631

THE U.S. NAVAL GUN FACTORY'S ROLE IN NAVAL PRODUCTION

22 January 1947

L47-70

CONTENTS

Page

SPEAKER--Rear Admiral Theodore D. Ruddock, Jr., U.S. N., Superintendent U.S. Naval Gun Factory..... 1.

GENERAL DISCUSSION..... 12.

General McKinley

Admiral Ruddock

Students

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D.C.

RESTRICTED

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

PUBLICATION NUMBER L47-70

RESTRICTED

THE U.S. NAVAL GUN FACTORY'S ROLE IN NAVAL PRODUCTION

22 January 1947.

GENERAL McKINLEY:

Gentlemen, this morning we are very fortunate in having Rear Admiral Theodore D. Ruddock with us. Admiral Ruddock attended the College of Charleston before his appointment to the U.S. Naval Academy from his native state in 1910. After his graduation he served in U.S.S. UTAH during World War I. Following this he was under instruction in ordnance engineering at the Postgraduate School at Annapolis, and at Columbia University. For the next twenty years Admiral Ruddock had various appointments, including that of Proof Officer at the Naval Proving Ground, Dahlgren, Virginia; in charge of the Design and Drafting Division at the Naval Gun Factory; Operations Officer and Aide on the Staff of Rear Admiral William S. Pye; and Director, Production Division, Bureau of Ordnance. From September 1943, until April 1944, in the rank of Captain, he commanded the U.S.S. Massachusetts. Under his command that battleship participated in the destruction of the Japanese installations on Nauru Island in the Gilberts in December 1943, and following the New Georgia Campaign took part in the assault on Kwajalein in January 1944. In April 1944, Rear Admiral Ruddock became Commander, Battleship Division 4, operating in the Pacific Area, and for his services in that command, which extended to January 9, 1945, was awarded the Legion of Merit; a Second Gold Star, in lieu of the Third Legion of Merit, a third Gold Star, in lieu of the Fourth Legion of Merit; the Navy Cross; and Gold Star, in lieu of the Second Navy Cross. He is now Superintendent of the Naval Gun Factory at Washington, and we will be his guests tomorrow afternoon.

His subject this morning is the U.S. Naval Gun Factory's Role in Naval Production, and I take great pleasure in introducing Admiral Ruddock.

ADMIRAL RUDDOCK:

General McKinley and students of the College: The subject assigned me this morning was The Naval Gun Factory's Role in Naval Production. That is a rather complicated subject to cover in a short period, and I would like to cover it by telling what we do and how we get hold of these projects. I believe that will give you a better idea on which to base your own conclusions as to what we really did in the Naval procurement program.

First, I would like to review the origin of the Naval Gun Factory

and why the existence of such an organization was necessary.

In Revolutionary War days naval guns, of course, had no relationship at all to land guns. They were entirely different in design and their application of course was very different. The guns in those days were made in a small foundry in Georgetown, and they were fired off the Marine Barracks that stood over at the mouth of Rock Creek. These conditions continued until about 1840 at which time some foundry equipment was moved to the Washington Navy Yard, now the Naval Gun Factory. It was not until the middle of the 1850's that the Navy Yard was assigned the job of producing naval ordnance. The Yard was then under Admiral Dahlgren who, incidentally, because he was a specialist, had to have a special Act passed by the Congress so he could command the place. In 1870 it was decided to make it a straight gun factory with no outside activities such as shipbuilding, etc. That didn't work so well, because of several factors, one of which was the lack of technical people, and it was again placed under the Navy Yard to assist the development of trained engineers. From then on the Gun Factory operated as a division of the Navy Yard. It was not autonomous. The different industrial services were provided through groups that were on the same administrative level. Consequently, they had a great deal of difficulty. During the First World War it was necessary to give it a great deal more autonomy and as a consequence a great deal was accomplished because of the development by that time of technical civilian engineers and a number of commissioned officers in the services who had been through a post-graduate school and were capable of undertaking the necessary technical as well as the industrial work. As a result, the Gun Factory was again established as a separate entity a year ago last November (November, 1945,) and an officer was ordered to command that institution for the purpose of developing naval ordnance and all of its appurtenances.

That, in brief, is the origin of the Gun Factory, growing from a small foundry which cast guns. I happened to run across a copy of the specifications of that day in browsing through some old papers one day. I would like to have a copy of it. I misplaced it. It ran somewhat as follows-"after removal of the mould, turn muzzle up and fill with water. If no leaks are apparent the casting is acceptable."

The Gun Factory operates under the management and technical control of the Bureau of Ordnance. The military control is exercised through the Commandant of the Potomac River Naval Command, who corresponds to the Commander of a Military District in the War Department. The military control doesn't extend to the industrial or other controls of the Gun Factory. That is, the industrial control is channelled through the Bureau of Ordnance and they place project orders with us for the design, manufacture test, and delivery of ordnance equipment all the way from the tiny little computing sights we use on anti-aircraft weapons to the 16-inch guns in our heavy turrets. In addition to ordnance work there is a large amount of work done for other organizations of the Naval Establishment.

The Bureau of Aeronautics when they get into difficulties sometimes will give us a job for what Dr. Bush called in his organization during the war a "Few Quick." In other words, if they want something chewed out of a piece of metal with teeth or a file, they give us the job of doing it, and when that is done we test it out. If it is all right they may go into production somewhere else or may have it manufactured by the Gun Factory. The Bureau of Ships often wants equipment developed for use on board ship in conjunction with the ordnance equipment, such as switch-boards, motors, current transmission systems, and signal systems, and often calls on the Gun Factory to design and build a prototype. These jobs are passed through the Bureau of Ordnance with the necessary funds. The Bureau of Ships also maintains at the Gun Factory an electronics laboratory, which carries out some of the basic experimental programs for them. Many ordnance and aeronautical programs depend upon electronics for their operation. In this laboratory early prototypes were made. The other bureaus have little interest in the Gun Factory as such, except as to materials or equipment for which they are responsible and which might be associated with ordnance equipment. We sometimes get projects of that sort. The Seabees would come in, for instance, for development of ground and shore installations for some of our rapid-fire anti-aircraft guns and the manufacture of other things in order to adapt guns for shore use. In addition to manufacturing this equipment it is essential to determine from the prototype whether or not changes from the designs and drawings are necessary and to test this equipment under as nearly service conditions as we can provide.

You can see from this general outline that the Naval Gun Factory is not a line production shop. It is fundamentally a great big job shop which undertakes any kind of work. There are all kinds of outside work which due to the nature of the installation as a job shop we can do while there are practically no other installations in the country, commercial or otherwise, that could undertake them. One was the manufacturing of the V-2 rocket heads which are now being fired in New Mexico. They were manufactured in the Gun Factory. The other is the 60-caliber aircraft gun, which I believe may become the standard for our fighters for all services. The barrel and rifle equipment were manufactured at the Gun Factory, and that was the only place in the country where adequate equipment was located. The first groups of those barrels were for experimental tests. Most of the Naval Gun Factory work is of that nature for the Bureau of Ordnance.

As another example of the type of work done, several years ago there was an 8-inch gun mounted on the cruisers. That gun as then designed could probably fire about four rounds per minute. Out on the range where you could use it, it averaged only around four. We thought that was a little light for the fire power. So we began working on the design for another gun from which we hoped to get seven rounds per minute. The proposed designs were discussed in the Bureau, and with the Gun Factory design personnel. A decision was made to proceed with the project. It

was essential to get the Gun Factory in at the earliest stage. The net result of the proposal is that the Gun Factory has built and is now installing an 8-inch gun which will under certain conditions fire at a rate in excess of double that of the old gun. The supply of ammunition is automatic, the firing of the gun is automatic, and it is a Case gun. This project was started in 1943 and the guns are going on board ship now.

To design, develop, and have built all the component parts for that part of the materiel which the Gun Factory could not build was quite an undertaking. There were hydraulic contractors to produce the safety devices designed so that the gun would be safe to use. We have another, a new one, which is a 3-inch automatic, which we hope will be much more effective than our 40 mm. and will reach much farther. It carries greater punch and actually the time of flight is greatly reduced due to the weight of the projectile. We are working on that now. We hope that in a matter of two and a half years from its inception, we will have that gun on board ship.

Those are the kinds of jobs that we get.

In connection with the three-inch program we hope that the Arsenal at Rock Island can give us a good hand in it because time is our great factor. If we do not get them in production, we cannot meet schedules. Rock Island has done some splendid work for us before and we hope to get them in on this program.

You can see from the kind of work which we have that the type of employee is a big factor. We have no repetitive operations except on a very small scale. We may make 200 pieces of this and 500 of some other. These sometimes do not warrant making standard set-ups for a machine. The making of so few pieces is relatively easy for an artisan. I was told only a few days ago that any one of our machinists could go out to certain plants here and be a Master Mechanic for that reason. As an aside, the Gun Factory on the recent return of veterans with their priority rights, was required to discharge as many as 2,000 of our people who had anywhere from fifteen to twenty-five years' employment and experience at the Gun Factory as artisans. As another aside, I was in Detroit last week at the Industrial Association meeting and one of the dreary pictures that I encountered was the fact that artisans are rapidly disappearing from industry. In discussing the matter with some of the leading industrialists, I found that they felt that in another twenty years if it were to be necessary to mobilize our industry for an effort comparable to that which we have just gone through, we wouldn't have an adequate number of tool makers, die makers, mechanics, and artisans to anywhere near meet the program which we have just gone through. Now that is a serious situation.

In an effort to improve the situation at the Gun Factory, we are pushing our Apprentice Schools which does produce men at least capable

of becoming artisan machinists and mechanics. We have some 275 people in the school now, and I think we are going to have to do some more about it. It may be necessary for all of the Government activities and everything else--the Naval Ordnance Plants and aircraft plants which are operated by the Government--to institute an intensive training program in order that we may have artisans in case they become necessary in the future.

There are many reasons for their disappearance, not the least of which is the intolerance of some of the workers' organizations.

The organization of the Gun Factory for accomplishing these tasks naturally would be of interest. It is extensive and complicated. Fundamentally the Gun Factory must be what amounts to a series of subcontractors to a boss. We have some twenty-five or thirty shops, each of which must be within its own sphere under its master mechanic. The job order system as set up must allocate the work where it can be most economically done. This necessarily means assembly in a final assembly shop, and it is very difficult to get all of these things arranged in a program so that everything lands at the right place at the right time, and gives you a finished job. That is the main problem. Of course there must be the military organization which has the military control of the station. The heads of divisions and chiefs of sections or departments have a military responsibility to enforce all the regulations within their own departments or divisions.

We have, in order to accomplish this, set up different divisions. Some of them are Staff, others are Service, and still others are Executive. I will go through them briefly.

The main Staff organizations are: Management, Planning and Review, which is industrial engineering; Industrial Relations, which is personnel and employee service; Progress; Gauge; and Finance or Fiscal.

To review these, the Management, Planning and Review organization is a unit set up to investigate the various phases of the management problem as it goes through the Gun Factory and to determine what relationships must exist besides the line and staff relationships to get the work done and to set up those lines of communication and contact so that the information will get where it is needed when it is needed. This is not a directive organization. It merely investigates these things and reports results. The executive agency for accomplishing them is at other places. As an end result, we can look at the organization objectively and find out where the defects are and where things are going wrong where a piece of paper goes to the wrong place, and all that sort of business.

Industrial Relations needs very little explanation. It is the hiring, firing, promotion, marking routine, together with employee relationships and morale.

Progress, the next of the Staff organizations, is again an objective hunter for facts. It takes all the programs whether they be repairs to the roof of a building or the manufacture of a 16-inch mount and lists the various subassemblies or parts; and when things look like they are about to pass out of hand, progress brings it to everybody's attention. It may be wrong, but after all it brings facts out in the open. The Progress Officer has no axe to grind. He is not associated with anybody, being responsible to the Superintendent directly. It is a Staff function. He lets the chips fall where they may. Of course the Progress Officer is the most unpopular man about, being about as popular as a skunk at a lawn party; nevertheless, he accomplishes an awful lot. I think the results are commensurate with the care with which the situation is investigated by his organization.

The Gauge organization is a relatively new activity and I will expand a little bit on that, because I feel greatly indebted to the Army Ordnance for that organization.

Back in 1940 and 1941, when we were just getting into the proposed program for the war that we knew was coming, Army Ordnance made a statement to the effect that the bottleneck in any large program was going to be precision measuring devices, and nobody except the organization that made that statement would believe it--nobody. The aircraft industry wouldn't believe it; Wright Field wouldn't believe it; Naval Ordnance wouldn't believe it. Within two years it was a crisis. You couldn't get precision measuring devices; you couldn't get gauges. Nobody could get them. Stemming from that, the Bureau of Ordnance set up at the Gun Factory a Gauge Unit which was to serve the entire Naval Ordnance. When a new design is made there are certain essential gauging operations for each particular bit or piece as it goes through its manufacturing process, to determine whether or not that bit when completed is suitable for use, or when during processing, it is suitable for further processing. The design is criticized from that viewpoint by the Gauge Division regardless of the source of the design, and changes are noted in the design to permit such an operation or series of gauging operations. Once the design is stabilized then the Gauge Division is responsible for the design, but not necessarily the manufacture or the final inspection use of the gauges to determine whether or not that piece will assemble with all the other component parts to produce a usable assembly. That is expanding more and more as we go into the use of gauges for determining interchangeability and where it is essential to have such interchangeability for spare parts purposes and other such applications. We are repeatedly attempting to get away from selective assemblies in any of this equipment. We find that in such work as we have done in the last five years that there has to be interchangeability. The Gauge Division is in the process now of setting up in various sections of the country large gauge laboratories in certain universities which we hope will be used by the Services. We are also attempting to have the universities put in a course of precision measurement in their engineering schools to utilize these laboratories so that

we will have a group of people coming out of the universities who will know something about this game. There were very few people who knew anything about it when we started. You might be interested in following through on that, those of you who are interested in that phase of the work.

We now come to the Fiscal Division, which is another Staff organization in part. Fiscal has control of certain accounting procedures and as such has authority and control over certain operations over all the Departments and Divisions in order that the charges coming back to them will be in such shape that they can be adequately used to determine the status of funds. In addition to that, however, Fiscal has a Staff function in that they must provide the Services with certain basic information which the Superintendent requires for Management-Control purposes in the broader picture, and that is where they get into the Staff function. It is purely accounting and disbursing so there isn't much more to describe here.

Now the Industrial or Executive Departments are: Planning, Design, Production, Inspection, Aviation, and Ships.

The Planning Department is the unit which receives all of the production orders, and whether that production order is for designs only, a prototype of somebody else's designs, or the development of a design, it institutes a long-range production program. All of that stems into the Planning Department where it is broken down into its various parts and certain directives issued to all the other Departments or Divisions involved so that the work can be initiated. Parts of the Planning Department are located in each of the other industrial departments so that these departments can be furnished details of the planning in that part of the program which they receive. This coordination of effort is one of the hardest things to achieve in an industrial organization. An industrial engineer must be set up charged with studying the situation and recommending certain lines of communication of responsibility between Departments and Divisions.

What I just discussed is one of these problems. How do we get the information from design to production, to inspection, to gauge, etc., as completed designs are available for work? That is one of the most difficult things to set up. Planning is responsible for the broad directives.

The next department is Design. There in the Gun Factory we have a hybrid. Many of the projects that come in for Bureau design work, stem from the Bureau of Ordnance directly. There is no intention of placing the work in the Gun Factory when the design is completed. However, the Control of the Design Department is under the Superintendent of the Naval Gun Factory. The excerpts of the Design Department, from the start of the program, do a great deal of your initial planning because they are the people who exercise control when a project is started.

You can start your work only if and when you get your design. It has been a hard job trying to convince those people that they must coordinate with Planning. They produce the designs for the pieces and assemblies. In addition to that they produce initially the bill of material. That can be done concurrently, by putting the thing on a piece of paper; it is a great help to the Planning Department in allocating the work. In addition to that the Design Department works on the modification of existing equipment as troubles develop in service. Periodically a job is shot down to the Gun Factory by the Bureau with instructions to get it done by a certain time, and we drop everything to do it. In the meantime, we have to be prepared to make pieces to change or to substitute for equipment that is afloat.

The next organization is the Production Department, and that of course is the big project. That department employs some 6,000 men currently, and it is organized in general within itself along the same general lines as the Gun Factory, except that they have no industrial engineer, industrial relations officer, gauge officer, or design officer. These services are provided from different departments. Production must have a Progress Unit and a Planning Unit, and it is organized along that line so that as the work is released, from Design through Planning to Production through job orders, it goes to work on scheduling the casting, machining, assembly, and delivery of the finished product. The job is then to see that materials raw or finished get delivered at the right place, at the right time, according to their schedules and according to the requirements of the program. Production operates the shops completely both for the maintenance of the internal installations and the personnel facilities therein. It is a big job.

The Aviation Department is currently set up in a two-fold status again, in that it is fundamentally a testing organization for aircraft armament items of all sorts. In addition this department has a small Production Unit to build the prototype; it has a Design Unit for designing or modifying designs of current aircraft armament items. There is a provision in its Planning Department so that when a program reaches the stage where it is desired for production it can be stemmed into the Production Program of the Gun Factory. That has been true in many instances and materials have been gotten out very rapidly. I personally feel that there should be some better integration in the Aviation ordnance activities within the Gun Factory itself in order to provide a larger measure of interest and knowledge on the general matters of aircraft armament through all the engineering levels and the administrative and control levels in the Gun Factory. I hope we will eventually get such an integration.

The Ships Department is responsible for the repairing of small craft and things of that sort. We have a small railway, but the principal thing is the electronics laboratory, which, as I pointed out, is an experimental thing and maintained for the Bureau of Ships. All

the orders have to stom through the Bureau of Ordnance.

The Inspection Department is, as its name implies, the unit which determines whether or not the finished pieces are suitable for the purposes intended, and also whether or not the final assembly is appropriate to the purpose intended. Is the assembly capable of doing what it was designed to do? Will a detector compute within two minutes of the estimates or will it not? That is what it is necessary for it to do. The Inspection Department doesn't do anything about it. It simply states what is wrong with it. The executive agency takes the action on it.

There has been some misunderstanding in recent months in regard to a term which is going to come up more and more in inspection. The term I refer to is "quality control." I notice there is a big organization now being set up called the Quality Control Association. That term is susceptible of many definitions. Right now the big danger in my opinion is that it will be confused with inspection. Quality control, I believe, should be limited to the shop practices and the shop supervision of the quality of the manufacture of individual bits, parts and pieces. Inspection thereafter determines whether or not quality control has done its stuff, and I believe that we should definitely conform to that in our industrial organizations; otherwise, we are going to have all those rules confounded. We will have inspections being conducted out of our Machines Department. Most of your master mechanics think they must be responsible for quality control. Inspection is responsible for the finished product, and we must definitely make that division. Although not particularly concerned here, I mention it in passing since I am fighting the battle in my own organization. Incidentally, the Inspection Department at the Gun Factory is very much disturbed about this; and it is somewhat unfortunate that due to the force of circumstances during the war, the Inspection Department in large measure, did both jobs.

Now we have two purely Service Departments and two others which I previously mentioned which also render services. The purely Service Departments are Supply and Public Works. Those with dual status are industrial relations for one and finance for the other.

Supply is that organization which either through withdrawals from stock or through purchase of stock equipment provides the material by which the Production Department or any other agency charged with the work carries it through to the machines in order to make the parts. There again you have a very different situation in getting the information from Design through Planning to Supply. The designer is working on something with a 3/4-inch anti-friction bearing on a job and puts that down; it goes through the Supply Department and is ordered; and the final designer decides we ought to make that a 1-inch bearing. How can you get that change through? Can your organization do that or not? Many times an odd piece of paper gets lost and the Progress

Division gets up and says "We haven't got that. It was ordered nine weeks ago. The Supply Department hasn't done anything about that." We are running short all the time. I think you gentlemen will find that that is probably one of your greatest difficulties, your problem of the supply of raw materials from which to make your bits, parts, and pieces for the assembled items which you want to buy from industry, on time, in the quantity you want it, and to the specifications you want. We are attempting to set up a materiel section which will be part of the Supply Department and attached to the Planning Department in an effort to get those people sitting alongside of each other, so that when one puts a piece of paper or little memorandum in the mail it won't finally have to go through a big file system and get lost. I suppose you will have that question too.

The Public Works Department is the group having to do with the buildings, grounds, rolling stock, power plant facilities such as our steam and electric transmission systems and the communications systems, janitor service, and many others of which you can think. Those requirements stem out of the Planning Division in regard to certain broad maintenance directives.

Industrial Relations is a Service Division for the other units in the Gun Factory, serving them in processing or marking and maintenance of the individual records, appointments, discharges, Labor Board activities, and that sort of thing.

Finance is a Service Department occupied with the status of the individual funds assigned for specific jobs. The responsibility of the Finance Department is to keep you informed as to the overexpenditures on any particular project, and to keep the other departments advised as to the status of the reallocated funds. The Finance Department also performs the Staff function for the Superintendent.

That covers, in general, some of the broad aspects of the organization.

To go back into the top echelon, the Superintendent of course is responsible for the operation of the place militarily and industrially. I have attempted to pass most of the industrial responsibility to the Assistant Superintendent, who largely operates that part of the Gun Factory, coordinating the work and making sure that those lines of communication are set up and followed, and he controls that through the Heads of the Departments and Divisions.

I see I have noted here "Types of Work Done." I think I have covered most of them except one or two Departments which may appear quite extraneous to our activities as an industrial plant.

We prepare at the Gun Factory most of the operational instruction

pamphlets for new types of equipment, also the maintenance manuals. The latter would normally be a product of the Design agency; the former not necessarily so. The preparation of the operational publications is accomplished in two ways. Many times we will go out and contract a commercial writing firm to prepare a draft. We will have this brought in and criticized by our Design engineers. It will then be sent to our Proving Ground where most of the material has been tested for further comment. After some revision, it will be published. The other way is to get your Design engineer, have him consult with some of the experienced writers and have them write it. The latter process has not always produced the best operational pamphlets because fundamentally they are written by a man who is familiar with it and he doesn't consider that he is writing for somebody who doesn't know anything about it and isn't an engineer. On the other hand, the fellow who comes in from an industrial pamphlet writing organization such as one that writes instruction pamphlets for an automobile, which are pretty good, he does it from an entirely different viewpoint. He wants to find out why it is in the book.

As we go along in the program of new weapons and all that sort of thing there is plenty of prospective work that probably the Gun Factory might be doing. We have done some of it along the line of rocket motors for fast rockets, the design and the production of them; the controls for guided missiles. We are studying the subject and trying to school our engineers so that they will be capable of lending such advice and assistance as we may know about. We have had some slight experience with ballistics for, after all, that has to be considered in guided missiles. I noticed the definition which the Navy Department has adopted the other day in connection with certain so-called guided missiles that were assigned to the Bureau of Ordnance and the Bureau of Aeronautics. The definition given for those under the cognizance of the Bureau of Ordnance was that they "didn't" depend on aerodynamic characteristics for flight." That doesn't make sense to me because if you use any sort of projectile its stability in flight depends on its aerodynamic quality. I think we are all interested in all of those things and I don't think we ought to be jealous of anybody else. We ought to have the best we can get and that is what we are going to try to do. I just mentioned that definition because it indicates a certain confusion of thought. The definition is not clear and it is unfortunate that many times in assigning responsibility those kinds of definitions are used.

It might be interesting to you also to know that some of the tolerances on which we are currently working down in the Gun Factory require that when certain machines are in operation on special jobs, the forges, and many other big machines that vibrate somewhat in their cutting, have to be shut down. Otherwise the required tolerances will not be met. There is too much vibration through the ground. Industry of course didn't understand why those tolerances were so close when we started out in the war production program. They quickly learned, however, and if we are asked the same questions in the future I think we

should be definitely prepared to tell them why and not have to argue with them as we did the last time.

I have mentioned the lack of journeymen and tool makers, and I think that is about all I can say. I hope that it has reasonably hung together. I didn't prepare anything because I like to talk "Off the cuff." Then I can say all I jolly well please. Thank you.

GENERAL McKINLEY:

The Admiral has very kindly consented to answer a few questions. I want to ask the first one myself, and that is about your load in time of peace. In connection with your assembly operations you brought up this question of hiring returning veterans, and having to discharge your good men. Are you experiencing any difficulty in these lean years in getting enough men for your jobs, or in keeping all your good people?

ADMIRAL RUDDOCK:

Normally not.

GENERAL McKINLEY:

Do you find that you have to lose them--to discharge them or lay them off?

ADMIRAL RUDDOCK:

That was in the '20's and '30's. Right now the backlog at the Gun Factory amounts to about a hundred-million-dollar work load. That will support about 10,000 men until 1951. At that time I don't know what the answer will be.

GENERAL McKINLEY:

Have you the dollars or the contract authorization?

ADMIRAL RUDDOCK:

We have the dollars.

GENERAL McKINLEY:

We have been through a lot of lean years with the same problem. I see a certain difference this time, because with atomic energy and the emphasis that we are putting on research and development, I don't think the appropriations are going to be as lean now as they were in the past.

ADMIRAL RUDDOCK:

It will not, and the Gun Factory itself is in the fortunate position of being capable of undertaking a great deal of the work. There is no other place that can do some of it.

GENERAL McKINLEY:

You are associated with research and development?

ADMIRAL RUDDOCK:

Yes, definitely.

A STUDENT OFFICER:

Will you be kind enough to tell us where the Quality Control group has its responsibility, and what the responsibilities of the Inspection Group are, for example in the manufacture of a gun barrel?

ADMIRAL RUDDOCK:

The initial responsibility is at the forge, for the inspector must determine whether or not the forging meets the specifications for the forging--whether there are any defects in it. That is certified by inspection. The preparation of the forging then for the assembly for the barrel, assuming that it is a multiple-pieced barrel, is taken up by Quality Control as soon as the forging arrives in the shop, and Quality Control becomes responsible to see that the outside is turned to the proper diameter within the tolerances; that the inside is turned to the proper tolerance and taper, if there is a taper. When that is finished and the shop Quality Control people have determined that it is ready for inspection for assembly, Inspection again takes it and checks to see if in certain critical areas it is appropriate for assembly. Once it is determined that it is accurate for bits, pieces and the barrel, it is then assembled by the shop and responsibility for final assembly determined again by the Inspection Department. The gun barrel is then assembled. If it is necessary to rifle it or turn the outside diameter, a breech mechanism is essential. The same general division of responsibilities apply in regard to the particular parts, bits and pieces. The responsibility for turning, treating appropriately, and checking the areas of the housing of the breech mechanism is a shop responsibility through Quality Control with the final determination by Inspection as to whether or not the gauge entered and passed the extent of the barrel and whether or not there were no excess clearances. Furthermore, the breech mechanism itself also must undergo that same type of control. Does that answer your question?

A STUDENT OFFICER:

Yes, sir. Thank you.

A STUDENT OFFICER:

In the matter of producing materials what is your channel of coordination for the Army and Air Forces? For instance, take a 3-inch gun. Do you try to determine whether the Army could use that type of gun or was working on the same type of gun? In other words, what is your channel of coordination for materials? How do you get your materials? Do you get them in the form of ingots from the steel mills, etc., or get them in the form of castings or forgings?

ADMIRAL RUDDOCK:

The answer to the first question is that there is very close work between the Army Ordnance and Navy Ordnance through--I have forgotten now just who the people are, but the researchers as a rule come in about once a month and talk over what they are doing. When it comes to the determination of the requirement for a specific type of weapon such as the 3-inch rapid fire gun that you spoke about and which I mentioned, the gun itself might not by any stretch of the imagination be applicable to the Army need because of its loading characteristics and the type of cartridge case. It is then thrashed out with the Ordnance Department of the Army. There was one case in which there was such a requirement. We are building a 40 mm. special naval gun for use aboard ship. The War Department wanted that gun for a mobile gun for the field and they were having mounts built I believe by Firestone. We had a requirement for a single mount for our PT boats. We accordingly looked around and asked the War Department if we could take some of those mounts from Firestone. We got them with the necessary remote control and they were put on our PT Boats. The War Department could use them twin or quadruple in order to get a tremendous fire power in a very restricted arch for fixed emplacements. It wouldn't be mobile but it would be applicable to fixed defenses. This 3-inch gun might be suitable for fixed defenses and I am inclined to think it will because it is a relatively light, and has effective fire power. We don't know just what it will do but I personally think it will have a rate of fire heretofore thought impossible in this caliber. The Ordnance Department knows we are working on it. When we get the work done through the arsenals or other activities then we go through the Chief of Ordnance of the Army. He has some of his men work on design, give us a drawing of it, and he asks some of his officers to come down and talk it over with us. If they want work done by us, the Bureau of Ordnance will designate somebody to come down and talk with us. There is a tremendous lot of exchange work of that sort. There is basic agreement between the services as to the general dividing line of responsibility.

In regard to the procurement of material, a 3-inch barrel, for instance, would be procured as a forging from a forging manufacturer and it would be pierced when we got it. The larger gun parts, if it were

assembled, they would be built by the forging manufacturer. The slide units which we often make ourselves would be cast right in the foundry at the Gun Factory. The foundry has a capacity of about ten tons and some of the foundry work that has been done there is quite surprising. Incidentally, we are not able to do magnesium castings as yet but we hope to.

GENERAL McKINLEY:

Our time is running out. We thank you very much for coming down here and giving us this splendid talk.

(11 March 1947--350)E