,000, and two are in use at present. The several miles of railroad are so arranged that all the magazines, shell houses, filling and store houses are reached and unloaded at the doors on wide platforms. Just how many shells Uncle Sam's crack fighters have stored down out of sight is not generally known, nor the cost of these death-dealing missiles. The huge 13-inch, weighing over 1,000 pounds, with a 220-pound powder charge, comes to nearly $500, while the 12-inch, with 126 pounds for a powder charge, amounts to over $300. The capped, armor-piercing shells cost considerably more than the common shell. Here is a pretty close estimate of the number of shells the new battleships and cruisers are to carry, such as the

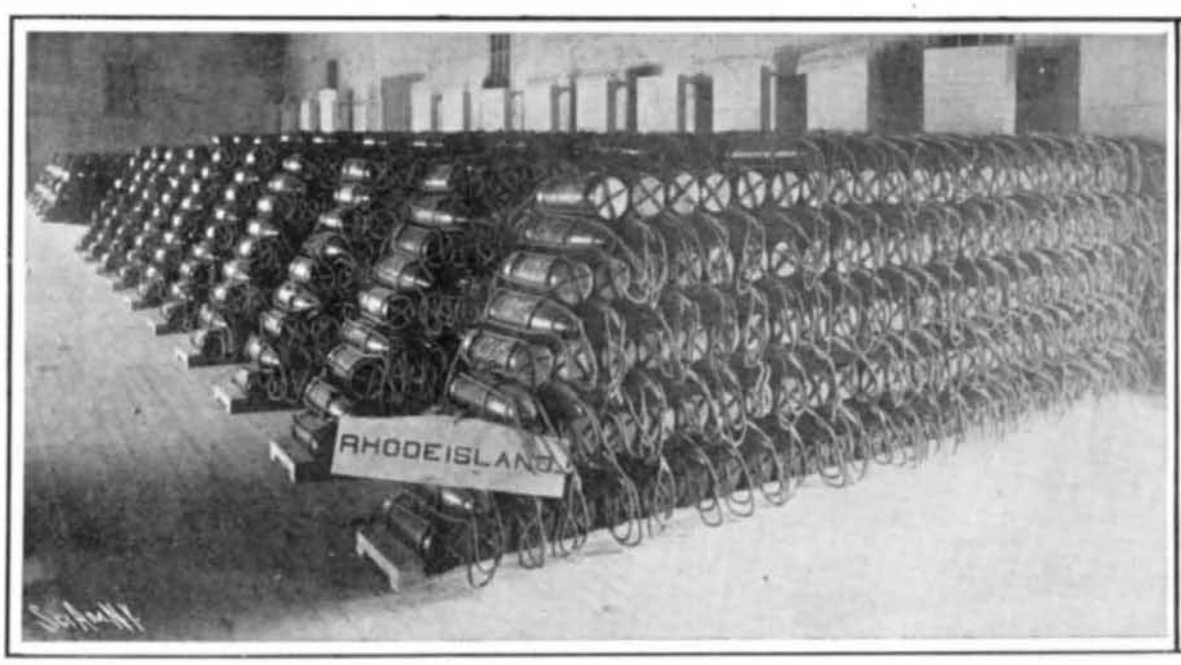


Exterior of Powder Magazine.

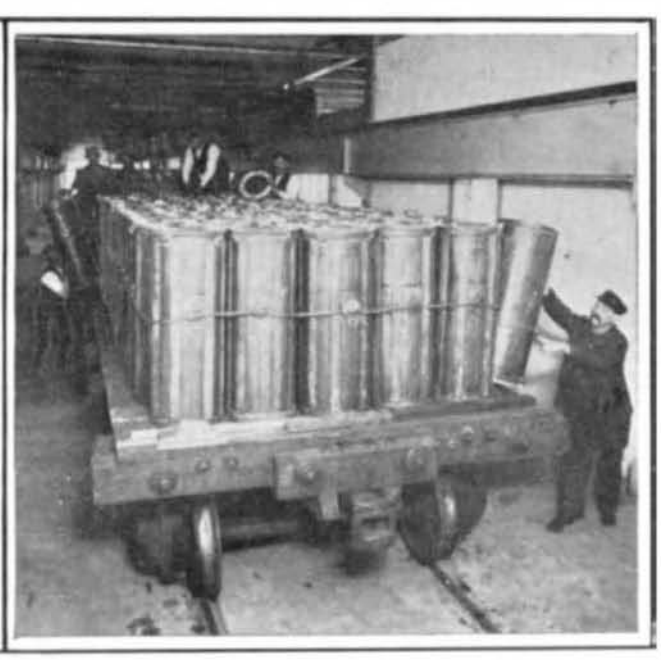


Compressed-Air Engine and Car Taking Out a Load of Powder.

The Compressed-Air Engine for Handling Cars Loaded with Ammunition.



Interior of Shell House, Showing Pile of Loaded Shells for U. S. S. "Rhode Island" Incased in Rope Slings Ready to be Loaded on Board.



A Load of Powder Cans.

"Rhode Island," "New Jersey," "Georgia," "Connecticut," and "Louisiana": 96 12-inch, armor-piercing shell; 144 12-inch, common shell; 700 8-inch, common shell; 300 8-inch, A. P. shell; 1,680 6-inch, common shell; 720 6-inch, A. P. shell; 3,600 3-inch, R. F. cartridges; 2,400 1-pounder cartridges, and 300 field-gun cartridges. The "Connecticut" and "Louisiana" carry about 1,500 A. P. and common shells for their new 7-inch guns. The loaded shells are kept separated from the empty ones and are stored in the two fixed ammunition magazines. A piled-up section of the "Rhode Island's" 6-inch loaded shells is here shown in one of the accompanying photographs. Each shell is put on a pair of scales and weighed and numbered. The weight is recorded in chalk on the shell. The shell houses are of special fireproof construction. Magazine attendants, having their living quarters on the ground, inspect these as well as the powder magazines many times during the day and night. At night each visit is recorded on the disk of the magnetic clock in the administration building. The temperature in the shell houses and powder magazines is kept at 85 and 90 deg. The temperature readings are taken at regular stated intervals. Flood cocks with automatic revolving sprinklers for drenching the loaded shells have been installed in the shell houses. By opening these from outside the buildings the contents can be wetted thoroughly.

(*To be continued.*)

One of the Outdoor Telephone Stations Near Powder-Filling House.

Making the Powder Bags in the Brooklyn Navy Yard. In the Foreground Are 6-Inch Bags for 6-Inch Shells.

THE IONA NAVAL MAGAZINE.—I.

Some Facts About Mushrooms.

BY ARTHUR H. J. KEANE.

A problem which has occupied the minds of agricultural and scientific men for many centuries past is how to cultivate mushrooms with as much ease and success as potatoes, carrots, turnips, and parsnips. The solution of this problem has so far proved extremely elusive but, within the last ten years, researches in this direction have taken a fresh turn which (in all probability) will hasten the advent of some means whereby it will become possible to increase and vary the production of a vegetable which, though of delicate flavor and nutritive excellence, is at present a luxury for the public at large. So far the *Agaricus campestris* is the only member of the mushroom family which has lent itself to experimental cultivation, all other edible varieties (including the truffle) remaining obdurate to all scientific attempts at cultivation; undoubtedly their production has been fomented in certain districts, but this is due merely to very empiric methods. The mushroom sold in our markets has also not much progress to boast of, as it is still grown precisely in the same way as it was over a hundred years ago and more; the only difference is that it is now grown in larger quantities, while means have also been discovered of protecting it from certain diseases to which it is liable.

Every plant in the vegetable kingdom, as a rule, springs from and produces seed. Mushrooms, toadstools, and other fungi are no exception, but their reproductive bodies are termed spores. Though these latter are truly analogous to seed, still they differ from it in structure.

Spores, for general purposes, may be regarded as reproductive bodies without an embryo, this latter being the minute rudimentary plant invariably found within true seeds. The spores of some fungi are so inconceivably minute that it would require more than two hundred million placed side by side to cover one square inch; yet these atoms keep constant to particular patterns, both in shape, size, and color. Each of these atoms is endowed with a sparklet of life which, under favorable circumstances, will cause the minute spore to swell, burst and reproduce the parent plant from which it sprang. The spores of different species of the mushroom family vary greatly in size, shape, color and quality. Some are one hundred times larger than others, and they take all sorts of geometrical and ornamental forms; many are white, some blue, green, red, yellow, or black; and, while some are perfectly harmless others are violently poisonous in their effects. The purple brown or violet spored edible mushroom so common in our fields consists, as our readers are aware, of an umbrella-shaped top carried by a cylindrical and vertical stem. On the lower surface of the "cap" (as the top is technically termed) there are thin blades or strip-like lengths of violet color which radiate all round the point of union with the stem; on cutting through one of these blades or "gills" and examining it with a microscope it will be seen that small oval bodies of a dark purple color spring therefrom and are attached two by two to thin filaments or threads. Each of these small oval bodies is a spore, and it is they in their entirety which impart the violet hue to the lower part of the cap. If a sheet of white paper be placed beneath the cap of a ripe mushroom, it will, after a short space of time, be tinted violet by the impalpable powder falling upon it. Each single one of these microscopic spores, provided it meet with the requisite favorable conditions, will thrive and produce a network of white filaments from which a new vegetable growth will originate that in due course, and for several years in succession, will produce growths similar to those to which the spore first owed its being. This is a brief and simple explanation of what scientists term cryptogamic generation. The filaments thus formed by the germination of the spores form in their entirety what is called the "mycelium," which forms the actual vegetative part of the mushroom, and is to it what the root is to superior orders (phanerogamæ) of plants. This mycelium ramifies indefinitely, and combines to form small whitish balls or globules; these latter gradually grow and increase in volume till they form the perfect mushroom. While pursuing its course underground (and before the small white globules forming the future mushroom appear on the surface), the mycelium is nourished at the expense of all other plants, which it destroys, at the same time sterilizing the soil, and exhausting all the potassium and phosphoric acid; however, it carries with it in its circular course various nutritive principles, the result being that a dark circle is formed on the grass, which shows up in marked contrast to the withered and yellow or poorly nourished verdure in the immediate vicinity. These marks have for many years past been the object of romance in all countries where children love to feast their minds upon witchcraft and goblin lore. These circles of grass, greener and more luxurious in growth than that surrounding them, are supposed by children and simple-minded country people to be "fairies' rings" left by the marks of fairy feet, after long and frisky frolics and dances in the silvery moonlight. Poetry must again give place to prose. We have no fairy feet to deal with, but merely the work of the spores of the little fungus called the "oread" or "fairy ring *champignon*" (*Marasmius oreades*) one of the best of edible fungi; it is of a creamy yellow color throughout; its blades (gills, as they are technically termed) are broad and each distinct; its stem is slender and solid, and it is possessed of a strong aromatic scent. It may here be pointed out that the stem of this mushroom is quite naked, while that of a noxious relative (and frequent neighbor), termed the "stinger," is downy at the base. In due course the little white balls appear in the circle, and gradually develop into the toothsome mushroom.

Mushrooms are cultivated everywhere. They grow in many strange places—among others in the Catacombs at Paris. The most likely place wherein to find mushrooms growing is a meadow or plot of grass, but they are also often met with in woods, on heaths, and in unfrequented wayside nooks. Of late a curious field for their growth has been selected in France. The St. Denis (department of the Seine) railway tunnel is no longer used for the purpose for which it was originally intended. It has been acquired for other purposes, and the ground therein has been cut up into ridges, divided from each other by means of furrows, upon which whole battalions of mushrooms are now flourishing in the shade of the gloomy tunnel walls. This enterprise (which is amply repaying all the time and capital expended upon it) has its counterpart in Scotland, where a company is now growing this class of vegetable in a tunnel 3,000 feet long. It was originally built by the North British Railway Company, and is 60 feet below the streets of Edinburgh.

Besides being a palatable morsel, the mushroom may also be termed the athlete of the vegetable kingdom. About a year ago some asphalt paving was laid down in a continental town, imprisoning some spores of a variety of the mushroom known as the *Champignon psailiota campestris*. In the course of their germination these spores lifted the asphalt, and finally split it in half in their struggle to reach light and life. Doubtless the asphalt may have been softened to a certain extent by the warmth engendered by the growth of the spores; still, in any case, Prof. Buillemin, of Nancy (France), estimates that the pressure exerted against the asphalt by the champignon must have amounted to about 25 pounds.

An Effective Mail-Bag Catcher Wanted.

An opportunity is now presented to inventors familiar with railway appliances to devise a mail-bag catching and delivering apparatus for fast-moving trains, by which mail bags can be caught and transferred to the car, and at the same time delivered safely from the car to a designated locality without mutilation. It appears the dropping or throwing of mail bags from a moving train, especially at night, is uncertain to occur at the right time, and occasionally mail bags are lost. Second Assistant Postmaster-General Shallenbergh at Washington has ordered an investigation into appliances of this character, for the purpose of selecting a type that is certain to be more effective than the present apparatus.

A commission has been appointed to make tests, composed of C. W. Vickery, superintendent of Railway Mail Service; John Holliday, chief clerk of the Post Office Department, and B. L. Andrus, superintendent of equipment, all of Washington, D. C.; Charles Rager, Railway Mail Service, Cincinnati, Ohio; Norman Perkins, St. Paul, Minn.; H. M. Robbins, Atlanta, Ga., and H. M. Wade, New York.

Inventors may communicate with any of them The Second Assistant Postmaster-General states that more than one hundred inventions in the shape of arms to remove mail bags from fast-moving trains have been presented to the Post Office Department within the past four years. Some of them seem worthy of investigation.

The commission will inspect inventions all over the country, and will report and make recommendations to him. It is believed some of the inventions may prove to be efficient in the handling of the bags.

Inventors should thoroughly test their inventions before submission to the commission.

According to reports made at the office of the American Motor Car Manufacturers' Association, there were 91 cars imported during the month of July, at a total valuation of $345,774. This is a decrease from July, 1905, when 101 cars were imported. There were 701 cars imported during the first seven months of the year. On the other hand, exports for July were double those for 1905, showing that the American motor-car industry is reaching out for the world's trade. There were 266 cars exported, of a total valuation of $485,672. During the first seven months of the year, the exports amounted to $2,829,289.