

ORDNANCE—THE BACKBONE OF WARFARE

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To procure and supply the Army's weapons and ammunition—that in a broad term is the function of the Ordnance Department of the United States Army. With the high state of mechanization of modern warfare, the term "Ordnance" has come to include not only guns and ammunition, but also tanks and motorized combat equipment as well as a host of miscellaneous items.

To perform its tremendous tasks of design, procurement, testing, distribution and maintenance, the Ordnance Department, headed by a Chief of Ordnance, is divided into four major divisions, the Industrial Division, Field Division, Technical Division, and Military Training Division. The Industrial Division is concerned with procurement, acceptance, and testing of ordnance materiel. The Field Service Division is charged with the responsibility of distribution and maintenance of ordnance materiel. The Technical Division is connected with design and development. The Military Training Division is the branch which trains the thousands of enlisted men and officers required for maintaining equipment at the front, delivering ammunition to gun crews, handling bombs and other ammunition at airfields and performing other ordnance duties.

Through the years of peace it was the responsibility of the officers of the Ordnance Department to carry on a program of development of new ordnance materiel, devise better methods for ordnance manufacture and to set up a streamlined organization that could be expanded, in time of emergency, with a minimum of confusion. The peace time budget for these activities was indeed meager, but the success of ordnance production today is full proof of the resourceful planning of our peace time ordnance heads, such as Major General C. M. Wesson, former Chief of Ordnance.

For carrying on the program of development, there are our six manufacturing arsenals—Watertown, Watervliet, Springfield Armory, Rock Island, Frankford and Picatinny. Each works on one or more of the major phases of ordnance and on countless minor and associated details. Watertown and Watervliet conduct various researches on the design and manufacture of guns and cannon. Springfield Armory developed the far-famed Garand rifle. Rock Island specializes in the development of tanks and gun recoil mechanisms, Frankford Arsenal makes studies on the manufacture of metal components for shells and bombs, and designs and develops methods for production of small arms ammunition. Picatinny Arsenal conducts researches on military explosives and their production; the manufacture of fuses, boosters and primers and the loading of high explosive shell and bombs and miscellaneous pyrotechnics. In addition to their researches, each arsenal manufactured enough items of their specialties to supply most of the peace time needs of the army.

Cooperating with all of our six manufacturing arsenals is the great proving ground at Aberdeen, Maryland. Here all ordnance materiel undergoes its test of acceptance. New weapons are tried and the proven designs in production are tested

to see that they maintain their high standards of quality. With the increased volume of ordnance production, the Aberdeen Proving Ground has been augmented by a number of new proving grounds located near production centers.

A large amount of credit for the success of the war-time ordnance production program must go to the various Ordnance Districts located in the principal cities of our country. During peace-time these districts, working in cooperation with the prominent civilians most of whom made up the local Army Ordnance Association Chapters, made surveys of the potential ordnance production capacities of industrial concerns in their area. They supervised the performance of peace-time trial contracts. With war their volume of activities has been tremendously increased. They have now become the link between the Ordnance Department and the thousands of private industrial concerns engaged in the manufacture of ordnance materiel. Ordnance districts now supervise all ordnance contracts with private industries in their district, providing inspectors at each plant and supplying the Ordnance office with reports on the progress on the contracts.

Although many private industries have converted their vast facilities to the manufacture of many items of ordnance, there are certain phases of ordnance production to which private industries could not be converted. The principal activities falling in this category are the manufacture of military explosives and the "loading" or assembling of high explosive and armor-piercing bombs and shells. These facilities were far short of those necessary for producing ammunition in the quantities required by global warfare. As a first step towards expansion, additional loading facilities were provided at Savanna and Ogden. Both plants are 100% government operated and have established fine records for low cost and highly efficient production. The major program of expansion, however, came through the establishment of government owned but privately operated plants. A typical government owned-privately operated organization is the Ravenna Ordnance Plant in Ohio. It was one of the first major bomb and shell loading plants completed. The Ordnance Department contracted with the Atlas Powder Company to operate this plant. The next step was to let an engineering-architecture contract. In cooperation with the Atlas officials and the Ordnance Department, the engineer-architects drew up complete plans and specifications for the plant. These plans were then turned over to the Q.M.C. and later to the Corps of Engineers who, upon completion of construction, turned the plant over to the Ordnance Department and the operating contractor. The operating contractor hires and trains personnel for the entire plant.

The above procedure is typical of that used in establishing all the new loading plants, TNT plants, powder works, small arms plants and ammonia works as well as new tank arsenals, gun works, armor plants works and shell forging works that augment private industrial facilities turned over to ordnance production.

Naturally, with the increased ordnance manufacturing facilities, the job of the Field Service has also been increased. The result is the establishment of many new ordnance storage depots and increased facilities for handling and maintaining all types of ordnance materiel. Practically all Field Service activities have remained 100% under government operation. All storage depots are government operated and their personnel is made up entirely of civil service employees, and enlisted men and officers of the Ordnance Department. However, construction of new depots is by private contractors working under the supervision of the Corps of Engineers.

As previously mentioned, the military section of the Ordnance Department comes under Field Service and consequently ordnance schools and training centers are quite frequently operated in conjunction with Field Service establishments. For example, the Aberdeen Proving Ground Depot is also the center of the Officer's Candidate School for Ordnance.

To more clearly understand how these various divisions cooperate and are inter-related it will probably be well to follow the history of some one item of ordnance. Let us take, therefore, an imaginary type high explosive anti-aircraft shell. This shell will probably be of the complete, fixed round type, that is, it will consist of a high explosive projectile, assembled to a cartridge case in permanent fashion by crimping the cartridge to the body of the projectile near the base. A time fuse will be installed at the loading plant.

Let us first consider the principal elements of the shell:

1. *The fuse*, consisting of a multitude of small formed or machined parts, some die castings and some special ignition materials.
2. *The booster*, consisting of a number of small formed or machined parts and a charge of supersensitive explosive.
3. *The projectile*, consisting of a machined carbon steel body and a charge of TNT.
4. *The cartridge case* of brass or the new steel construction, filled with a propelling charge of smokeless powder and perhaps employing some type of cardboard distance wad to make possible the use of only a part of the potential powder capacity of the cartridge case.
5. *The primer*, consisting of some soft brass parts and a charge of fulminate of mercury or other ignition explosives.

The completed shell will probably be packed in a heavy cylindrical fibre container and three or four containers put in a wood box or crate for shipment.

The general design for this shell will have been made by Picatinny Arsenal and the Ordnance Department in Washington. Details of the design for the projectile body and the cartridge case will have been developed by Frankford Arsenal. Explosive details and details of the metal parts of fuse, booster and primer will have been worked out by Picatinny. The shell design will have to be approved by the gun experts at Watertown or Watervliet for use in the anti-aircraft gun of the caliber and type they are developing.

After a number of trial rounds have been manufactured and loaded, they are sent to Aberdeen Proving Ground for test and final approval. If final approval is received, the shell may in time go into production.

Assuming that it does go into production, contracts will be let by the Ordnance Department Industrial Division for the various metal components which can be made by private industry. These components will be distributed to the various plants where fuse, booster, primer and final loading are to be done. Contract supervision and inspection of these parts will be handled by the Ordnance Districts.

The shell loading plant is the receiving center for the fuse, the booster, the primer, the shell body, the cartridge case, bulk TNT and smokeless powder as well as the fibre packing container, the wood packing box and miscellaneous small items required for final assembly, marking and packaging. Shell bodies and cartridge cases are usually furnished on contracts with private industrial concerns. TNT and powder come from government owned ordnance works. The packing materials and miscellaneous items are furnished on contracts usually negotiated by the loading plant rather than the central ordnance office.

At the loading plant the shell body is usually painted with one or two coats of special enamel after being thoroughly degreased. Next the actual loading of the projectile with high explosive takes place. In a specially designed building, TNT is melted by carefully regulated steam grids and poured into the projectile. After solidification of the TNT the booster is inserted in the projectile at a nadjacent location. From a second section of the plant comes the loaded cartridge case. The case is fitted with a primer and an accurately weighed propelling charge of smokeless powder is inserted. Finally the two major elements of the complete round, the projectile and cartridge, are brought to a final assembly building and are assembled in a special assembly and crimping press. After the fuse is added, the complete round is marked, packaged and boxed. All loading plant operations are carefully watched by ordnance inspectors who accept completed shells.

From the time the shell leaves the loading plant until it is actually turned over to the gun crew for firing, it is the property of the Field Service, which determines whether it is to be placed in storage or immediately shipped to a fighting front. If stored, it will be subjected to frequent inspection to detect any deterioration. If sent to the front, it will be delivered to a gun battery by ordnance troops.

Rather complete records are kept on each lot of shells and before any lot is certified for use, representative samples are tested at a proving ground. Should any irregularities occur either at the proving ground or in the field, complete reports are made so that correction of any difficulties can be made.

A medium caliber shell is one of the simpler items from the thousands that make up ordnance materiel. Tracing the effort required to make this one shell ready for service gives a glimpse of the tremendous task which the Ordnance Department is facing in getting millions like it to the front. In addition, it supplies billions of rounds of small arms and tons of bombs, as well as the more complex items such as guns, tanks and motorized equipment. For the efficiency with which the Ordnance Department is fulfilling its part in the war program, all credit is due to our ordnance officers, enlisted men, Ordnance Department employees and those American industrialists who are cooperating to make mass production of ordnance practical.