

412

MACHINE TOOL PROBLEMS IN WARTIME

5 December 1946

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CONTENTS

Page

SPEAKER----- Mr. Alvin B. Einig, Vice President,  
The Motch and Merryweather Machinery Company 1

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

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RESTRICTED

MACHINE TOOL PROBLEMS IN WARTIME

5 December 1946

CAPTAIN WORTHINGTON:

The speaker this morning is Mr. Alvin B. Einig. Mr. Einig was educated at the Case School of Applied Science in Cleveland, where he received the degree of Bachelor of Science and the degree of Mechanical Engineer. He also studied at Cleveland College, specializing in finance, investments and commercial law.

He was employed in 1907 and 1908 with the Allis-Chalmers Company. In 1908 and 1909 he was with the Cleveland Hardware Company and left that enterprise to accept employment with The Motch and Merryweather Machinery Company. He has been with this important machine tool manufacturer in various capacities from 1909 until the present date. At present he occupies the position of Vice-President.

In July of 1940 his extensive experience and knowledge in the field of machine tools as well as the field of engineering resulted in his being called to duty with the government in the Office of Production Management. There he occupied the important position of administrative chief of the Tools Section, and in July of 1942 he was appointed chief of the Liaison Clearance and Service Section of the War Production Board.

In August of 1942 when the machine tool problem was well under control, he left the government service to return to his duties with The Motch and Merryweather Machinery Company.

He is a recognized authority in the field of engineering, and particularly in the field of machine tools, and the production problems incident to their manufacture.

The subject of his lecture is "Machine Tool Problems in Wartime".

"Machine Tool Problems in Wartime"

In speaking to you on the subject "Machine Tool Problems in Wartime", I might well take as my text "Victory is our Business. In time of Peace, Prepare for War".

The principal factors which determine the capacity of a country to produce armament are its working inventory of machine tools and its

machine tool manufacturing capacity. Without a factory system encompassing a metalworking industry, a nation has no war potential. Without machine tools it has no factory system.

Only machine tools can build machine tools and thus multiply the industrial and military potential of a nation.

In the field of world politics machine tool production might well be used as an index to measure the drift towards aggressive warfare. Both Japan and Germany began to build up their inventory of machine tools and their machine tool production under government subsidy as early as 1935. It is just as important to watch the expansion of the machine tool industry of a foreign nation as it is to study its reasons for increasing its military and naval establishments. Dr. Karl Lange, Director General for German Machine Construction said; "The conversion of the machine industry to war production tasks places extremely heavy loads on the machine tool industry. Machine tools are required by the armament industry, by the vehicle, airplane and shipbuilding industries. In all fields of the iron and nonferrous metal goods industries they are the decisive production equipment". Without machine tools, mass production, which is particularly necessary in war times is not possible".

In his 1940 report of the Vier-jahresplan Dr. Lange states: "Among all branches of the machine industry, the building of machine tools shows by far the strongest upswing. Not only the machine tool industry began its upward development at a particularly early date, but it had realized the greatest increase in output, so that in 1938 it was about eight times higher than in 1933. Furthermore, considerable expansions have taken place in the enterprises, and in addition factories of other branches of the machine industry were to a large degree put at the disposal of machine tool production".

1933 was a depression year in the United States and machine tool shipments for that year amounted to only twenty-five million dollars, of which twenty-five percent were exported. In 1937 our production had risen to two hundred millions, or eight times the 1933 figure; however, our curve of industry output for the period 1933 to 1939 looks like the Alps with its peaks and valleys, but the German curve starts at one hundred and fifty millions of marks, or \$60,000,000 in 1933 and goes up almost as a straight line at 45 degrees, adding 100,000,000 R.M. per year in arithmetical progression, with the results that in 1939 the German production of machine tools was almost twice the production in the United States. The curve of German machine tool production for the years subsequent in 1933 gives a vivid picture of an industry operating according to a plan.

At the request of General Wm. H. Knudsen, then the Director of the Advisory Commission to the Council for National Defense, I came to Washington with Mason Britton in June 1940 to organize a Machine Tool

Division of the Advisory Commission. In those days there was not much of a plan for defense, to say nothing about a plan for carrying the war to an enemy.

Machine guns seemed to be in some demand, but it was suggested in some circles that they could be made in parts shops on second-hand machine tools.

It was extremely difficult in those days to get any impression that those charged with the responsibility of planning the defense of our country were considering the possibility of the United States becoming involved in a global war.

So far as the machine tool industry is concerned I think the so-called pool orders placed thru the Defense Plant Corporation stand out as of prime importance in stimulating the adequate production of machine tools for our wartime programs.

The Pool order was a development of the Tools Branch of the War Production Board, or to be more accurate, of the Advisory Committee to the Council for National Defense.

Early in 1941 Mason Britton and I discussed the desirability of placing orders with the machine tool builders ahead of definite requirements and thus having equipment available to meet the actual needs of the Services when they arose.

Accordingly, the plan was submitted to Mr. Knudsen and he arranged with Mr. Emil Schram of the RFC for a credit of thirty-five millions of dollars to carry out the plan.

As originally conceived, the pool order was placed with the machine tool builder and the RFC agreed to take delivery of the equipment if a substitute purchaser was not found by the machine tool builder prior to completion of the equipment. Certain provisions were made for storage in the event that became necessary. Later, other provisions were incorporated in the pool orders, such as cash advances to provide working capital for the machine tool builder who found the volume of the business placed with him beyond his own resources, or greater than ordinary prudence would dictate.

The first pool order was for 500 Pratt & Whitney 14" Tool Room Lathes of a model just prior to the model then in current production by Pratt & Whitney. The lathes covered by the pool order were built by the United Shoe Machinery Company and did not interfere with the operations of the Pratt & Whitney Company.

I wish to call your attention to the fact that the machines covered by the first pool order were not special machines for the manufacture of some intricate piece of military materiel, but standard tool room lathes which were at that time in demand and which were needed for the manufacture of jigs, gages, and tools, as those things come before the

manufacture of production machinery and product.

The question often arises concerning the type of equipment to be stored to meet emergency requirements, and it is my feeling that first of all should come an adequate amount of standard tool room equipment. Experience has shown that a war is usually started with the military equipment of the previous war and then the race begins for new types of military materiel with the enemy setting the pattern in many cases. The experimental work and the building of the prototypes is carried on in tool rooms, and the building of tools, jigs, fixtures and gages necessary for putting the new model into production is a tool room job. Accordingly, the first impact of a new production schedule is on the tool room.

It did not take long to use up the initial thirty-five millions and we went back for more and received an additional credit of seventy-five millions from the D.P.C.

While we were working on the seventy-five million dollar credit, the five hundred bomber program was inaugurated and we asked the Air Corps for a schedule of the amount and type of equipment which would be required. The Air Corps had no definite information and approached the problem by asking the manufacturers of air frames and engines for an inventory of their present equipment and the production obtained with that equipment. They then divided 500 by the total production figure and obtained a factor which was used to multiply existing equipment to obtain the total required for a production of five hundred bombers per month. Obviously that was a crude approach to the problem because it did not take into consideration the fact that in many cases quantity production permits the use of an entirely different type of equipment than that used when product is built in small lots.

There was a preliminary estimate that the job would require a total of about five hundred million dollars of machine tools, and that figure was sufficiently large to warrant the D.P.C. asking for the name of the ultimate user. As the total figure represented the requirements of prime and subcontractors it was not possible at that time to tell who the subcontractors would be, so we compromised on two hundred fifty millions as representing the requirements of the subcontractors and assuming that the prime contractors would place their orders direct for their needs, we placed pool orders in such quantities and for such types of equipment which in our judgment would be required to meet the overall needs of the program. Later on Ferdinand Eberstadt advanced the idea that the machine tool program should be on the basis of too much and too soon and practically all of the machine tool builders were given pool orders for about fifty percent more equipment than called for by their present manufacturing schedule, the theory being that if a manufacturer has a very definite order on his books, with a cash advance, he will do something extra special to complete that order.

During this period the machine tool builder was having his troubles with the draft boards, supplies of material, transportation and raids made on his, experienced help by other high priority industries who were not operating under O.P.A., but the one thing that aggravated the situation most was his inability to find out what was needed, in what quantity and when.

The pool orders helped the builder keep his plant operating at top capacity, but it did not solve the problem of what was to come first, with sufficient advance notice to intelligently plan his schedule, or eliminate frequent schedule revisions to meet critical needs. The pool order was a wonderful device and it served many purposes other than keeping the machine tool plant at peak production and providing quick deliveries for the contractors turning out military material.

When the British ran out of money prior to Lend-lease, I placed their requirements under pool orders and later transferred them to Lend-lease. Likewise, I placed orders for chemical and electrical equipment which were charged against the machine tool pool account as the Tools Branch was the only division of W.P.B. with a credit at D.P.C.

I want to give you some figures on the cost to the government of the pool orders for machine tools.

The pool orders amounted to a total of \$1,945,000,000.00. The cash advance was \$398,500,000.00. The D.P.C. placed in storage \$23,000,000.00.

Sales out of storage were \$21,000,000.00.

Amount declared to Surplus Property Board \$2,000,000.00; cost of cancellations \$10,300,000.00.

There will be some salvage of the \$2,000,000.00 which was turned over to W.A.A., but if we ignore salvage, we have a loss on a \$2,000,000,000.00 machine tool program of 0.1%.

The cancellations should not be charged to the plan as they were for the most part brought about by changes made by the Services and should be charged to the Services; however, including the ten millions of cancellations, the total loss on the pool orders was 63/100ths of 1%.

The cutting tool pool programs show a similar record.

The cutting tool pool order total amounted to	\$78,144,000.00
Advance payments were	\$20,370,000.00
Cancellation cost	\$ 576,900.00
Loss on pool orders	.73%

Not only did the placing of pool orders make possible mass production of machine tools and cutting tools, but the plan insured deliveries when needed. From a cost standpoint I think the record is without parallel.

The rate of production increase of the machine tool industry can be appreciated from the following figures.

1935	-	\$	85,000,000
1936	-		133,000,000
1937	-		195,000,000
1938	-		145,000,000
1939	-		200,000,000
1940	-		440,000,000
1941	-		775,000,000
1942	-		1,320,000,000
1943	-		1,180,000,000
1944	-		494,100,000
1945	-		407,315,000

A total of \$4,816,000,000 for the seven years 1939-1945, or an average of \$700,000,000 per year.

Naturally, the increase in shipments after 1939 called for an increase in capacity and in 1940 that was obtained in some measure by financial assistance rendered certain machine tool builders by the British and French Governments.

However, it soon became apparent that the machine tool industry would have to be expanded far beyond the limit set by normal peacetime requirements and business prudence, and surveys were made to determine the probable future requirements for all types of machine tools.

Perhaps this is a good place to mention that the Ordnance surveys conducted after World War I were of little value as an index of machine tool requirements in World War II. The Ordnance tabulation of machine tool requirements was probably less than one month's production at the 1942 rate of the Machine Tool Industry which brings us back again to the old refrain: What kind, how much and when?

As a result of our own survey of machine tool production and probable requirements, steps were taken to encourage increase of plant capacity by means of the Certificate of Necessity, or accelerated depreciation plan, the Emergency Plant Facility Contract and the Defense Plant Corporation Contract backed up by a D.P.C. pool order.

It would be a fine thing if we could have at once whatever we needed simply by rubbing a lamp, but that is not the way things happen in wartime.

The plant expansion contracts and the pool orders were placed when their need was actual or indicated and at that time any other course would have been subject to the objection, that much needed material and manpower were being tied up in creating facilities and machine tools which might not be needed. If machine tool requirements could be projected so that the machine tools could be produced during periods when that activity would not interfere with other programs it would be a fine arrangement and equivalent to the stockpiling of critical war materials. This of course would also apply to the small tool and cutting tool industries in so far as standard equipment is concerned.

Most of the wartime requirements call for machine tools of standard specifications, and production of these could be started just as soon as instructions could be sent to the builders, thus saving valuable time for those programs requiring only standard machine tools. With those in some measure out of the way, the machine tool builders would be in a better position to handle the special jobs when they came along.

Now the question arises concerning what increase in machine tool output should be considered as of "M" Day.

In the case of World War I and World War II we had over two years to step up our production at the expense of the belligerents before we were drawn into the conflict, so let's take a look at those periods, realizing that the next time the war may start with us and we will have to start our industries from scratch:

1913	machine tool production was	\$ 44,600,000
1914		\$ 35,300,000
1915		\$104,300,000
1916		\$141,400,000
1917		\$168,500,000
1918		\$220,600,000

The increase from 1914 to 1917 was largely for the account of private industry working for the Allies, i.e., England, France, Italy, Russia and Japan.

I came to Washington with the late George E. Merryweather early in April 1917 to set up the Machine Tool Division of the War Industries Board, or as it was known at that time, the Munitions Board. I immediately got in touch with the Ordnance Department concerning their machine tool needs and found that they had on order one small milling machine and one small universal grinding machine. After arranging to have those machines delivered at once by diverting machines on private orders, I inquired if there was anything else required and was told that a carload of molding sand was needed for Watertown Arsenal. I arranged with the American Railway Association to expedite delivery of the sand and went looking for more urgently needed equipment and was informed that if the thing happened that we feared the Ordnance Department would need fifty typewriters and

typewriter desks. So you see with the country on the verge of war there was no authority or funds to enable the department to anticipate requirements even if they were known.

But let us take a look at the figures and see what they tell us: From 1914 to 1918 the output of machine tools expanded from \$44,600,000 to \$220,600,000 or roughly five hundred percent. From 1939 to 1942 industry increased from \$200,000,000 to \$1,320,000,000 or about six hundred and sixty percent.

Accordingly, as it is necessary to expand machine tool production in time of war five or six times the peacetime output, it would seem that pool orders could be issued as of "M" Day for at least twice the normal peacetime production of standard machine tools, thus permitting the machine tool builders to immediately take the necessary steps to expand facilities to meet wartime requirements which seem to average for the entire war period three times the normal peacetime shipments of the year just prior to the declaration of war. It must be kept in mind that both in World War I and World War II it took the machine tool industry three years to equal the average rate of production of the war years due to initial delay in expanding the industry. Like most production curves, the production curve of the machine tool industry in time of war is below the demand curve for several years.

By placing pool orders with practically all established machine tool builders as of "M" Day for three times their normal peacetime production standard machines, a backlog would be created against future requirements. The machine tool builders would be given an opportunity to increase their facilities and organization, and by increasing the output of standard machines in the early period of the war, capacity would be available for handling the special machines when their specifications became available. Further pool orders would be placed as the requirements became clear.

In the past we have found that when we got into the war, considerable business had been placed for foreign account and it is recommended that as of "M" Day all foreign shipments, except for the account of such Allies as we may have, be suspended and that the machine tool builders be asked to furnish immediately a complete list of all foreign orders on their books and all foreign shipments made during the previous ninety days with the name of the customer, country of destination, date of shipment, name of forwarding agent and port. Equipment thus impounded is made available to prime contractors either thru a negotiated sale or by means of a command order. At this time there is considerable agitation to have the Service preserve in storage a very liberal amount of government owned surplus machine tools. The number of tools being retained by the Services is wholly inadequate. It should be not less than 10% of wartime production or a minimum of 100,000 tools carefully chosen. The type of equipment going into scrap is in many cases just the kind that should be stored against an emergency.

I am assuming that the latest type of small arms manufacturing equipment along with the ammunition equipment will be retained and that the government arsenals and gun shops will see that ample equipment for the manufacture of artillery and ammunition is in storage. However, I am thinking of other types of equipment which is expensive and takes a long time to build, such as hydraulic and mechanical presses and testing equipment.

When the plans for the two-ocean navy got under way, I sat in a meeting of heavy forging manufacturers called together by the Navy to consider the requirements for propeller shafts required by the new program. Having in mind that the equipment for handling these heavy forgings would also have to take care of forgings for guns, tie rods for forming and extrusion presses, forged vessels for the chemical and petroleum industries, etc., I inquired if ample flat die forging equipment was available as well as the necessary turning and boring equipment. I was told that nothing was needed. However, we time-studied the boring and turning operations on the Navy shaft job and commandeered boring and turning equipment just being completed for the Russians and later we found that it was necessary to place orders for hydraulic forging presses. As early as 1935 I made a recommendation that the Services acquire hydraulic forging presses when they could get such equipment at rock bottom prices without interfering with anything except a W.P.A. program for raking leaves.

In the case of the aluminum and magnesium programs, great stress was laid upon the creation of plants for the production of virgin metal, but little consideration was given to the type of equipment required to make that metal available to the manufacture of air frames for our expanding aircraft programs.

I knew that we did not have extrusion equipment in this country to handle the requirements and called the attention of the Aluminum and Magnesium Section to that fact. After considerable persuasion I finally got a letter from that section to the effect that they would sponsor four machines. As similar machines were required for cupro-nickel condenser tubes and ammunition brass, I took a chance and ordered sixteen machines, eight of two thousand ton capacity and eight of thirty-six hundred ton capacity, all with piercing equipment. Before the program was over approximately one hundred heavy extrusion presses were installed to meet our requirements. Those initial orders saved about a year in getting the Aluminum and Magnesium program properly started.

This extrusion press story has a few interesting sidelights. Probably the most experienced firm in that line was the Schloeman Engineering Company of Dusseldorf, Germany, who had an office in Pittsburg. During the Stinnes regime, two brothers by the name of Loewy obtained control of the Schloeman plant and later when Hitler came into power they found it advisable to take refuge in England, later coming to this country.

As Schloeman in Pittsburg and the Loewy brothers had the information that we needed, the order was split between them, the actual construction of the equipment to be subcontracted. This arrangement left the established sources of supply in this country available for other requirements.

It was necessary to have the Loewy Brothers incorporate in this country which they did under the name of Hydropress and it was necessary to work out a plan with the Treasury to have Schloeman operate under blocked funds as the Treasury officials felt that the connection of the Pittsburg office with the parent company in Germany was too close for comfort. However, both concerns did a very excellent job in carrying out their contracts.

Along with the extrusion press requirements was also the need for heavy steam drop hammers for forging aluminum and magnesium, which came along when steel foundry capacity was extremely critical.

Advance planning would have got the heavy steel castings for this sort of equipment including forging machines instead of sending the steel scrap to Japan and thus introducing a scrap shortage when we were desperately in need of material.

Recently I was in Japan as a member of the United States Reparations Mission and investigated the machine tool industry. Japan developed the machine tool industry in Japan proper and in Manchuria thru the Zaibatsu or Japanese trusts and encouraged expansion thru monopoly and a guarantee return of 10%. Really the industry was negligible prior to 1935 when Japan went into Manchuria, but a rapid development occurred since that date and a very considerable number of the plants were built subsequent to 1940. Bombing destroyed less than 6% of the industry.

In Manchuria I inquired concerning the use of cemented carbides and was told that in the early days of the war they were extensively used but had to be abandoned when the supply of suitable grinding wheels from Japan was stopped, so along with stockpiling machine tools and cutting tools should go abrasives which are of major importance to present day industrial processes.

The Germans also started to increase their machine tool industry in 1935 and by '39 it was in the pink.

Gages and measuring equipment of a universal character should be stockpiled against the day when they will be needed in great quantity. Having the standard measuring equipment on the shelf will permit the gage makers to concentrate their efforts on the special equipment which is always critical.

My experience with machine tools in two wars convinces me that a civilian agency such as the War Production Board responsible for the development of sources of supply and the allocation of material and

facilities, cooperating with, but entirely independent of the Services is a necessity. The Services should be plenty busy developing the tactics of war, determining the type and quantity of material needed and the timing of the flow of military materiel. I mean actual timing in connection with a well developed plan of having the most important things come first as a matter of actual military necessity and not to establish some sort of a record for promotion at the expense of life and property.

A number of outstanding issues are readily recalled where the Services insisted on curtailing programs which were sponsored by the civilian planning agencies, programs which later events proved were vital to the war effort.

The Maritime Commission, while establishing a record for ships, did what they could to scuttle the building of the Big Inch and the Army was very late in realizing the need of a synthetic rubber program. Their idea was to make people walk to work. Even the top flight Army people spent a lot of valuable time worrying about the comic strips.

In World War I we were asked to lay out a plant and develop equipment sources of supply for a plant for relining guns in France.

While we were on the job a Major showed up saying that he had been assigned to follow the job through and that he would appreciate it ever so much if we would make a special effort to make the report attractive and well illustrated with photographs of the equipment recommended. He wanted to present the report personally to his chief. We worked night and day with the man at Watervliet and the Naval Gun Factory to get the report finished, and dressing it up with photographs we delivered it to the Major. About two weeks later I met the Major on the street and asked him how the report was received. He told me he had not turned it in because he was waiting for a Morocco leather cover from New York as he hoped the report with the ornate cover would be the reason for changing his oak leaf from bronze to silver. I suppose we will always have "apple polishers", but they are expensive.

Another thing that made a great impression on me during World War I was the shutting down of industry by the Fuels Administration on the Fuel-less Mondays. When that happened we got in touch with the Secretary of War and explained to him that until the Army and Navy had their plants equipped with the necessary machine tools, it was folly to shut down the machine tool plants. The Secretary referred the matter to the Chief of Ordnance who said there was no record in his office of any machine tool requirements and it was only by pleading with the Secretary that the plants were kept running.

I mention this only as a sample of the vigilance necessary to keep the production of machine tools from being curtailed by people who do not understand production problems involving the use of machine tools and metalworking equipment.

Another case of polishing the apple was in connection with the production of the French 75 mm. field gun. A. J. Baker, who during the last war was with the British Purchasing Commission, was a member of our group in World War I. Baker and I were asked to give an opinion as to whether the French 75 could be tooled up as quickly as 1916 U. S. field gun. We stated that there was no difference as we could furnish the equipment as readily for one as for the other. We were quickly excused and later when I inquired if we had done something out of order I was informed that we were expected to say that the U. S. Model was preferred rather than the French 75.

When we started our defense program in 1940 we found that the British and French had about half the machine tool capacity working on their order and later as our defense program needed equipment for prompt delivery, it was necessary to raid the British orders. That worked pretty good for us, but of course was an interference with the British plans. On one occasion we had a request from the tank section for a machine tool to be taken away from the British and the Army representative recommended that the request be denied as we had plenty of old tanks for training and certainly had no need for tanks.

I mention this to support a previous observation that the time and talent of the professional men in the Services should be spent in looking forward to determine what they need to win a war and when they need it and how much. The time table should start with the assumption that the necessary machine tools will be available to turn out the military materiel in accordance with the plan. There will be enough troubles taking care of changes in plan and changes in arms and armament without any additional ones due to lack of any plan.

Along in 1943 some of the people in the Army and Navy got the idea that the machine tool industry had fulfilled its mission and agitation was started to channel contracts for various things other than machine tools into the plants. Likewise, the selective service people began taking men away from the machine tool builders. That was a serious mistake as later events amply demonstrated, particularly during the "Battle of the Bulge", that the machine tool industry should not be written off while a war is still in progress.

Another bad move on the part of the Services was the sending out of instructions to prime and subcontractors to have all of their orders placed by a certain date.

The instructions were certainly misunderstood by the contractors with the result that the machine tool industry was flooded with orders which were followed by a flood of cancellations. The whole industry worked night and day for weeks digging out from under an avalanche of paper work and bringing order out of confusion compounded by that ill-advised directive.

The problem of the machine tool industry was to secure accurate information concerning what was actually going to be needed. Instead of furnishing that information it was all too common in some quarters to raise the cry that machine tools were a bottleneck. I know of no important program that was retarded by a lack of machine tools. The Machine Tool Branch of the War Production Board actually had to set up a police force to keep contractors from accepting delivery of equipment before they had even started work on the buildings and some of the Services had their own systems of hoarding machine tools.

Another common cry was that the machine tool builders were seeking special consideration. If any such consideration was sought, it was only because of a firm conviction that first things should come first.

A machine tool can be used to make shell, but if you need a lot of shell, then use the machine to make machines for making shells. That is a fundamental principle and special consideration should be given to the industry until the Services can be sure that they have all the machine tools they will ever need. The Services should be willing to take full responsibility for any shortage of machine tools and not pass the buck by calling the industry a bottleneck.

There are a lot of things that can be done by the Services to speed up production in time of war. Among such I would list the following:

1. Bring the manuals of practice for munitions manufacture up to date based on the best practice at the end of the war. For example: What was the best practice for producing artillery shells? Many of the operations set forth in the manual on the manufacture of shell were obsolete long before the end of the war.

2. Bring the practice up to date on equipment balanced for maximum production. For example, the daily production should be based on all the equipment being busy. There should be enough equipment on the slow operations to balance out the fast operations. This would give the maximum overall production with the minimum number of machines.

3. Promote research in cutting tools and materials such as are carried on at California Institute of Technology and the University of Michigan.

4. Study the fiscal practices of the past war with a view to eliminating practices which are conducive to delay in the placing of contracts. For example, renegotiation and cancellation procedures; Attempts by the ill-informed to change long established trade practices in time of war.

5. Develop emergency regulations. For example, the plan of Mr. Baruch to freeze all prices including rents and wages as of "M" Day.

6. While the practice of commandeering machine tools from one plant for the benefit of another was never an important factor, still a machine tool census would be of some value and is always suggested after we are well into the war.

7. Study security measures and eliminates the needless waste of barbed wire and guards, and great duplication of effort by the various agencies all striving to build a big organization, with catching crooks as a side line.

8. Have industry committees study the elimination of critical materials in design of war materiel; i.e., substitute plain bearings for precision ball bearings on radio dial shafts.

9. Stockpile such things as standard anti-friction bearings and design for their use, not for special bearings.

10. Check designs for standard components. For example, use standard size thermos bottles in planes, not a special size for each model of plane

11. In the case of pool orders covering standard machine tools, reduce the accessories to a minimum. Not all engine lathes need three chucks and not all turret lathes should be furnished with both bar and chucking equipment.

12. Investigate means of encouraging labor to operate metal working equipment at its full capacity. During the last war a third more machine tools were purchased than were needed for unrestricted production.

13. Study the experience of the last war from the standpoint of eliminating the waste of time usually employed in determining the field of action of the Services and the field of the civilian agency such as the War Industries Board.

In the early days of the late war I asked Mr. Baruch, with whom I worked in World War I, why there was so much pioneering going on in the Services and in W.P.B. He said it was because there was only one man in Washington who could read, as the procedures to be followed were all set forth in the final report by the War Industries Board.

In World War I it took quite some time to establish the field of authority of the Services and of the War Industries Board. In World War II that battle was fought again between the Services and the War Production Board. Finally, the Assistant Secretary of War and the Under Secretary of the Navy issued instructions on March 16, 1942 defining the relationship with the War Production Board. I think that statement can be generally accepted and perhaps improved upon. Certainly it can be assumed that with our type of government there will be a civilian agency working with the Services in time of war and it is a waste of time and talent to try to nullify that agency.

While this country has been the greatest producer and user of machine tools and metalworking equipment, we must realize that much of the metalworking equipment of Germany is going to Russia in the form of reparations and restitution, and we must keep in mind that much of the very heavy equipment of the very latest type will find its way behind the "Iron Curtain".

Next to your chosen profession, the machine tool industry should hold a prime interest for you gentlemen, because it is the basic industry for the production of the tools of your profession. You should be the guardians of the machine tool industry, alert to see that the machine tool industry is not allowed to deteriorate in this country due to pernicious legislation which would stifle its growth and retard its development. Unless backed up by a strong and vigorous machine tool industry, the Army and Navy cannot fulfill their appointed mission of defending and protecting our country.

What I have said to you may sound critical of the wartime performance of the Services, but believe me when I say that it is intended as constructive criticism as I am a great admirer of the men who make up our Armed Services. If I speak in parables, it is only to point up certain situations where I think improvement is possible.

In closing, I wish to emphasize the fact that war at best is a wasteful business and such being the case, it is usually determined in favor of the side that approaches it as a prodigal, not in the sense of being wasteful, but as one who having thoroughly planned the logistics of the operation, shoots the works.

I am quite sure that wars are not won by misers.

(10 December 1946---350)L.