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Czechoslovak Engineering and Its Further Tasks

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Czechoslovakia

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ENGINEERING

~~THE~~ CZECHOSLOVAK MACHINE INDUSTRY AND ITS FUTURE TASKS

Ceskoslovenské Strojírenství a Jeho Další Úkoly,
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~~Státní Nakladatelství Politické Literatury~~
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by Rudolf ~~PLATZER~~

PART I.

The Preferential Increase of the Production of Production Means.

The constant repetition and expansion of the production of ~~products~~ material goods - expanded reproduction - is a preliminary condition to the ~~material~~ ^{continuous} development of the Czechoslovak national economy. Expanded reproduction is ^{not only} the repetition of ~~production~~ the production process ~~mainly~~ for the purpose of replacing used production means (raw materials and materials, machines, mechanical equipment, buildings, etc.) and articles of personal use (clothes, food, etc.); it is also a repetition of the production process on an increasingly larger scale. In the repeated production process society replaces the used material goods and also makes more such goods, first, to insure the expansion of the volume of production in the future production process and, second, to satisfy on a larger scale the increasing demands for consumers' goods.

The process of expanded reproduction as a whole is primarily a process of the expanded reproduction of social production. Social production embraces all material goods which society created, for example, in one year. Social production is formed in the sphere of material production - in industry, agriculture, building, transportation of goods and partly also in commerce (to the extent that such operations are conducted in commerce which are a continuation of the production process - sorting, packing, storing etc.)

The entire social production is divided into two large groups. The first group is the production of production means which are destined

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to return anew into the production process. (To this first group belong most of the products of the heavy industry). The second group embraces the production of consumers' goods which are intended to satisfy the demands of the population. (To the second group belong most of the products of the light- and food industries.)

The major role in the process of reproducing social production is played by the reproduction of production means and primarily of tool machines, since the ~~continuous~~ ^{continuous} increase and improvement of tool machines are necessary conditions for the constant expansion of production on the basis of advanced technical science. The expanded reproduction of production means insures the possibility of expanding the production of ~~consumers~~ consumers' goods, such as foods, textiles, shoes, metal consumers' goods etc. The ceaseless increase and improvement of tool machines are, therefore, necessary to insure the fulfilment of the material demands of society on a constantly wider scale.

Expanded reproduction demands that production be constantly renewed and increased at a certain ratio. Therefore, in accordance with the ~~basic~~ requirements of the basic economic principle of socialism and of the principle of the planned (proportional) development of the national economy, the required ratios between the production of production means and that of consumers' goods, also between the various branches of the national economy, is systematically established in the process of social reproduction. The most important proportion of social reproduction is the proper ratio between the first and second group of products. The first groups, however, play the decisive role in the entire national economy. Without the preferential increase of the production of production means, it is impossible to achieve expanded reproduction. This means that without it we are unable to expand production and thereby meet the increasing demand of society on a constantly increasing scale. "To increase production, it is ~~indispensable~~

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first of all necessary to ~~make~~ make production means. Therefore it is necessary to expand that branch of production which makes production means.

The preferential increase of the production of production means (primarily tool machines) is also a necessary condition for the wide application of advanced technical science in all branches of ~~the national~~ the national economy, and thereby also for the ~~systematic~~ systematic increase of labor productivity and economy in production. For ~~the reason~~ ^{such} an increase of production, in which the rise of the first group is more rapid than the increase of the second group, is characteristic of expanded socialist reproduction accompanied by the rapid progress of technical science. Simultaneously, in socialist society the production of consumers goods is constantly increasing. This is reflected by the constant increase of production in agriculture, food- and light industry, ^{urban and rural housing} ~~the production of housing~~ in the ~~country~~ development of commerce, etc.

The basic branches of the heavy industry which provide raw materials and materials (production supplies) are: coal and ore mining, the iron and steel industry, the chemical industry (the production of artificial fertilizers, fuels), the power industry (electricity) etc. This group of production means is of exceptional importance in the development of the national economy. Without them it is not even possible to manufacture consumers' goods. Therefore, the faster their production increases, the more opportunity society will have to manufacture ^{its own} consumers' goods for its use. This explains ^{the heavy industry's} key importance and the need to develop it rapidly and preferentially. Failure to insure the preferential production of production means would make the constant development of the national economy impossible and this in turn would sooner or later restrict the development of the production of consumers' goods.

* Lenin: The characteristics of economic romanticism. Works of Lenin, Volume 2 Svoboda 1952, pp 145.

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With the general and rapid development of the heavy industry it is possible to achieve a considerable increase in agriculture, the light- and food industries. This is not a question of the heavy industry serving its own ends. Only by maintaining and supporting the leading role of the heavy industry is it possible to insure an abundance of ~~the~~ articles of mass consumption in Czechoslovakia.

Because of the objective need for the preferential and more rapid development of the heavy industry, the construction of socialism in the Czechoslovak republic is marked by a basically more rapid ~~increase~~ rise of the heavy industry than that ~~in~~ the light industry. Thus, for example, in 1955 the production of production means in industry increased to approximately 172% as compared to the 1937 level, where ~~as~~ the production of consumers' goods increased to 112%.

The heavy industry was the basis of the development of the Czechoslovak national economy. The results, which the Czechoslovak working people achieved in the construction of a new society, must be linked directly to the development of the heavy industry.

In the future it will be necessary to continue along this right road which insures ~~the~~ constant increase of the standard of living for the Czechoslovak people. For this reason the second ^{Czechoslovak} five year plan will be based on the more rapid development of ~~the~~ production in the ~~heavy~~ ~~industry~~ ~~and~~ ~~light~~ ~~industry~~ ~~than~~ heavy industry than in the light industry.

The most important branch of the heavy industry is the machine industry which manufactures ~~the~~ ~~essential~~ tools. It plays an important role in the development and strengthening of the country's ^{economic life} ~~industry~~ and national defense, also in the development of all branches of the national economy. Especially the Czechoslovak iron and steel works, mines, the chemical industry, power industry, transportation, agriculture, construction industry etc. are placing great demands on the machine industry. The machines

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supplied by the Czechoslovak machine industry to the individual branches of industry, not only increase labor productivity, but also improve working conditions and provide safety. By completing the tasks assigned by in the first five year plan, the Czechoslovak machine industry has insured also in the years of 1954-55 the rapid socialist industrialization of Czechoslovakia. For this reason in the past years the machine industry was considered the leading industry of the Czechoslovak national economy.

In respect of the enormous significance ~~of this development~~ of the production of production means for the further development of the Czechoslovak economy, it is necessary to continue to attach exceptional significance to ~~the~~ development of this branch of industry.

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The Development of the Czechoslovak ^{Engineering} Machine Industry Before 1945.

Especially in the last thirty years, the Czechoslovak machine industry ~~has undergone~~ ^{try has undergone} a considerably rapid and simultaneously complex development. In this period its significance in the national economy has increased considerably, the volume of its production shows a significant increase, and the assortment of its products has widened. With respect to these basic changes, the machine industry of to-day cannot be compared with that of capitalistic Czechoslovakia.

Frequent changes can be noted in ~~the course~~ of the machine industry's ~~development~~ course of development and in a comparatively short time its concepts have changed several times. The following stages can be recognized in the development of the machine industry: the economic crisis, the armament boom of the pre-war years, the period of World War II, post-war reconstruction in 1945 and '46, the Two Year Plan, the first Five Year Plan and the period between the first and second Five Year Plan.

During the capitalistic regime the Czechoslovak machine industry achieved the first summit of its development in 1929. Its favorable de-

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velopment, however, was interrupted by the economic crisis which affected this industry much more than the others, ~~causing a sharp decline in production~~ disrupting it to a considerable extent. This fact can be judged best on the basis of the following figures: Whereas the maximum decline of industrial production did not exceed 58,3% of the 1929 figures, machine industry production dropped to not quite 34% for the same period. In the years of economic crisis the machine industry, naturally, developed in accordance with market demands, while the production of arms gradually increased its ratio in proportion to the total production of this industry, and from 1935 on dominated it entirely. The adjustment to arms production enabled this industry to increase its production by more than 70% in the years from 1935 through 1937 and to surpass its 1929 production level.

The economic crisis and ~~the~~ subsequent preparations for World War II ~~had~~ had a penetrating effect on the structure of machine industry production, determining the ~~extensive~~ degree of its concentration, specialization and technical level. The ratio of arms production - arms, munition and airplanes - rose considerably in proportion to ~~the~~ total production. ~~Together with these industries, the others increased their production, thus for example: electronics, processing machines, etc. Their development was made possible and necessary by the armament boom itself.~~

~~also~~ and significance.

Together with these industries, the others increased their production, / thus for example: electronics, processing machines, etc. Their development was made possible and necessary by the armament boom itself.

Simultaneously with the development of production, extensive concentration was also achieved. In the period following the economic crisis large concerns were formed in Czechoslovakia. The most prominent ones among these were the Skoda Works, the CKD, The Československa Zbrojovka (Czechoslovak Munitions Works) and the Ringhoffer Works, etc. These concerns gradually ruled more than 80% of the machine industry's total production. This gives one a fair idea of the extent of the concentration

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which had been achieved.

Despite its increasing importance in industrial production, the pre-war machine industry was marked by faulty construction and incompleteness. Despite its high scientific level and expansion, the pre-war machine industry was unable to supply the national economy with ^{the needed} machines and mechanical installations. During the entire period of capitalistic development, the Czechoslovak machine industry was compelled to insure a large import of machines from abroad. Besides this the machine industry, in a considerable volume of products, was forced to rely on completing parts from abroad, especially from Germany and Great Britain.

The high concentration of production enabled the German invaders to gain control of the Czechoslovak machine industry in a short time and to adjust it to their armament program. During the war, arms production reached its height in 1943. After that its volume constantly declined in accordance with the military situation. Fascist occupation, therefore, did not improve pre-war conditions in the Czechoslovak machine industry, only made them even worse, causing heavy losses in this industry, disorganizing it and increasing its dependence on the capitalistic countries. Toward the end of the war the Western "allies" ~~also~~ considerably reduced the capacity of this industry by their air raids, especially against Plzen, Prague and Brno. In this way they ^{also} reduced the machine industry's ability to ~~supply with the capacity~~ fulfill ~~capacity~~ the needs of the rapid reconstruction of the national economy.

These briefly outlined facts compelled the Czechoslovak National economy, after the liberation of the country by the Soviet Army, to part with the mistakes and deficiencies of the former machine industry production, to end its chaotic development, to place it on a new basis which will insure its self-sufficiency and a lasting development of the technical level of the entire national economy.

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The Development of the Czechoslovak Machine Industry in the Period From 1945 Through 1949.

After its liberation Czechoslovakia was faced with the difficult task of reviving ^{her} ~~the~~ disrupted economy, ^{to} ~~reconstructing~~ and developing it in such a fashion as to insure its constant development, ~~and~~ a steady rise ~~in~~ the standard of living, ~~and~~ the independence of the country and its national defense. For this reason both the Two Year and the Five Year Plan placed great emphasis on the development of the machine industry.

The first task of the Czechoslovak machine industry in the people's democracy was to readjust war production to peace production, switch the full capacity of this industry into the reconstruction of the national economy. The required pace of development in the individual industries was hampered by transportation difficulties and ~~material~~ shortage of material. A considerable lack of railroad cars, locomotives and trucks demanded the speedy development of these industries. Factories manufacturing finishing machines and agricultural machinery were faced with the task of overcoming the lag behind the world level, their backwardness being caused by Czechoslovakia's isolation during World War II.

To insure the task of reconstructing the national economy, it was necessary to merge the individual nationalized enterprises into one great unit - the new Czechoslovak machine industry -, to rectify the location of the production programs and to accelerate the needed consolidation in this industry.

Basically the aim of the Two Year Plan was to renew the Czechoslovak national economy, ~~and~~ restore its pre-war level, and only partly to develop it further. Thus the Czechoslovak Two Year Plan, unlike the first Five Year Plan in the Soviet Union, was not a plan for ~~the~~ ~~reconstruction~~ ~~of~~ ~~the~~ ~~national~~ ~~economy~~, ~~but~~ altering the structure of the national eco-

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onomy. Basically it retained the former structure of production. It was considered that this period was sufficient for the restoration of the national economy because of the considerable degree of its development.

With regard to the situation in the Czechoslovak national economy after 1945, the machine industry was assigned such roles in the Two Year Plan as were necessitated by the most urgent post-war problems of the country, as for example: the production of railroad cars, locomotives, tractors, trucks, cars, agricultural machinery. Naturally, the Two Year Plan also called for an increase in the production of consumers' goods.

The Two Year Plan of the Czechoslovak national economy contained only special tasks which insured:

the restoration and increase of the capacity in the production of transportation means,

the reconstruction of production installations in the iron and steel industry,

the mechanization of agriculture,

a rise in the standard of living.

The consolidation of the nationalized enterprises was so successful that by 1947 the national enterprises were already able to achieve a higher productivity of labor than in the private enterprises. Besides, the national enterprises were manufacturing products which required much more work than the production of the private sector which to a considerable extent only installed products manufactured by the national enterprises.

The Two Year Plan for developing the national economy has fulfilled its tasks. National economy has revived and the enterprises have been adjusted to peace-time production. The production of consumers' goods has also developed to a considerable degree.

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The Significance and Tasks of the Czechoslovak Machine Industry in the First Five Year Plan.

The renewal and revival of the national ~~new~~ economy did not create any basic changes in the structure of industry nor -consequently- in the dependence of Czechoslovakia on the capitalistic countries. It became necessary to alter this situation in accordance with the statement of Klement Gottwald made to the workers of the Central Planning Commission on 10 October 1947.

The task of constructing socialism and reconstructing the Czechoslovak national economy in the first Five Year Plan was one of historical significance.

The basic tasks of socialist industrialization in Czechoslovakia demanded, first of all, the readjustment of Czechoslovak industry in a very short time. The rapid pace of reconstruction was made necessary by the internal and external conditions of the development of the Czechoslovak state and its national economy. The external conditions were created by the fact that reconstruction began to materialize in an era when the differences between the peace camp and the imperialistic world were constantly sharpening. At the same time the capitalistic countries endeavoured to retard the pace of ~~Czechoslovak~~ reconstruction and ~~socialist~~ construction of socialism in the Czechoslovak economy to the greatest possible extent, through discriminatory policies (as for example: ~~the~~ cancelling the shipment of ~~machine~~ machines already paid for, etc.). Questions pertaining to the pace of reconstruction would not have become so critical, had the Soviet Union and the people's democracies possessed the same high industrial potential as the capitalistic countries. In other words: it would have been necessary for the people's democracies to have a substantially more developed industry, respectively machine industry, than they had in the years from

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1949 through 1953. It was necessary to create ~~them~~ in the shortest possible time the conditions required for the socialization of Czechoslovak agriculture. Internal conditions ~~them~~ demanded a rapid pace of industrial reconstruction, the same as external ones.

Other people's democracies like Poland, Hungary, Roumania etc. were in an even less favorable position. ~~Export of the Czechoslovak industry~~ Along with the machine industry of the Soviet Union, the basis of socialist industrialization in these countries ^{was} ~~depended~~ to a large extent ~~on~~ the Czechoslovak machine industry. To aid ~~the~~ the development of industries in these countries was one of the most important tasks of the Czechoslovak first Five Year Plan.

The importance of the Czechoslovak machine industry in the period of the first Five Year Plan ~~must be~~ ~~recognized~~ recognized in the task of insuring the general reconstruction of the national economy through shipments of the needed kinds and quantities of machinery and installations, and also in the task of contributing to a considerable degree to the socialist industrialization of the other people's democracies. For this reason the machine industry became the most important chapter of the five year plan. And for this reason the Communist Party of Czechoslovakia and the Czechoslovak government have paid close attention to this industry in the past years.

With the first Five Year Plan a new period began in the development of the Czechoslovak economy. The volume of industrial production increased year by year. In 1953 industrial production rose to 200% in comparison to the 1948 level, and to 250 % in comparison to 1937. Thus it has exceeded by 53% the highest level achieved by Czechoslovak industry during the capitalist regime.

Within the framework of the entire development of the national economy in Czechoslovakia, the development of the machine industry is especially noticeable. In five years its volume has increased ~~more than 100 % in com-~~

parison to the prewar years. This increase was accompanied by substantial changes in the structure of the machine industry. By the end of the Five Year Plan the machine industry was manufacturing an uncomparable volume of heavy and special processing machines, various machines and installations for the mining-, power- and chemical industries, complicated measuring and control instruments. With some insignificant exceptions, all completing parts were manufactured in the Czechoslovak factories. In course of the first Five Year Plan the constant increase in the output of iron ore and the production of basic materials for the light- and food industries were insured. If at the time of the liberation of Czechoslovakia by the Soviet Army the Czechoslovak economy was depending almost completely on the capitalistic countries, the situation in 1953 was entirely different. The industrial structure of Czechoslovakia had been changed completely by the readjustment of her industry and its construction in course of the Five Year Plan. With the effective and large-scale aid of the Soviet Union and ~~that~~ with developed intensive economic cooperation with the countries of the democratic camp, ~~already by the end of the first Five Year Plan~~ Czechoslovak economy was able to end its dependence on the capitalistic states. The Czechoslovak economy was able to provide a market for its products and to insure the import of those raw materials and food supplies which ~~are not~~ are not and were not available in sufficient quantities.

The best proof of these basic changes is the trend in the development of Czechoslovak foreign trade:

~~1947-1953~~
~~1947-1953~~
~~1947-1953~~
~~1947-1953~~
~~1947-1953~~

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	1937	1948	1949	1950	1951	1952	1953
<u>Imports</u>							
Total	100	100	100	100	100	100	100
from the people's democracies (including the USSR)	11,9	30,7	44,2	54,5	59,6	70,8	78,3
from the USSR	1,6	15,8	23,9	29,6	27,7	36,4	37,8
from capitalistic countries	88,1	69,3	55,8	45,5	40,4	29,2	21,7
<u>Exports</u>	100	100	100	100	100	100	100
Total	↓	↓	↓	↓	↓	↓	↓
to the people's democracies (including the USSR)	13,8	32,6	46,8	54,8	61,5	71,5	76,4
to the Soviet Union	1,6	16,0	23,4	25,4	30,0	33,0	39,9
to capitalistic countries	86,2	67,4	53,2	45,2	38,5	28,5	23,6

The need

~~to insure the development of a socialist economy~~ the develop-
ment of the Czechoslovak national economy independently of the capitalistic
states and to provide constant markets for Czechoslovak industrial products
abroad, required the better utilization of domestic raw material sources
and ~~the~~ ^{of} changing the trend of Czechoslovak foreign trade, either in imports or
in exports, toward states ~~with planned economies~~ with planned economies who have begun
to construct socialist economy similarly to Czechoslovakia.

The reorientation of Czechoslovak foreign trade can be noted in the
development of its structure in the various years:

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<u>Imports</u>	1937	1948	1949	1950	1951	1952	1953
Total	100	100	100	100	100	100	100
Heavy industry products	38,3	34,5	41,4	43,8	45,5	50,3	44,1
Light industry products	46,3	40,1	41,6	34,8	29,4	26,1	27,1
Agricultural, forestry and lumber industry products	15,4	25,4	17,0	21,4	25,1	23,6	27,1
<u>Exports</u>							
Total	100	100	100	100	100	100	100
Heavy industry products	33,6	51,0	54,1	51,2	52,2	58,6	62,1
Light industry products	58,9	47,3	44,2	44,6	43,2	37,8	33,1
Agricultural, forestry and lumber industry products	7,5	1,7	1,7	4,2	4,6	3,6	3,8

The basic changes in the Czechoslovak economy, brought about by the socialist construction and reconstruction of the first Five Year Plan, are evident in the fact that the Czechoslovak national economy, especially industrial production, are to-day the secure and firm basis of the independence of the Czechoslovak republic, its economic strength and national defense.

The results of socialist construction and reconstruction of the national economy are convincing proof of the rightness of the general line of policy laid down by the Czechoslovak Communist Party for the construction of the national economy; and this policy is purposefully being carried out into practice by the working class and the workers.

In these historical years of the Czechoslovak economy, when the basic tasks of socialist industrialization were being carried out, the leading and decisive branch of industry was the machine industry. It insured the construction and reconstruction of the individual branches of the national economy by supplying machines and installations, by equipping with the most

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modern machines also the new industries which rose in the first Five Year ~~Plan~~ in order to fulfil it.

Investments made under the Five Year Plan made it possible: to place into operation: 12 new electric plants, 2 mines for brown coal, 1 mine for lignite, 1 mine for pyrite ores, 6 blast furnaces, 9 open hearths, 8 electric hearths, 6 rolling mills, 2 roller frames for the rolling of pipes, 1 aluminum plant, 2 plants for the production of synthetic fibres, 1 plant for the production of active carbon, 24 new machine industry plants, 1 cement factory, 4 large brick factories, 2 lime kilns, 2 factories for the production of fireproof materials, 8 saw mills, 1 cellulose factory, 46 refrigeration plants, 10 deep-freezing plants, 30 dairy plants etc. ; to increase the ~~number~~ ~~of~~ ~~locomotives~~ number of locomotives by 15,4%, the number of motor vehicles by 83,5%, freight cars by 41,5% etc. The machines and installations supplied by the Czechoslovak machine industry served to increase power production by 65%, the output of brown coal by 45%, ~~sixty~~ that of lignite by 57 %, coke production by 52%, gas production by 390%, the production of benzine for motor vehicles by 31%, the output of iron ~~was~~ ^{crude} by 69 %, that of ~~rough~~ ~~cast~~ ~~steel~~ crude steel by 67%, rolled steel products by 73 % etc. These figures are based on the 1948 production figures.

Simultaneously the Czechoslovak machine industry contributed considerably to the increase of labor productivity in the individual branches of the national economy by supplying them with machines and installations and enabling these branches to expand the mechanization and automatisaion of their production processes. Thus the productivity of labor in the years of the first Five Year Plan in-

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creased 69 % in the entire industry as compared to 1948. The breakdown of these figures for the various industries is the following: in fuel mining the increase is 25,2%, in the fuel refineries 81,4%, in the mining of ores 26,4%, in the iron- and steel industry 45,5%, in the machine industry proper 94,5%, in the output of chemical raw materials 106,9%, in the chemical industry 84%, in the production of construction materials 54,7%, in the textile industry 69,9 %, etc.

To enable the Czechoslovak machine industry to fulfil these great tasks in the ~~first Five Year Plan~~ first stage of the construction of the national economy, it was necessary to develop its capacities on a large scale and to make its rate of development higher than in the other industries. In its period of construction the production surface of the machine industry increased about 14% in comparison to 1948, and the number of ~~new~~ production machines in this industry increased 25%. The substantial expansion of machine industry production in the years of the first Five Year Plan placed Czechoslovakia among the leading nations, with regard ~~to~~ to the role and significance of ~~the~~ machine industry production in the national economy. For example: the ratio of ~~the~~ machine industry production in the US in 1953 was 35%, in Great Britain 40%, in West Germany in 1954 about 31%. The development of the Czechoslovak machine industry is reflected in the ratio of the machine industry products in proportion to the entire industrial production:

	1948	1949	1950	1951	1952	1953
Gross industrial production	100	100	100	100	100	100
Ratio of the machine industry's production	17,4	18,3	20,0	22,6	25,2	27,9

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The increasing significance of machine industry in the Czechoslovak national economy can also be noticed in the increase of its employment ratio in proportion to the total number of persons employed in the industries in the years from 1948 through 1953.

	1948	1949	1950	1951	1952	1953
Entire industry	100	100	100	100	100	100
Ratio of the machine- and metal industries	21,9	22,6	23,1	25,2	26,9	29,0

In Czechoslovakia

The machine industry has developed ~~much more rapidly~~ much more rapidly than the other industries. Its expansion is comparatively more rapid than in the leading capitalistic countries. For example: in the years from 1950 through 1953 machine industry production in Czechoslovakia increased at an average of 25,3%, whereas the machine industry in the capitalistic countries, for example in West Germany, achieved an average rate of expansion of only 15,5%.

In comparison to 1948 figure, the important branches of the machine industry showed the following production increase in the first Five Year Plan: the total production of steam boilers increased 49% (boilers with a pressure of over 40 tons/h increased 400%), steam turbines in all increased 460% (steam turbines over 6000 kW increased 500%), Diesel engines 420% (the number of ^{nautical} Diesel motors ~~increased~~ increased ^{32,2} ~~32,2~~ fold), generators for alternating current 360%, electric motors over 100 kW increased 1360%, power transformers over 25 kW increased 1170%, electric stoves 330%, electric cables 240%, milling machines 30%, mining installations increased 420%, rolling mill installations 1100%, foundry installations 340%, cement factory installation 290%, power mining machines 350%, caterpillar excavators

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increased 290%, trucks 58% (respectively 580% in comparison to 1937), cranes 870%, turbo-compressors and ~~rock drills~~ pneumatic drills 520%, ballbearings 550%, etc.

Another index of the importance of ~~the~~ machine industry ~~production~~ ^{(in proportion} ~~to the total foreign trade.~~ production in Czechoslovakia economy is the industry's ratio ~~to the total foreign trade.~~ to the total foreign trade. In 1953 machine industry products represented about 42% of the total foreign trade. In order to visualize better the extent of this index, it is necessary to realize that in that year Czechoslovakia imported about 28% of its total grain supply, 24% of its annual meat consumption, 68% of its artificial fertilizer and about 70% of its iron ore.

The basis for developing the machine industry was determined in harmony with the policy of socialist industrialization, by the requirements of the heavy industry and of the Czechoslovak foreign trade.

After the first Five Year Plan the basis of the development of the Czechoslovak machine industry was marked by the following indexes: its ratio in proportion to the total social production was 12,5%, machine industry production represented roughly 28% of total industrial production. In 1953 the Czechoslovak machine industry employed about 29% of the ~~workers~~ ~~employed~~ total number of workers ~~in the country~~ and 38% of the total number of ~~engineers~~ ~~and technicians~~ and technicians employed in ~~industry~~ all industries.

The Development of the ^{Engineering} Machine Industry in the Years 1954 and 1955.

After the successful completion of the Five Year Plan, Czechoslovak national economy was faced with the task of working out a new perspective plan for the development of the country. ~~In the interest of~~ ~~increasing~~ increasing cooperation between the democratic countries, however, it was deemed expedient and necessary to mutually coordinate the individual economic plans. It was necessary to draft a further plan for the development of Czechoslovakia in cooperation with the people's democracies and with

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the Soviet Union, and this preferably for the same period. Therefore the years of 1954 and 1955 were assigned to the solution of the most urgent tasks in the development of the Czechoslovak economy. First of all it was necessary to remedy the insufficiencies in the developments of the past years - to remedy the ~~disproportions~~ disproportions among and within the industries, and to improve the work of certain departments. It was necessary to insure the conditions for the liquidation of the lag in fuel supply, to insure the construction of new mines, to increase substantially the mechanization of coal-mining etc. For the purpose of expanding the raw material resources, it was necessary to start and to intensify basic geological survey work. It was necessary to expand the production of nitrogenous fertilizers and artificial fibers, and also to develop the production of crude iron and steel by building ore refining installations, also to raise substantially the mechanization and automatization of metallurgical processes etc. The completion of the above-mentioned tasks was basically insured by the plans for the machine industry in the years mentioned and by the pace of development in the machine industry. Beside this it was necessary to increase considerably the export ~~of~~ of machine industry products and to create thereby the preliminary conditions for the further expansion of raw material imports for industry and the imports of consumer's goods. Similarly as in 1954, the plan for 1955 also reflects the need to abolish disproportions within industry and the disproportions between industry and agriculture. The years 1954 and '55 were decisive in insuring the successful start of the second Five Year Plan. This explains the importance which the X. Congress of the Czechoslovak Communist Party attached to the 1954-55 plans and to the basic needs in the development and activities of the Czechoslovak Machine Industry. It was established that the Czechoslovak machine industry not always insured the completion of machine industrial production on time, and in many instances, by its failure to meet deliveries for the construction of ~~industrial~~ various branches of the national economy on

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time, it caused a delay in setting the planned capacities into production. By its failure to fulfill the planned exports, the machine industry also delayed the construction of the basic capacities in the other people's democracies. The machine industry did not conduct the ~~typical~~ standardization and unification of installations consistently and rapidly enough, neglecting thereby to create the conditions for raising machine industry production to a higher level. It neglected the production of instruments and installations required for the mechanization and automatization of production processes. Long delivery dates for machines and installations, the disproportionately long period ^{for} ~~of development~~ developing, mastering production and ~~introducing~~ ^{placing} new products into production were further consequences of inadequate functioning of the machine industry. In the past years the Czechoslovak machine industry did not pay sufficient attention ~~to~~ even to the production and quality of metal consumers' goods, for example: refrigerators, washing machines, motorcycles, cameras etc. The production of agricultural equipment also lagged behind the needs and demands of ~~the~~ Czechoslovak agriculture.

The most serious insufficiency in the development of machine industrial production in the first Five Year Plan was the failure ~~to make~~ ^{to make} spare parts in the required volume and assortment, especially of spare parts for motor vehicles. This failure caused considerable difficulties in completing the ~~motor vehicle production plan~~ motor vehicle production plan and hampered the work of Czechoslovak foreign trade. During the Five Year Plan the quality of some machine industrial products ~~of~~ also deteriorated, for example in the case of steam turbines, and the required pace was not achieved in reducing the use of raw materials and materials and in economizing machine industry production. The considerable pace of development in the entire machine industry before 1953 ~~ensured~~ caused insufficiencies also in the field of cooperation, respectively it caused undesirable cooperation, between certain enterprises of the ministries for the machine industries.

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After a thorough analysis of the achieved level of the machine industry, the X. Congress of the Czechoslovak Communist Party determined the path for its further development and basic improvement of its work in the field mentioned.

At the end of 1955 the Czechoslovak machine industry's rise could be determined by the following indexes: the ratio of the machine industry production in proportion to the total social production was 14,3%, the machine industry's production comprised 29,6% of the total industrial production.

The ratio of the machine industry production in proportion to total production in the years 1954 and '55:

	1954	1955
Total industrial production	100	100
Ratio of the machine industry production	28,1	29,6

The export of machine industry products comprised 42,9% of the total Czechoslovak export.

In the first year of the second Five Year Plan the structure of the machine industry, expressed in the ratio of some of its branches in proportion to total machine industry production, was as follows: power installations 5,1%, high frequency electrotechnical products 8,1%, mine installations 0,8%, smelting installations 0,4%, installations for the processing of ores 4,8%, chemical industrial installations 1%, installations for the production of construction materials 0,4%, construction industry and ~~mining~~ road machines 1%, installations for the light industry 1,5%, installations for the food industry 1,1%, low frequency electrotechnical products 2,9%, agricultural machinery and trac-

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tors 5,7%, automotive products 21,5%, instruments 2,7%, transportation installations 1,4%, general machine industrial products 8%, consumer's goods 7%, castings, forged and pressed products 5%, etc.

In 1955, in comparison to 1953, there is a marked increase in ~~the~~ production in the following machine industry branches: steam boilers 227 %, Diesel engines 73%, milling machines 21%, ~~rolling~~ ^{shaping} machines 64%, cement factory installations 204 %, machines for the food industry 74%, cars 72%, motorcycles 108%, washing machines 233%, agricultural machinery 257%, tractors 93%.

Guided by the directives of the X. Congress of the Czechoslovak Communist Party, the machine industry ⁱⁿ ~~and~~ its further development overcame a considerable part of ^{the} ~~its~~ deficiencies ~~which~~ it revealed during the past ten years. The Czechoslovak machine industry to-day is sufficiently prepared to meet the great tasks which await it for the further development of the Czechoslovak national economy. The directives for the further development of Czechoslovakia, set by the Party and the government for the ~~next~~ future years, and the ~~principles~~ principles formulated by the Central Committee of Czechoslovak Communist Party for the future technical development of the country will guide the Czechoslovak machine industry.

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PART II.

The Export of Machines and Mechanical Installations.

Machines and mechanical installations form the basis of Czechoslovak export. The exporting of machines and mechanical installations enables the Czechoslovak national economy to cover the imports of such materials which are essential for the further increase of the technical level of the national economy and for increasing the standard of living.

The enormous development of Czechoslovak industry after World War II's construction and reconstruction in accordance with the basic principles of the Five Year Plan, the considerable demand for machines and mechanical installations in the people's democracies and the expanded possibilities of exporting machines to capitalistic countries all are factors contributing to ~~the increase of~~ the increase of exports of machinery and mechanical installations to 86% in 1950 in comparison to 1937 when exports of machinery and mechanical installations were the highest in capitalistic Czechoslovakia. By 1953 this increase amounted to 236% in comparison to 1937. By 1960 the export of machinery and mechanical installations is expected to surpass five fold the exports of 1937.

An outline of machinery and mechanical installation exports after World War II are given in the following tables.

An outline of the total volume of machinery and mechanical installation exports in the years from 1922 through 1937 giving the ratios of machinery and mechanical installation exports ~~in proportion~~ in proportion to the total Czechoslovak export in the respective year:

Year	Ratios in proportion to the entire Czechoslovak export	Index of production increase.
1922	2,5	
1923	2,1	100
1924	4,0	78
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Year	Ratio in proportion to the entire Czechoslovak export.	Index of production increase.
1925	3,5	195
1926	3,3	181
1927	3,4	204
1928	4,2	269
1929	4,3	280
1930	4,8	302
1931	5,1	266
1932	5,2	166
1933	4,0	105
1934	4,4	142
1935	5,0	167
1936	5,8	195
1937	6,8	322

An outline of the structure of the machine and mechanical installation exports in the years from 1923 through 1937:

Year	Machinery and industrial installations	Locomotives and rr.cars	Motor vehicles	Tractors and agricultural machinery
1923	81,4	2,8	3,6	12,2
1924	56,5	34,6	2,2	6,7
1925	55,6	26,0	3,1	15,3
1926	63,1	16,6	3,7	16,6
1927	72,6	6,8	6,4	14,2
1928	68,7	11,9	8,1	11,3
1929	70,0	4,8	9,5	15,7
1930	67,8	9,6	9,9	12,7
1931	71,2	7,6	14,0	7,2
1932	75,0	6,8	13,9	4,3
1933	88,0	-	8,8	3,2
1934	91,5	0,6	5,1	2,8
1935	83,0	6,8	7,6	2,6
1936	78,5	-	9,2	12,3
1937	63,2	2,1	10,4	24,3

An outline of the geographical distribution of Czechoslovak exports in 1923 and 1937

Country	Percentage of the total export of machinery and installations in 1923	in 1937.
USSR	-	5,6
Bulgaria	3,6	-
Hungary	7,5	-
Poland	4,5	2,4
Roumania	7,4	8,3
China	-	2,0
Belgium	4,4	2,2
France	4,0	2,6

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Country	Percentage of the total export of machinery and installations	
	in 1923	in 1937
Holland	-	3,5
Italy	12,9	2,7
Yugoslavia	10,3	9,5
Germany	6,3	5,7
Austria	11,0	2,3
Sweden	-	2,2
Great Britain	3,2	4,5
Turkey	-	6,2
India	-	4,0
Iran	-	2,9
Argentina	4,5	5,7
USA	-	2,4

Even though the export of machinery and mechanical installations in 1937 amounted to 222% in comparison with 1922 exports, the export of machinery in capitalistic Czechoslovakia ~~has~~ never been a decisive factor in the country's pre-war exports. In 1937, when the export of machinery and mechanical installations achieved its greatest height, it was still an insignificant factor because it amounted to only 7% of the total Czechoslovak export volume. It is a very important fact that before World War II the imports of machinery and mechanical installations in Czechoslovakia exceeded exports. If we compare the imports of machinery with ~~exports~~ such exports in 1937, we find that Czechoslovakia in that year imported 10% more than it exported. Besides, in many cases these were imports of such machinery, ~~and~~ mechanical installations and instruments which were completing parts of machinery and ~~units~~ investment units exported by Czechoslovakia.

Figures dealing with the Czechoslovak machinery and mechanical installation exports indicate ~~that~~ the preponderance of piece products. The export of investment units consisted mostly of installations for the food-~~industry~~ and chemical industries and of steam power plants; Czechoslovakia excelled mainly in sugar refinery installations. As far as individual parts of the investment units are concerned, Czechoslovakia has at-

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tained world fame through her shipments of steam ~~XXXXXX~~ furnaces, turbo-aggregates, transformers and switchboards. Czechoslovak hydraulic presses and high-pressure compressors for air and various gases have also achieved ~~from~~ a good reputation. Among Czechoslovakia's piece exports, ~~her~~ dock cranes and steam locomotives have achieved a very good name.

Czechoslovakia exported tool machines only to European countries. On the other hand Czechoslovakia has exported railway cars and excavating machines everywhere in the world, even though their production has developed only after World War II. Czechoslovakia has not achieved world fame in the exports of Diesel engines and electric motors despite the fact that these exports were considerable. In the line of agricultural machinery, Czechoslovakia has exported mostly sowing machines, threshing machines, harvesting machines and plows.

An analysis of the pre-World War II exports of machinery and mechanical installations reveals that most of these exports went to the Balkan ~~and~~ countries. Their share of Czechoslovak exports amounted to an average of approximately 20% annually in comparison to the total Czechoslovak export of machinery and mechanical installations. The best customers for such Czechoslovak exports were Yugoslavia and Roumania.

Already before World War II, the Soviet Union was ~~significantly~~ purchasing a considerable amount of Czechoslovak machinery and mechanical installations. Up to 1929 approximately an average of 10% was shipped there. ~~XXXX~~ ~~XXXXXX~~ Czechoslovakia also found a market for her machinery and mechanical installations ~~also~~ in Poland; in 1929 17% of such Czechoslovak exports were earmarked for Poland. Czechoslovakia exported the most to China in 1930, approximately 6.7% of the total export of machinery and mechanical installations. The more important European markets for Czechoslovak machinery and mechanical equipment were Britain, Sweden, The Netherlands, Belgium and Italy. In the Near East there were Turkey and Iran. Overseas there was Ar-

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gentina. Before World War II, Czechoslovak exports did not have access to India which was a British colony. However, Czechoslovak influence on Indian trade increased very rapidly.

In connection with the import of machinery and mechanical installations it is significant that Czechoslovakia imported mostly from Germany, the US, Britain, Switzerland and Austria, i.e. from countries where Czechoslovak exports for machinery and mechanical installations were not especially large. From these countries Czechoslovakia imported unique and precision machinery, mine installations, cement factory installations, power plant installations, chemical industry installations, ball bearings, tractors and foundry installations etc. Thus for example, in 1937 Czechoslovakia imported from these countries approximately eight times more machinery and mechanical installations than she exported to them. In that year Czechoslovakia also imported from Hungary, France, Holland and Sweden more machinery and mechanical installations than she sold them.

Czechoslovak Exports of Machinery and Mechanical Installations After World War II.

Czechoslovakia exceeded the highest pre-war volume of machinery and mechanical installation exports already in 1948. After that the volume of machinery exports shows a regular increase and by 1953 reaches practically the threefold level of the 1937 exports.

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Exports of machinery and mechanical installations in the years from 1948 through 1955:

Year	The index of increase of machinery and mechanical installation exports in comparison to the year		Percent ratio in proportion to total Czechoslovak exports.	
	1937	1948		
1948	108	100	20,3	20,3
1949	172	156	27,2	27,2
1950	186	170	27,8	27,8
1951	210	192	30,3	30,3
1952	263	239	36,3	36,3
1953	266	242	40,0	40,0
1954	294	267		40,0
1955	336	304		42,9

Simultaneously machinery and mechanical installations are becoming a decisive factor in Czechoslovak foreign trade with regard to their ratio in proportion to the entire volume of exports. This ratio was ~~approximately~~ at the best 7 % in 1937 ~~and~~, reached 20,3% in 1948 and 42,9% in 1955.

The structure of the export of machinery and mechanical installations in the years from 1951 through 1955:

Year	Industrial machinery and installations	Locomotives, rr. cars and boats	Motor vehicles	Tractors, agricultural machinery	Complete plant installation
1951	47,5	10,0	14,3	6,8	21,4
1952	48,1	8,5	9,9	7,8	25,7
1953	49,1	1,3	15,9	7,4	26,3
1954	47,4	2,2	13,0	5,3	33,1
1955	40,2	0,9	13,8	6,5	38,6

It is very characteristic of the structure of the post-World War II Czechoslovak export of machinery and mechanical installations that where in complete plant installations as the export of capitalistic Czechoslovakia exports of (investment units) amounted to approximately 11, 5% of the ^{total} ~~complete~~ export of machinery and mechanical installations, in the first Five Year Plan such exports amounted to approximately ~~25%~~ 24% of the total export of machinery and mechanical

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installations. Simultaneously the rate of exporting investment units is constantly increasing and in 1954 they already amounted to 33 percent and in 1955 to 38 percent. The present structure of these machine industry products has also changed in comparison to the pre-war years.

Geographical distribution of Czechoslovak machinery and mechanical installation exports:

Year	Democratic countries (including the USSR)	USSR	Capitalistic countries
1947	21,2	9,5	78,8
1948	41,3	15,4	58,7
1949	55,8	20,5	44,2
1950	75,6	25,8	24,4
1951	82,2	31,2	17,8
1952	89,4	37,5	10,6
1953	89,5	36,2	10,5
1954	89,7	42,6	10,3
1955	75,3	37,5	24,7

This outline indicates that the preponderance of the Czechoslovak export of machinery and mechanical installations goes to the democratic countries. From among the capitalistic countries, Czechoslovakia exports mainly to Finland. Exports to Argentina and Brazil are remaining at approximately at the same level. A considerable decline in the export of machinery and mechanical installations has occurred in regard to France, Holland, Austria and Sweden. The increase in the export to capitalistic countries is the result of newly established economic ties with colonies and semi-colonial countries.

↓ Czechoslovak Exports of Machinery and Mechanical Installations Compared To World Figures.

In 1953 the ratio of machinery and mechanical installation exports

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in proportion to the total exports amounted to 45 % for West Germany, 31 % for Britain, 38% for the United States whereas in the other countries the ~~exact~~ figures are considerably lower and move around ^{an} ~~the~~ average of 20%. Because ~~Czechoslovakia is the greatest exporter of machinery and mechanical installations among the democratic countries~~ Czechoslovakia is the greatest exporter of machinery and mechanical installations, we can supplement the outline of international trade in machine industry products for 1953 by stating that Czechoslovakia occupies the seventh place in the world. The international trade in machine industry products is dominated by the United States with its 41% and by Great Britain with 20%. The third place is occupied by West Germany with 13%, the fourth by France. Czechoslovakia can be assigned to the next group to which belong also Canada, Holland and Sweden. Czechoslovakia's approximate share in the international trade of machine industry products is 2.4%.

The ratio of exports in proportion to production in 1953 exceeded 12% on a world scale. In the United States it was only 7%, in ~~Manufactures~~ ~~many~~ Western Europe 33%. In Czechoslovakia the export of machine industry products comprises approximately 22% of the total production of this industry. On a world scale approximately 43% of the total world export of machinery and mechanical installations consist of non-electrical machinery, 17% are electrical machinery and approximately 40% are ^{vehicles} ~~made~~ ~~for~~ ~~of~~ transportation.

The world foreign trade in machine industry products is comparatively constant and is developing further. In 1954 an increase in exports of machine industry products can be noted especially in West Germany and Great Britain while the United States exports in that year were stagnant.

In the export of machines for metal work Czechoslovakia has attained a prominent place since her share of the world export amounts to

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7,6 % and she occupies fifth place immediately after the United States, West Germany, Great Britain and Switzerland. On the other hand Czechoslovakia's share in the export of automobiles and tractors has not been significant so far, even though in the export of tractors she surpasses France, Italy and Austria where production is considerably higher than in Czechoslovakia.

The geographical structure of the capitalistic trade in ~~the~~ machine industry products in 1953 indicates that approximately 42% of the entire trade was conducted between capitalistic territories, that is among the United States, Canada and Western Europe. In 1953 approximately 50% of the capitalistic exports of machine industry products went to economically underdeveloped areas, of this almost 40% went to Latin American countries and to the countries of the Sterling block. The greatest exporter of machine industry products for Western Europe was West Germany. (30%).

Perspective Plan for the Export of Machinery and Mechanical Installations.

In the future a further increase in the export of machinery and mechanical installations can be expected. According to present estimates, the exports of machinery and mechanical installations in 1960 will increase approximately 90% in comparison to 1955 exports. Thereby the ratio of machinery and mechanical installation export in ~~exports~~ ~~the~~ proportion to the total volume of export will be approximately 60%. This includes a more than double increase in the export of investment units and a 76% increase in the export of piece products. In comparison to 1937 figures, exports will be five-fold higher.

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In conducting the export of Czechoslovak machinery and mechanical ~~and~~ installations in the coming years, it must be expected that trade relations with the capitalistic countries will substantially expand.

A change in the structure of the export of machinery and mechanical installations to the advantage of investment units is due to the fact that a further ~~expansion~~ increase in the export of such units to capitalistic countries is expected. These units will be mostly installations for the food industry, cement plants, light industry plants and machine industry plants. ~~The export of products of the machine industry.~~ Among the piece products of the machine industry the greatest increase in exports In the coming years is expected in automobiles, tool machines and tractors. ~~These~~ these three items and railroad locomotives should form the basic volume of the Czechoslovak export of piece products manufactured by the machine industry, mainly because these are products which have already reached the world level.

Czechoslovakia intends to export to the democratic countries mainly mine installations, transportation and maintenance installations, power installations, food industry installations, cement factory installations, refrigeration installations, foundry and chemical industry installations, excavators, locomotives, coal grading installations, Diesel ~~motor~~ engines, electric motors, tool machines, trucks, pumps, machines for the light industry, ball bearings, agricultural machinery, installations for the manufacturing of paper and cellulose, machinery for the construction industry, meters and regulators, lumber finishing machines, passenger ships and tugboats, suction excavators etc. ~~The chief market~~ ~~market~~ The Soviet Union will remain the chief market for Czechoslovak ~~machinery~~ machine industry products.

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Czechoslovakia intends to continue her export of metal-working machines, agricultural machines, tractors, construction machinery, textile machines, cars, rolling mills, machines for the lumber and rubber industries, pumps, shoe industry machines, food industry machines (mainly sugar refinery installations), motor-cycles, etc. to the capitalistic countries.

To the economically underdeveloped areas Czechoslovakia plans to export power plants and textile mills, cement factories, saw-mills, various machine shops, assembly plants, plants for industrial oils, factories for artificial fertilizer, plants for pharmaceutical products, brick factory installations, flour mills, refrigeration ~~plants~~ installations, installations for paper mills, shoe factories, canneries and sugar refineries, locomotives, locomobiles, tractors, mining machinery, trucks and automobiles, power installations, Diesel aggregates, foundry installations, processing machines, printing machines, road construction machinery, cranes, electric motors and pumps; all this in a much greater volume than during the past years.

Figures concerning the volume, structure and geographical distribution of Czechoslovak exports of machinery and mechanical installations prove without a doubt that there is a substantial difference in quality and quantity between the present Czechoslovak exports of machinery and mechanical installations and the pre-war such exports. Changes in the structure of the Czechoslovak exports of machinery and mechanical installations are due primarily to the Czechoslovak alliance with the Soviet Union and the people's democracies. Their demands have enabled the Czechoslovak machine industry to complete its reorientation and have compelled the introduction of such new machines which previously were not manufactured in Czechoslovakia.

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The favorable development of Czechoslovak foreign trade in the past years had also its ~~disadvantages~~ dark sides. The export of machine industry products increased naturally to a certain extent. Its results can be seen, among others, in the fact that Czechoslovak machine industry is always able to supply the foreign markets with the required quantity and quality of machinery and mechanical installations. The constant increase in the assortment of exports manufactured by the machine industry have made it impossible to maintain the necessary technical level of production in every case. This fact is expressed also by the uneconomical production of the machine industry. In several instances funds were lacking to insure the rapid development of important branches of this industry in order to insure a more effective expansion of the national economy.

In the export of Czechoslovak machine industry products to the people's democracies in the past years there occurred several cases which did not serve to maintain the good name of the Czechoslovak machine industry. These faults were caused mainly by the failure to supply the desired quality of the exported installations. For example, the #1 Klement Gottwald Machine Factory in Brno prepared for shipment a turbine from which the rotor was missing. The "Heroic February" ~~Factory~~ Machine Works (Zavody Vitezneho Unora in Hradec Kralovy stored a sugar refinery installation intended for export but the diffusors were not completed and badly painted. Furnaces exported by the Czechoslovak machine industry did not always give the required performance once they were installed for operation. In some cases cracks and holes were found in the body of the turbines and the selfclosing covers were loose.

The construction of the basic capacities of industry in the individual democratic countries, the renewal of trade relations with the capitalistic countries and primarily the extension of trade with economically

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dependent and industrially underdeveloped states, the competition of the leading capitalistic countries on these markets confront the Czechoslovak machine industry with new tasks which necessarily require a change in the organization of production in the machine industry and also in the Czechoslovak foreign trade. So far the Czechoslovak machine industry is manufacturing a large variety of products and there is no branch in this industry which is not represented in exports. This state of affairs is not the most favorable one. In the future it will be necessary to prepare for export a smaller assortment of ~~machine industry products~~ machinery and mechanical installations, but which ~~are~~ are of a much higher technical level.

If it is desired that the Czechoslovak machine industry master these new tasks, then ~~several necessary measures must be adopted, namely:~~ several necessary measures must be adopted, namely:
~~ability~~ ability

1) To increase the ~~range~~ ability of the machine industry to meet the demands of the democratic countries, Soviet Union, the capitalistic countries and eventually the economically dependant countries. This involves primarily the greatest possible speed technical ability as for example: ~~speed~~ in answering inquiries, orders, technical information, ~~and~~, giving technical aid and making technical preparations.

2) To shorten the time required for deliveries and primarily to shorten the tentative time-limits in projection, construction and the supply of materials, and last but not least, to shorten the time required for the production process itself.

3) To modernize machine industry products and to improve their quality in order to satisfy the demands of the consumers and to meet world level requirements with respect to quality and operation.

4) To improve the maintenance of the exported machinery and mechanical installations.

5) To organize direct contact between the manufacturer and the

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foreign customers (especially in the case of investment units).

Before World War II, Czechoslovak manufacturers followed and insured the proper operation of the exported machinery and installation they did so not only during the period of warranty, but also after ~~it~~ it expired. They were motivated by their interest in obtaining good references. Their further interest lay in the supply of spare parts, and a third important interest lay in their eventual participation in expanding the supplied installations. After World War II in Czechoslovakia the care and follow-up of the supplied machinery and mechanical installations have deteriorated very much. The pre-war traditions were not observed. Spare parts, accessories and attachments to the machines are being supplied in insufficient quantities and with delay. And this is done even in cases where spare parts were ordered simultaneously with the basic installation. With a very few exceptions there is no follow-up on the operation and endurance of the machines and installations. There is no direct contact with the purchasers and no experiences are collected which would help to direct production and to eliminate in time the experienced insufficiencies not only in the machines already delivered but also in those under production.

PART III.

The Technical Level of Production in the ^{Engineering} Machine Industry

The application of new technique and progressive technology in the machine industry has not achieved so far a decisive effect on the increase of production, ~~improvement of quality, increase of the~~ productivity of labor and ^{economy} ~~commercialness~~ of production, nor has it improved the quality of production. Despite the fact that in the past years a series ~~is~~ of new technological processes and production methods have been introduced - for example: automatic and semi-automatic welding, speedier and power-driven

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toolmachines, high-pressure and pressure casting, the production of machines with centrifugal and oblique casting, precision forging, cold pressing, high frequency tempering etc. -, the level of ~~the~~ machine industry production is still low and lags behind the technology used by highly developed industrial countries.

Insufficient technology is evident primarily in the high ratio of manual work in proportion to the total work required in production. For example, in the case of steam turbines, turbo-compressors, crude oil engines, locomotives and large tool machines the ratio of manual work is as high as ~~over~~ 60% while in the production of cranes, steam boilers and railroad cars it exceeds 75%. In the United States in 1947 in the production of tool machines 78% of the production time was ~~by~~ work done by machines; in Czechoslovakia machine work amounted to only 45-50%. This is due primarily to the fact that many enterprises neglect ^{the} mechanization of manual- and assembly work (they are very inadequately equipped with assembly machines and preparations) and also to the fact that the requirements of technological designing are disregarded. For example, in the designing of steam boilers only now are they beginning to be designed in a way ~~xxx~~ which allows their assembly with the aid of blocks. Also the considerable ratio of piece production ~~and~~ ^{and of} production in small series ~~and~~ as well as the unsatisfactory level in unification and standardization lead to a greater ration of manual labor. ~~The rapid increase in the production volume of the machine industry~~
~~of the machine industry~~

The rapid increase in the ~~rapid~~ production volume of the machine industry is reflected in the increasing volume of the production of individual products; in this way ^{also} the character of piece- and small-serial production is transferred to serial production. This justifies the introduction of such technology which corresponds to a higher level of production.

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But it is necessary to ~~win~~ strive toward a higher level of technology also in piece- and small-serial production and to adopt progressive production methods. For this reason it is necessary to ~~transfer~~^{change} in the shortest ~~possible~~ possible time from serial production to mass production in the case of products of mass consumption, also in the case of typified products and standardized parts, such as piston rings, pistons, pivots, bearings etc. Besides, it is necessary to proceed through production lines and one-purpose machines toward the automatization of production processes. For this reason, for example, in the factories manufacturing ball bearings a production line system will be introduced for six typified sizes of ball bearings and thereby the preliminary conditions for the automatization of production will be established. It is a mistake that up to now the mass production of the most ~~about~~ current standard parts has not been introduced. The individual factories are manufacturing these standardized spare parts ^{ves} themselves and are using production methods which are ~~still~~ considered primitive in the present age. The organization of the mass production of standardized spare parts for stock and for the elastic supply of the enterprises on the basis of norms, will contribute to increasing the productivity of labor. In the production of typified products it is necessary to change to the most progressive ~~types~~ methods of production organization, in accordance with the volume of production.

In the production of the heavy machine industry, where not even typification itself can make the introduction of serial production possible, it is necessary - because of the differences of the machines manufactured on a piece basis - to find and to design groups of parts of the same measurements or at least of the same kind. It is also necessary to group the production of these parts into series and to organize their pro-

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duction ~~in shops~~ in closed cycles.

Another important factor in increasing the level of technology is the specialization of production, coupled with the specification and stabilization of ~~the~~ cooperation between ~~the~~ factories. Specialized production demands that the production program of the factory be defined and stabilized, and that the program be basically ~~be~~ chosen from the point of view of ~~the~~ identical or similar technology of production, embracing products where ~~the~~ variations of ~~their~~ demand compensate each other.

The specialization of production, made possible by the drafting of the plans for the second Five Year Plan, ^{principle} must become a basic ~~method~~ in ~~the organization of production~~ organizing the production of ~~the~~ machine factories ~~and~~, also in the location of the production programs and in the formation of ^{expedient} ~~expedient~~ cooperational relations.

The development of modern technology in ~~the~~ machine production demands basic changes in the machine stock of the machine industry. This applies first of all to tool machines because their level determines the degree of the productivity of labor and thereby the economy of production. The ratio of milling machines in proportion to ^{shaping} ~~turning~~ machines in Czechoslovakia has remained unchanged for several years. For example, in the United States in 1949 the ratio of milling machines in proportion to shaping machines was 73:27, whereas in Czechoslovakia at the same time the ratio was 86:14 (in pieces). The stock of machine tools in Czechoslovakia machine industry consists mostly of universal machines which meet the requirements of technology used approximately at the end of World War II. Thus, for example, from the total number of lathes only 25% are turret lathes, automatic or semi-automatic lathes. ^{and} The automatic ~~or~~ semi-automatic lathes represent only 2,8% of the entire number of machine tools. Turret lathes represent 5%

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and planing machines 11,5%.

Similarly, the structure of ^{the} shaping machine stock also fails to meet the requirements of modern machine industrial technology. For example, 97% of the machines for unguided forging are hammers and only 3% are presses whose production capacity in comparison to hammers is considerably higher. From the total number of hammer 48% are spring hammers which by far do not meet the demands ~~the~~ of modern production and lag ~~far~~ way behind the capacity of the pneumatic hammers. 80% of the machines for guided forging are obsolete ones such as: fall hammers, belt hammers, cable hammers and turn presses. Only 20% of such machines meet the requirements of modern technology. These are mostly vertical and horizontal forging machines of the most modern design and have been acquired for the Czechoslovak industry mostly in the last years.

The obsolete machine park, especially in the forging industry, are an obstacle to switching over to highly productive technological processes. The average age of ~~existing~~ shaping machines is 20,6 ~~years~~ years (in 1954), whereas in the United States in 1949 the average age was 17,7 years, in the Soviet Union between 14 and 15 years. The average age of the milling machines is 16,4 years; in the United States in 1949 it was 12,5 years, and in the Soviet Union it was approximately 12 years.

The present development in the production of machine tools does not guarantee the rapid elimination of these serious deficiencies. This is substantiated by the following facts.

In 1955 the production of milling machine tools increased 33 % in comparison to 1950. The production of lathes increased 46,5 %,
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that of turret lathes 8%, automatic lathes 10,5%, and the increase is similar in special machine tools. These figures are naturally influenced by the production of machine tools for foreign export. However, an examination of the consumption of the Czechoslovak machine industry reveals that the insufficiency of milling machine tools had not changed. The situation is similar with regard to ~~forming~~ ^{shaping} machines. It is true ~~but~~ the stock of forging machines has increased, but primarily in small and medium units and their technical level shows only an insignificant improvement in comparison to pre-war products. Thus, for example, the LE 160 model cam-press - after ~~reworking~~ ~~was~~ ~~redesigning~~ and many "technical" improvements - differs from the pre-war model only with its greater weight, higher price, ~~and~~ ~~some~~ ~~slightly~~ ~~higher~~ ~~number~~ ~~of~~ ~~elevations~~ ~~per~~ ~~minute~~ and higher degree of safety. Accessories, which would provide a better utilisation of the elevations, so far have not yet been built. ~~Despite~~ Although every year the tasks of mechanizing production processes in the foundries and forging shops are included in the state plan, there still exist operations which are conspicuously obsolete technically.

One of the serious obstacles to a more rapid introduction of new technique in production was the slow pace of removing machines and mechanical installations. In the past years the replacement of obsolete and used machines was ~~carried out~~ ^{carried out} in a noticeably small degree. The replacement of the machine stock was conducted to the extent of 1- 1,5% annually which presupposes a lifetime of 60-70 years or more for machines, especially in the forging and foundry industries. Consequently, up to May 20th 1954 the number of milling machines ten years or older comprised more than 60 % of the machine stock, the

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number of machines from 20 to 30 years old was 20%; shaping machines (non-milling ones) over 10 years old comprised 69,5% of the machine park, the number of such machines from 20 to 30 years old amounts to 31,6%.

It can be said that the aging of the machine park is continuing. New ~~methods, processes, and~~ technical methods provide ~~limited~~ unlimited possibilities in the development of the productivity of labor. However, the Czechoslovak machine industry workers who make the machines and mechanical installations, and also those who adapt such techniques to production, are inclined to forget this. They tolerate in their shops a large amount of old installations and are blocking the way to the more rapid introduction of new techniques in production.

For this reason, when drafting the perspective plan for the 1956-60 years, the basic principle in connection with machine tools was that the machine stock of the ministries concerned with the machine industry must be replaced at a rapid rate, in such a fashion that the composition and ~~the~~ average age of the machine stock should reach a level corresponding to that of states boasting the most developed machine industry.¹⁹³ It has been determined that by 1960 there will be no machines in the factories of the ministries for machine industry ~~with an average age of more than 30 years~~ over 30 years old.

~~Some of the most important of these machines are found in~~ Certain industries, where high precision in production is not required ~~for example:~~ for example: the government tractor stations, construction industry etc. - are now adequately supplied with new machine tools. The new machines are not ^{fully} ~~adequately~~ utilized in these industries, and especially their technical qualities are left unexploited. Therefore, it is

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directly uneconomical (from the ~~contemporary~~ ^{present} point of view) to supply these industries with the newest and technically perfect machines ; it would seem more advisable to give them older machines from enterprises belonging to the enterprises of the machine industry.

Both problems, that is the economical distribution of machine tools and the faster modernization and replacement of the machine stock of the ministries for the machine industry, can be solved by ~~satisfying~~ ^{partly} satisfying the needs of ~~industrial~~ ^{requiring} industries, ~~with~~ ^{with} precisional production, with older machines in good condition to be supplied ~~by~~ for this purpose by the factories belonging to the ministries for the machine industry.

Further acquisitions of machines by the machine industry will substantially reduce the average age of its machines by 1960. An improvement in the structure of the machine stock will also be achieved by supplying machines of the newest construction and high capacity, for example: automatic lathes, turret lathes, machines for combined operations, one-purpose machines etc.

By replacing the shaping machines, their average age will be reduced and the average world level will be achieved. Production and its development will be geared to provide mechanical presses of greater pressure. For example, it has been planned to manufacture for the Czechoslovak forging shops die presses of the "Maxi" model with a pressure of 4,000 tons. Also counter-passage hammers of the 16,000 kgm "Berbe" model. They will be used to introduce new technological methods in shaping, especially in the automobile and airplane industries. The production of ~~heavy, pneumatic hammers~~ steam- respectively pneumatic heavy forging hammers, with the hammer head proper weighing up to 2,500 kg, and of rolling mills

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has also been planned. This will provide the conditions for the introduction of the most advanced technology into ~~the Czechoslovak~~ the Czechoslovak machine industry.

When new advanced production methods were introduced into the Czechoslovak machine industry, they concerned only a few factories and individuals and were not ~~widely~~ spread sufficiently in the entire industry. New advanced methods are being introduced slowly. For example, automatic welding in Czechoslovakia is used for only about 15% of the welding jobs, whereas in the Soviet Union its use extends to 60%. Precision casting, the automatization of heated processing, the introduction of production assembly lines, etc. are not being adopted widely enough. Similarly, insufficient technical preparations ~~for~~ ~~production~~ before the actual production ~~was~~ was also an obstacle to the increase of the technological level. Most ~~of the~~ technologists are concerned with eliminating and solving current insufficiencies in production and do not pay much attention to the thorough technical preparation of production, organization of work etc. Insufficient cooperation between the designers and technologists is reflected in the inadequate technological requirements of ~~designing~~ the designing. For this reason it is necessary to focus all attention within the ~~the~~ shortest possible time on the technical development of the machine industry, especially on the basic improvement of the technology of production, on the modernization of a considerable number of plants, on the mechanization and automatization of production processes and on the ~~the~~ ~~introduction of new models of machines and devices~~ ~~introducing~~ introducing new models of machines and devices into production.

In the second Five Year Plan a medium degree (about 85%) of mechanization will be achieved in the foundries and forging plants.

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A complex modernization of about 80 machine industry plants will be carried out. ~~The modernization~~ Modernization will be based on the revision of ~~from~~ the present technology in accordance with the newest experiences and on ~~redesigning~~ redesigning ~~the~~ present-day operations. Modernization will permit the introduction of efficient machine tools and shaping machines, combined automatic machines, one-purpose machines; it will also make possible the organization of closed cycles and automatic production lines. The ~~modernization~~ mechanization and ~~modernization~~ automatic operation of the presently used machine tools and shaping machines will exceed the 1955 level fifteen-fold, the use of automatic and semi-automatic welding will be doubled in comparison to 1955.

The technological level will basically influence the ~~modernization~~ equipping of products with accessories, tools and instruments. ~~Modernization~~ Their production in Czechoslovakia is completely split up. ~~It~~ Under the Ministry of the Machine Industry alone there are 270 plants beside the small units conducting mostly maintenance work. In only 4 of these shops is the production of ~~modernization~~ instruments the chief line of production. ~~Modernization~~ Until now the development of the production of tools, accessories and instruments has been only accidental; it was conducted on the basis of local demand and never aimed to provide such equipment which would affect the increase of the productivity of labor, as for example: perfect switches, automatic instruments for ~~measuring~~ making ~~measurements~~ measurements in the course of production, etc. Little attention has been paid to the typification and standardization of ~~basic~~ instruments, especially of operational instruments, with emphasis on their individual elements. In affecting the normalization and typification of instruments it is necessary to compile series of basic elements and to introduce the serial production of the typified and standardized parts.

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Unexploited Possibilities in Connection With Raw Material, Materials and New Substances.

The results achieved by the Czechoslovak people in the field of new technology in the first Five Year Plan are evident in an entire row of new products in all ~~industries~~ branches of the national economy. To a decisive degree these results were made possible through the technical assistance of the Soviet Union. Soviet plans, industrial processes and scientific information were made available to Czechoslovak experts who were able to acquire experience in the best Soviet factories.

Despite all ~~these~~ ^{these} results achieved in the first Five Year Plan, certain deficiencies have occurred in connection with the expansion of industries and the introduction of new technology in the entire Czechoslovak national economy. Consequently the great possibilities and ~~resources~~ resources, which Czechoslovakia unquestionably had and has, ~~were not exploited completely.~~ were not exploited completely. The other branches of the heavy industry did not keep pace with the rapid growth of the machine industry. This is true especially of the ~~supply of industrial materials.~~ supply of industrial materials. For this reason the introduction of new technology had to be linked with an increasing economy in the use of materials, coupled with ~~the~~ ^{an} improvement of the quality of the manufactured machinery and installations. It was necessary to declare war on the former extensive use of metals. On the basis of the latest developments in science and technology, it was necessary to direct the activities of ~~the~~ scientific institutions, designing bureaus, ~~the~~ inventors and innovators (- with the mass participation of ~~the~~ ^a workers and technicians -) in such a fashion as to promote ~~the~~ ^a rapid reduction in the use of materials and thereby to insure ~~the~~ ^a further ~~rapid reduction in the~~ ^{coming} development of the machine industry in the ~~next~~ years. This ~~task~~ task continues even to-day, despite the fact that basic deficiencies, for example in the foundry industry, have ~~already~~ been eliminated.

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Machines

How to Reduce the Weight of ~~the Machinery~~ and Installations.

The weight of machines and installations can be reduced by preparing new, more economical designs which give better ~~the~~ performance, and also by improving the present designs. Both methods demand on one part, a closer cooperation ^{AMONG} ~~between the~~ designers, technologists and scientific workers ~~and~~ ~~the~~ ~~wide~~ utilization of practical experiences, improvements and perfections, which have been achieved by the technicians and workers, on the other part. To reduce the weight of the machines and installations is a basic demand of technical progress. This is naturally linked with the perfecting of ~~the~~ existing materials, ~~and~~ the developing of new materials of superior quality, and also with the progress achieved in theoretical mechanics, statical computations, etc.

In the past little attention was paid in Czechoslovakia ~~to~~ ~~the~~ ~~systematic~~ ~~struggle~~ ~~for~~ ~~the~~ ~~reduction~~ ~~of~~ ~~machines~~ ~~and~~ ~~installation~~ ~~weight~~, coupled with an improvement ~~of~~ ~~the~~ ~~quality~~ in quality. Specific tasks in this respect have not been ~~yet~~ assigned so far and ~~if~~ this entire problem to-day depends on the designers and innovators of the factories. Greater attention to the reduction of ~~the~~ machinery- and installation weight must be the basic aim ~~in~~ ~~the~~ ~~work~~ of the designing bureaus and "technical collectives" in the factories.

The existing possibilities ~~in~~ ~~the~~ ~~industry~~ for achieving a considerable economization in the machine industry through the reduction of weight can be determined by comparing Czechoslovak products with the products of some technically developed countries. For example, the Czechoslovak excavators, models # D 500 or EP 23, are considerably heavier than excavators of the same performance manufactured in West Germany, either by the Wielhag, or Menck & Hambrock, or Orrenstein ~~and~~ Koppel. In connection with machine tools,

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the situation is similar. For example, Czechoslovak table lathes are comparatively much heavier than similar products made by the Austrian firm of Vereinigte Oesterrichische Eisen- und Stahlwerke in Linz. The same can be said about Czechoslovak milling machines in comparison to similar machines manufactured by East Germany. The frictional screw press, model PFch 360, manufactured in West Germany (Schuler) is 14 tons or 25% lighter than the Czechoslovak press, model LF 36/100 (Zdarske Machine Works). The table lathe NTH 300/400, manufactured in the TOS machine works in Hronov, weighs 22 tons more than a similar machine, model SV 40, manufactured in East Germany.

It is essential that the designing ~~institutes~~ ^{which} bureaus ^{judge} have direct influence on designing, ~~regard~~ ^{judge} the quality of the designs not only on the basis of operational advantages of the planned machines ~~and~~, installations or their parts. They must judge them also on the basis of saving metals in their production. Until now, designing bureaus have not ^{paid} ~~given~~ sufficient attention to the technological problems of their designs. The form of the designed parts has not always complied with the principle of achieving the possibly ~~most~~ simple and - ~~from the point of view of production~~ from the point of view of production - most economical forms and surfaces. Designers have often neglected technological requirements and did not examine the conditions of the factories which were preparing ^{to manufacture} ~~the~~ the new designs. In Czechoslovakia there have often occurred cases ~~where~~ where cooperation between the designers and ~~manufacturers~~ planners on one part, and the "collective" of technicians and workers in factories was insufficient. There were also instances when the aid, which the technologists could supply, was not utilized. This resulted in serious difficulties, especially when the factories received ~~the~~ technical descriptions, ^{which they} ~~had not been able to check previously~~ ^{which they} ~~had not been able to check previously~~ In such cases it was later necessary to make numerous adjustments. This meant

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- at the very best - an extension of the period required for the development of production.

Under the present conditions in Czechoslovakia, there are wide possibilities for substantial reductions in the bills of material for each product. This is true ~~because of the lack of~~ because standardization, typification and the organization of supply are insufficient, and technological discipline is lax. Simplicity, reoccurring parts or groups of parts, ease of operation and maintenance, availability of necessary materials, etc. should be the main features of the new machines.

This means that it is necessary to exercise greater care in the designing bureaus; to insure cooperation ^{among such} ~~between~~ ~~these~~ bureaus, ~~and~~ the factories and scientific institutes; to ^{exercise} ~~insure~~ constant control over the elaboration of the basic conditions ^{of designing} ~~of designing~~ and over ^{their} ~~the~~ realization of ~~these conditions~~ before beginning the production of the prototypes and ~~also~~ also when checking production.

Possibilities for the Application of the Best Technological Advancements.

A considerable saving of metals, and often a marked reduction of labor as well as an improvement in quality can be achieved by using new advancements in ~~the construction of~~ production technology. This applies especially to the machine industry where it is possible and easy to introduce new technological ~~advancements~~ methods in place of ~~the~~ methods used formerly. Technical and economic norms for material used per production unit indicate that approximately ~~in~~ from 40 to 50 percent of the original material is wasted in the production of parts. Here it is clearly evident that it is necessary to strive to improve the ^{utilization} ~~effectiveness~~ of material in the Czechoslovak factories by introducing new technological processes. If the utilization of material is improved, not only will material be saved

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from which eventually further products can be made, but tools and machines will also be spared and their lifetime extended.

Because of the low coefficient of the utilization of material, especially in milling operations, the campaign to reduce ~~operational~~ unnecessary/cost has a great significance; ~~with respect to the processing~~ and the same can be said about the change ~~in~~ from milling operations to shaping operations, i.e. ~~in forging, cold~~ guided forging, pressing, etc. Machine production today often bears the marks of production by milling. This is not advantageous because of the great amount of ~~work~~ wasted material and also because of the longer production time. In comparison to ~~the production of parts by~~ milling, cold or ~~hot~~ heated shaping is much more economical with respect to the material, power and time required. Under ideal circumstances the ~~simple~~ substitution of shaping for ~~production by~~ milling can reduce production cost to as much as 1/15th of the former amount. The average amount of material is more than 20% and in some cases as much as 60%. In Czechoslovakia this fact can be verified with the production of cog-wheels on the model ETK 25 gear cutting machine. With the aid of this machine the former production time of 30 minutes can be reduced to two minutes.

During the past decades
The production of parts with the aid of pressing has become more widespread everywhere in the world than had been originally expected. Present experiences indicate that in the future parts and whole items will be ~~made~~ manufactured on an even larger scale by pressing. It is necessary to apply this production trend on a large scale also in Czechoslovakia.

Even with such production methods which have undisputedly great advantages over production by milling, there still are considerable

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reserves for economizing on material. The designers of pressed parts must pay more attention to the initial form of the material and must design the final form of the pressed ~~products~~ parts with due regard for the utilization of material. The cutting of the material actually depends on the construction of the punch. For this reason, the most decisive role in the economical utilization of material in pressing is played by the construction of the press itself. The punch must be such as to fulfil not only its original function, i.e. the rapid, exact and safe production of pressed units, - but it must also be constructed in such a fashion as to reduce sheet waste to a minimum. In this respect the introduction of ~~planned~~ cutting plans can cause a considerable ~~loss~~ saving in metal sheets. ~~Manufacturers~~ Such plans, however, have not been widely introduced in Czechoslovakia. The losses caused by mistakes in determining the form of the ordered sheets and ~~systems~~, primarily, by their careless cutting have been considerable until now; and they have a very unfavorable effect on supplying production with such materials.

Another factor, equally important ~~for~~ for economizing on metals, is the rise in the technical level of the Czechoslovak foundry industry. The foundry industry must use mould casting, centrifugal casting, ^{the} spent wax method of casting, etc. more extensively. This applies also to pressure casting which insures the greatest degree of precision and minimal waste of metal. These new economical production methods must become the main tasks of the Czechoslovak foundries.

To facilitate the more widespread introduction of new technological processes, it is necessary to eliminate certain factors which are obstructing such progress in production. Such, for example, is the erroneous belief that new production methods can be used only in the case of special mechanical installations. It is necessary to refer to the previous results of some factories, for example the Klement Gottwald

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Automobile Works in Prague. Their example shows that very often new methods of production can be applied to machinery which is available in the factory.

Welding today is a special branch of science in all industrial countries. It is rapidly developing, and every day opens new doors in industry, providing new possibilities for increasing the productivity of labor and reducing the consumption of materials. In the Czechoslovak industry the possibilities and perspectives ⁱⁿ of the development of welding have so far been underestimated. The use of welding has ~~had~~ a great effect on the saving of scarce materials. Czechoslovakia has made some progress in automatic and semi-automatic welding, especially in the production of automobiles, motorcycles, etc. But it is necessary to expand the use of these methods on a far larger scale in the Czechoslovak factories.

~~Extensive work has been done~~ In the past years Czechoslovakia has failed to develop metalization, especially with regard to the regeneration of machine parts for economizing on non-ferrous metals, high-grade and alloy steels. Here a small surface of the appropriate metal can provide protection against corrosion, acids or high temperature.

The Use of New Materials.

Efforts to reduce the weight of machines and installations and yet retain or improve their quality raises the question of manufacturing and using steel of a harder grade. On one hand it is possible and necessary to introduce a change from alloy steels to carbon steels or low alloy steels, simultaneously using the required heated processing. Such changes in the Czechoslovak industries have already proved ~~to be~~ resultful. On the other hand it is necessary to begin

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to concentrate seriously on the problem of expanding the production of steels of a harder grade for the purpose of replacing the present steels with them. By using such steels instead of the common steels, an average saving of from 15 to 20 percent can be achieved; in some cases even more.

Another important problem is the use of new materials in Czechoslovak industry. In economization and consumption of materials, Czechoslovakia is still far behind ~~other~~ the results achieved by other industrial states; ~~for example, in the use of~~ non-ferrous metals or in the substitution of metals with new ~~non-ferrous~~ materials. The specific consumption of non-ferrous metals, such as copper, zinc, lead and aluminum, is higher in Czechoslovakia than in other industrial countries. And even though the use of such metals in Czechoslovakia ~~has~~ has declined since 1950, it is still necessary to seek further ways of reducing it. For this purpose it is very desirable to use surfacing methods; their development serves this purpose. And it is also desirable to use ~~a~~ new materials.

The production of plastic materials is not sufficiently developed and is not progressing in such a fashion as it would be desired ~~is~~ for economizing on structural material. Thereby the application of plastic materials in production is very much limited.

It is, however, true that the research on plastic materials will not have the same priority as that of metals, until it will be possible to use plastic materials more widely and suitably in the production of machinery.

Very often traditional materials are used in the ~~manufacturing~~ ~~designing~~ designing of machinery even where technical ~~developments~~ developments demand a considerable reduction in the use of colored metals, or their replacement with new materials which are better suit-

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ed and more advantageous for their given task. For example, in the production of food industry machines, chemical installations, measuring devices, pipes etc. it is possible to use technical glass and basalt with good results. In the production of ~~engines~~ machines, cog-wheels of synthetic materials coated with bronze can be substituted for bronze cog-wheels. These examples show what considerable savings can be achieved in the use of colored metals if the designers have some inclination and good will to give up their unfounded conservatism.

It can be established that Czechoslovakia is lagging behind in the development and expansion of non-metal materials, e.g. minerals, organic and synthetic materials. In designing, such materials as basalt and glass are hardly used ~~for the production~~ for machines and installations. Experience has proved that products made of fine crystal basalt and from certain kinds of glass can replace or even surpass ~~many~~ materials used in designing as copper, bronze, lead, alloy steels, dural, in all branches of the national economy hardwood, etc. This is confirmed by the conclusions derived by some technicians and research workers. ~~from the experience of Czechoslovakia~~ Products made of glass and crystal basalt should be used on a far wider scale in Czechoslovak industry. Because of the qualities of molten basalt, its use in industry, especially for the production of pipes, is far-reaching. Therefore it is necessary that the Czechoslovak technicians, planners and designers fully understand the economic importance of this new material. Czechoslovak industry is now making pipes, plates, tiles, wall tiles etc. from this material. It is also used partly for the manufacturing of pipes used to ~~transport~~ transport such loose materials as e.g. coal, coal dust, coke etc. In practice basalt has proved very satisfactory in the production of

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transport tubes for the hydraulic transportation of materials, for the ~~lining~~ lining of various chutes, platforms, bunkers, for the paving of flour mills, distributing channels, funnels, coal and coke washing plants etc. Pipes have been made for carrying off the waste from ash-removing and decinderating installations, for transport canals subject to great wear, etc. Armor plates for the bottom of floatators have been made of molten basalt, and it has been used for lining acid-proof measuring vessels etc. From this incomplete list of uses to which basalt can be applied, it is evident that every single industry has opportunity ~~to~~ to use basalt products in its own behalf and for the benefit of the entire national economy. The production of molten basalt, however, is insufficiently developed and exploited because little research work has been done in this field. The use of molten basalt for lining pipes used in the mining industry would save thousands of tons of material, especially steel piping. The use of basalt plates ^{and} ~~tiles~~ in the chemical industry would save large quantities of manganese steel etc.

In Czechoslovakia comparatively ^{very} little glass is used in industrial designing, whereas in other countries it is widely used for the making of glass tubes, tiles, excenter presses, installations for the cooling of steams and gases etc. An examination of technical glass as a new material reveals that, for example, in the production of tubes it can be used as a designing material. Its prominent advantage is that it permits visual control of the flow of liquids and meets all requirements of hygiene. These two qualities are appreciated most by the food-, pharmaceutical- and chemical industries. It is essential that these positive results be ^{fully} ~~be~~ recognized by the Czechoslovak planners and designers so that the use of glass be intensively studied and utilized in the required extent. As with glass, the situation is similar with ceramic materials which are being used so extensively, for example, in

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East Germany.

Parts made of new materials must be used in those branches of the machine industry where technologically it is necessary to use colored metals and metals resisting corrosion and acids. For example, "novodur" must be regarded as one of the main designing materials in the construction of chemical installations, in the production of autoclaves, heaters, diffusors, ~~XXXX~~ laboratory utensils, etc. Tests have proved that instruments made of novodur and partially reinforced with metal bands are able to operate at a pressure of five atmospheres. The operation of a series of ^{eccentric} ~~eccentric~~ pumps made of novodur has proved that the cast designs can be replaced with novodur and thereby a considerable reduction of weight can be achieved. To-day everywhere in the world machine parts of various form and measurement are being made of plastic materials.

Furthermore, it is necessary to insure the extensive use of ceramic materials in the machine industry. Their valuable traits, such as very low conductivity and ^{their} ~~high~~ chemical resistance must be fully utilized. Because of such qualities, they are suited to replace stainless steels and colored metals, for example, in the production of pumps for transporting acids or in making ventilators for various gases.

Similarly, it is necessary to introduce the use of polyamide dust in the machine industry. Its qualities have already been tested. Until now it has not ~~found extensive use~~ been used extensively because ~~high~~ production tests have shown that production cost with polyamide dust was higher than when color metals are used, as now. But to stop at the first results of production tests and to dis-

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regard the further improvement and expansion of the use of polyamide dust in the machine industry would only reveal ~~some progress~~ bias toward the use of new materials. The situation is entirely similar in the production of cables where the use of regenerated materials ~~is still minimal~~ for isolation is still minimal.

The use of new materials has met so far with an exemplary understanding only by some designers, namely in the industries manufacturing consumer's goods. This is indicated by the fact that already in 1954 experiments with the use of new materials have increased and resistance to their application is declining. Despite this, however, interest in the new materials is still small. Arguments pointing out the small quantity and still insufficient quality of some of the new materials are a weak excuse for the considerable degree of conservatism ~~in~~ with respect to the wider use of synthetic materials.

An important factor in insuring the more economical use of materials and raw materials is the cooperation between the designers and technologists on one part and the production "collective" in the factories and research institutes on the other part. ~~It is necessary to~~ If research work and tests are conducted rapidly, the main results can be quickly applied to practice. On the other hand it is necessary to demand that scientific and research institutes provide ~~the~~ incentives for constructive thinking through their live, universal and practical activities. The results of such activities must be made popular; theoretical conclusions should be drawn from them, and the rapid application of theoretical results into practice must be insured.

Some Obstacles to the Introduction of New Techniques in the Machine Industry.

The results achieved by the Czechoslovak machine industry in the past

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years are favorable with respect to both the rate of increase of production and its quality.

The Czechoslovak machine industry, however, should not be judged solely on the basis of its contribution to the development of other industries by supplying them with new machines and installations. The achieved level of technical development in the machine industry proper and the introduction of new techniques for the production of machines and installations must also be examined.

The production of machine tools has provided a certain amount of assembly and special machinery for the machine industry proper; thus, for example, for the production of automobiles, tractors, motorcycles, airplanes, rolling mills, etc. The trend in the production of machine tools was to increase the number of models with automatic and semi-automatic production cycles. Whereas in 1945 the Czechoslovak machine industry manufactured 35 models of such machines, in 1951 this increased to 68 models, and in 1953 to 105. In 1952 and '53 the planning and ~~mechanization~~ designing of ~~mechanization~~ the automatic measuring of mass production have been completed, and such ~~mechanization~~ equipment has been prepared for production-line installation where it ~~will~~ ~~control, respectively measures production materials and in some cases even sorts according to size. Mechanized assembly lines have been prepared and installed in the production of automobiles, tractors, motorcycles, airplanes, bicycles, sewing machines, radios, television sets, electric motors, etc.~~

In the field of welding, automatic submerged arc welding and the feeding ~~of~~ filling material with the aid of ultrasonic waves have been introduced. Electrodes of a larger diameter have been used.

In the field of heat and chemical processing, a modernization

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of tempering processes has been achieved by ~~continuous~~ with the introduction of tempering with the aid of high frequency current supplied by ~~new~~ power generators. Tempering with the aid of a surface flame has been ~~new~~ tested. Cementing in a gas medium has been introduced, also the nitridation of ~~machines~~ machines. Methods for processing steel ~~below~~ below freezing temperature have been tested.

In the use of materials steel has been ~~substituted~~ substituted with molybdenum and ~~chrom~~ chrommolybdenum, also with chromvanadium- and molybdenchromvanadium steels for temperatures up to 550 degrees Celsius temperatures, this mainly in the production of power ~~plant~~ installations. The problem of welding wolfram steels has been solved. Plated sheets have been used, primarily for chemical installations, and transformer plates have been made ~~with~~ which have a very low current leakage.

Because plastic materials are manufactured in Czechoslovakia ~~only~~ in a small assortment and in insufficient quantity -, only bakelite, carbonite, polyamide, ~~polymer~~ polyvinylchloride, methylmethacrylate, cellulose plastic, texgumoid, kresolformaldehyde, etc. were used. These materials ~~are~~ were used to manufacture buttons in order to economize on tombak; the magnets of ~~synthetic~~ bicycle dynamos were pressed into bakelite in order to save brass, nickel and aluminum. Plumbing fixtures were made of polyamide, also bearings; bearing bushing for calendars used in the rubber industry were made of texgumoid, etc.

New methods have been introduced and tested also in the forging industry. The die forging of crankshafts has been tested under a pressure of 5000 tons. A series of presses has been made for pressing the hubs and main vanes of turbine rotors. In die making, a method for stamping out forms with a positive die ~~block~~ has been tested; a method for pressing the die-stamp into the die-block and using cold material with a firmness of up to 85 kilograms/square millimeter has been likewise

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tested. The making of dies by casting, the making of combined dies with ceramic inset etc. were ~~known~~ also tested.

In the foundries the quality of cast iron has been improved and has reached a firmness as high as 35 kilograms/square millimeter. ~~Thus~~ Formerly the ~~firmness~~ firmness had been approximately 26 kilograms/square millimeter. Pressure casting was tested, for example, in the machine factory in Holešovice. Precision casting into "spent" wax had been tested, among others, in the Lenin Works in Plzen and in the Precision Machine Factory in Gottwaldovo. In ~~these~~ ^{these} factories centrifugal and oblique castings were also tested. Water-cooling of the cupola was introduced in order to ~~extend~~ prolong the lifetime of its walls. The possibility of using recuperators in the cupolas was also tested.

The Czechoslovak ~~machine industry~~ ~~scientists and technicians~~ scientists and technicians strive to master and test the newest production methods which are being employed in the most developed industrial states of the world. The positive trait in the development of the machine industry in ~~these~~ recent years is the fact that development workers undertook the solution of the most various possibilities and methods of production which could insure the constant rise of the productivity of labor and make production economical by reducing the consumption of materials, raw materials, etc. The insufficiency in connection with the introduction of new technical developments was the slow pace at which the necessary conditions were created for introducing specifying conclusions derived by development and research workers into ~~production~~ production in order that these new and tested methods may make machine industry production even more economical. It cannot be said that in recent years the Czechoslovak machine industry has always developed by improving production on the basis of new technical developments.

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This was caused, among other things, by the fact that the tasks ~~of~~ for technical development ~~had~~ were not always an integral part of the national economy plan, and ~~the fulfillment of the tasks of technical development~~ ~~was not always~~ their fulfillment did not specifically imply the fulfillment of the tasks for the increase of labor productivity and for economizing on materials and raw materials. The tasks for technical development were determined independently, without regard for the production - and production cost plans. Very often they were determined as a matter of course. This conclusion can be substantiated by the following facts:

In the past years the productivity of labor has developed in the Czechoslovak machine industry in the following manner:

1949	1950	1951	1952	1953	1954	1955
12,5%	18,9%	11,6%	19,5%	9%	7,4%	13,0 %

Until 1952 the tasks of technical development consisted only of the mechanization of tedious jobs, and the fulfillment of these tasks were not supervised at all. In 1953 a change in the methods of planning considerably expanded the number of tasks in connection with the introduction of technical developments. But these tasks were still not supervised, nor insured and were not fulfilled. Therefore they did not have a marked influence on, for example, the index referred to above.

1953	Number of tasks planned	Fulfilled	Partly fulfilled	Not fulfilled
Mechanization of tedious jobs	6	2	4	-
Automatisation, new technical processes and methods	65	24	31	10
Learning of production methods	160	62	64	34

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Scientific research work	85	50	27	6
Total	316	138	126	52
Fulfillment in % Percentage of fulfillment	100	44	40	16

The 1954 plan for new technical improvements was fulfilled similarly:

1954	Number of tasks planned	Fulfilled	Partly fulfilled	Not fulfilled
Mechanization of tedious jobs	5	5	-	-
Automatisation, new technical processes and methods	58	26	32	-
Learning of production methods	33	9	8	16
Scientific research work	217	103	73	41
Total	313	143	113	57
Percentage of fulfillment	100	46	36	18

In 1955 the tasks of technical development were fulfilled from 50 to 60 percent. This fact indicates that with a more rapid pace of introducing technical developments into production and with closer unity between the plans for technical development and the annual plan, it was possible to assign the Czechoslovak machine industry far higher tasks in the increase of labor productivity and in the rate of reducing production cost, and that it was possible to acquire greater accumulation and to free a certain number of co-workers for the other branches of the national economy, or to insure a higher pace and greater volume for the machine industry production.

In the past the fulfillment of the tasks set by the ~~state~~ government plan was often accomplished by more convenient methods - either by build-

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ing new capacities of the present technical level, by excessive use of materials and raw materials, requiring more labor or overtime work, etc. - or by demanding adjustments in the government plan wherever similar methods for fulfilling the plan were ~~not sufficient~~ inadequate. The insufficiency in introducing new technical improvements stems also from the fact that in many cases the ~~management of the machine industry~~ leading workers of the machine industry revealed signs of self-satisfaction over the technical level achieved in production. Their self-satisfaction was further supported by the views that the conditions for a more rapid introduction of technical developments are not insured in the Czechoslovak machine industry because of the ration of small serial- and piece production, and because of the wide range of the production programs. Insufficient ability to insure a constant increase of technical development and the leisurelyness of the leading workers of the machine industry also became apparent; they wanted to maintain the ~~machine~~ machine industry at the same level at which they have taken it over, or to which they have ~~industrially~~ ^{ingly} "painstakingly" developed it.

~~The world technical level of recent years must be achieved by the Czechoslovak machine industry in the shortest time possible because it insures the constant introduction of new technical methods. It must be realized, however, that large serial production is characteristic for this world technical level. If Czechoslovakia desires to clear the road for modern technical methods of the kind as exist in the Soviet Union or the United States, then it is necessary - among other things - to raise the level of machine industry production to the same level as exists in these countries. Every degree of technical development/always corresponds to an average degree, respectively kind of production. Modern world technical methods, which insure a basic reduction of~~

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material consumption and time in the most various branches of the machine industry, is made possible primarily by large serial- and mass production. Therefore, if Czechoslovakia wants to accelerate the pace of introducing new techniques into the machine industry, it is necessary to create the required conditions ~~and~~ by introducing mass- and large serial production more extensively. These conditions, however, have not been created because ~~of~~ "the wide production program and the considerable ratio of small serial- and piece production in the machine industry." Thereby the way for the rapid further development of ~~the new technical~~ techniques in ~~the~~ machine industry production has not been sufficiently insured. But even where these conditions did exist, as for example in consumer's goods, electro-technical products, ~~mechanical~~ tools, etc., the requirements for introducing new techniques have been neglected. The workers have not been prepared for ~~the~~ ~~adopting~~ adopting new production methods, nor were the preparations for production, the necessary machinery and installations, the financial means insured.

A more rapid introduction of new techniques in the machine industry is still hampered by ~~the~~:

- a) the excessive engrossment of leading workers in current production,
- b) inadequate results in the standardization of machine industry products,
- c) inadequate results in connection with the concentration of production and specialization of enterprises,
- d) insufficiencies in planning new techniques,
- e) the improper attitude of some workers toward new techniques.

One of the factors which indicate the low level of organizing production in some factories and which hampers the speed of introducing new techniques, is the unevenness of production. The uneven operation of the fac-

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tories consumes the valuable time of the leading workers which they could use for creating the conditions required to introduce new techniques into production ~~conditions~~ and for promoting technical developments. Some improvement has been achieved in the evenness of production in the factories. This is reflected in a better distribution of quarterly tasks according to month. But so far there are no signs of having achieved evenness in production during the month itself. Both in the factories and within the entire ministry ~~level~~, the completion of the plan ~~unsuccessfully~~ shows considerable fluctuation in the individual decades (ten-day periods). There is also a stormy rush period at the end of each month. For example, if the average production in the first decade is 100 percent, ~~in~~ the production figures for the ^{quoted} ~~data~~ ~~existing~~ decades of 1955 were the following:

	1955					
	May			June		
	1st	2nd decade	3d	1st	2nd decade	3d
Total machine industry production	100	117	170	100	118	173
Production of consumer's goods in the machine industry	100	134	307	100	139	336
Agricultural machinery	100	147	216	100	192	295
Ball bearings	100	173	276	100	130	201
Motorcycles	100	105	166	100	97	194
Elec. washing machines	100	175	769	100	167	195
Electric sweepers	100	151	223	100	97	102
Hair clippers	100	104	141	100	124	110
Sewing machines	100	142	208	100	94	122

With few exceptions, in the entire Czechoslovak national economy to-day the conditions necessary for every factory to complete its state plan with

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strict adherence to the determined specifications and to maintain an even production pace - ~~approximately~~ do exist.

Attention should be paid to the fact that in the Czechoslovak machine industry, despite some improvement, there are still many enterprises which are not operating rhythmically and are not completing their production plans evenly.

The production figures of the Machine Industry Factory Nat. Enterprise in Žebrak and the ball bearing factory in Mecholupy can be quoted as examples. Although the factory in Mecholupy is conducting large serial production, its production figures month by month show a stormy rush in the third decade of the month. This not only consumes the ^{entire} time of the top workers, but also requires that the technicians, after finishing their own work, help in the shops to work on the machines in order to insure the fulfilment of the plan. Such production has become accepted and is considered normal. In this factory the break-down of production figures for the various decades is the following:

April 1955			June 1955		
1st	2nd decade	3d	1st	2nd decade	3d
17%	25,3%	57,7%	16%	31%	53%

This break-down of production operations corresponds also to the working time of the workers and leading co-workers. In the first decade the working time was from 8 to 9 hours; in the second decade it was from 9 to 10 hours; in the third from 12 to 14 hours. "Brigade work" by co-workers from the offices is not included in these figures.

The Machine Industry Factory National Enterprise in Žebrak operates similarly. Here the breakdown of production according to

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decades is ~~xxxxxxxx~~, the following:

January 1955			March 1955		
1st	2nd decade	3d	1st	2nd decade	3d
3,8%	22,6%	73,6%	12,8%	25,8%	61,4%
June 1955			July 1955		
1st	2nd decade	3d	1st	2nd decade	3d
15%	27%	58%	12,8%	28,6%	58,6%

Neither in Měcholupy nor in Zebrač was the management able to level out the fluctuation of production and to create a balance of semi-finished products.

The main reasons ~~xxxxxxxx~~ for the unevenness in production and in the shipments of finished products causing a great rush in completing the plan at the end of the month - are to be found primarily in ~~the~~ insufficient planning and organization of production within the factory itself. The level of planning within the factory is often unfavorably influenced by the increasing demands with which ~~the~~ planners are faced as a result of the constant increase in production. Here internal planning does not insure the necessary organization of production in the shops. This in turn leads to the disruption of even assembly and shipping of ~~the~~ finished products. In 1955, for example, in the Machine Industry Factory National Enterprise in Zebrač the assembly and shipment of finished precision lathes model FN 22 were delayed because the factory failed to make the necessary preparations for production in the shops. The assembly was ^{hampered} ~~delayed~~ also by the delay of the shops in supplying parts. These are the primary reasons why the ~~fulfilled~~ plan for the machines mentioned was not fulfilled.

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factory

Another great fault in internal/planning ~~in the factories~~ resulting in uneven production - is the improper utilization of production capacity and the failure to conduct previous estimates of production capacities according to the work required and the groups of machine installations. The underestimation of the existing production capacities in the operation plan ~~is~~ hampers the ~~achievement~~ ~~of~~ achievement of the required results ~~in production~~ and also the supply of the necessary ~~raw~~ materials semi-finished ~~products~~ for production. In many cases it disrupts the production of ~~the factory~~ small parts which are necessary for assembling the products. This occurred, for example, in the Machine Industry Factory National Enterprise in Varnsdorf in June 1955.

In this factory the state and production capacity of the machine park were unknown. This led to an underestimation of the production capacity. For example, in the first half of 1955 the plan for general repairs was completed 48%. In comparison to this, unplanned repairs were completed to the extent of 168%; their volume exceeded the volume of the planned repairs three-fold. The machine for grinding down the edges of the manufactured machines broke down and was out of order for 2½ months. It was necessary to rasp these edges by hand. The result of this was feverish work in all shops of the enterprise and a failure to complete the plan.

An equally important insufficiency in internal planning and organization of production in the factories, which disturbs their even production, is the unsatisfactory state of technical preparations for production. ~~This is due to the fact that the designers~~ When designing new machines, the designers and technologists fail to insure the productional and operational quality of the new product. For this reason, numerous corrections are made ~~when~~ ^{as} this becomes evident when production is begun. It is necessary to make

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various structural and technological changes, adjustments and supplements during production. All this is very unfavorably reflected in production results. An example of this was the introduction of the already mentioned precision lathes into production in the machine factory in Žebrak. The production of these lathes had been transferred from the Czechoslovak Arms Factory (Ceska Zbrojovka) in Strakonice, without sufficient preparations and with considerable mistakes in the accompanying blueprints.

Failure to maintain an even production level and a disruption of work necessarily leads to exhausted supplies of semi-finished products during the month, and to a considerable decline in production ~~with all its accompanying symptoms,~~ in the first part of each month. ~~These~~ Unevenness of production necessarily causes considerable work stoppages, especially in the first part of the month. Efforts to overtake the results of these stoppages by working overtime (for example, in the production of ball bearings in Měcholupy) in the last decade of the month do not at all compensate for the losses in the productivity of labor, and they are accompanied by a deterioration in the quality of the products and require an overstepping of the wage limit.

~~These stoppages give the top workers of the machine industry time to prepare and plan the introduction of technical developments in the machine industry, it is necessary to achieve an even level in production, in all machine industry factories, in the shortest time possible.~~

It cannot be assumed that only an increase of production in the various branches of the machine industry can bring improvement in the ~~level and character of production.~~ level and character of production. Such views,

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at the best, would be a sign of shortsightedness. Under the conditions existing in Czechoslovakia, it is necessary to choose another solution. ~~It is necessary to choose another solution. It is necessary to choose another solution.~~ A change from small serial- and piece production to large serial- and mass production is possible only with a wide, thorough and ~~profound~~ systematic standardization of machine industry products. Very little has been done in this respect in the past years. Therefore, it is necessary that more attention be paid now than previously to this important basic condition for the further technical development of the machine industry. The tasks assigned for this purpose must insure: ^{possible}

1) the most extensive unification and standardization/ of models and characteristic measurements of machines; ~~the selection of~~ the selection of the best kinds of machines for production;

2) the ~~most~~ ² most extensive standardization and unification possible of models and design groups, units and parts; the determination of the ~~most~~ ¹ most perfect designing forms and ~~the sizes for production~~ sizes for production;

3) the mutual replacability of groups, units and parts.

Naturally, in the production of a large number of various kinds of machinery and installations in comparatively small series, it is not always possible to make the often expensive change to ~~modern~~ ^{modern} technical ~~methods~~ ~~production~~ production methods. Through a purposeful standardization of machines, ~~and~~ mechanical installations, units and machine parts - it is possible to create conditions which are ^{most} favorable for the constant introduction and realization of technical developments, especially the introduction of modern production methods, and to achieve thereby a high degree of mechanization and automatization of production. Standardization and unification, respectively normalization ^{will in turn} force ~~the construction of new efficient machines and special mechanical in-~~ the construction of new efficient machines and special mechanical in-

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stallations on a wider scale than before.

An example of the lack of standardization as to performance, size and ^{re}placability of parts, and also an example of uneconomical production with respect to ~~various~~ models and parts - is the present production of electric motors. A survey of the production of electric motors has revealed that, for example, the parameters of the various manufactured motors have practically nothing in common. Assembly measurements are very diversified, although very often there is no difference at all in performance. The ~~measurement~~ measurement of parts and the selection of the materials used are varying. This does not facilitate ^{the replacement} ~~exchange~~ of motors, their repairs. It also requires that an ample assortment of spare parts be kept on stock, and primarily it requires that the present kind of production be continued. The formation of ^{specific lines} ~~individual series~~ containing a smaller number of models which meet the requirements of economy in ~~the~~ the choice of fuel, and also the realization of the production of such lines. make ~~possible~~ ^{fullest} the/standardization of the production of electric motors ~~as far as possible~~. They also enable a change to ~~the~~ ^{to} higher level of production - that is large serial production, and in some instances mass production, with all ~~the~~ ^{to} ~~its~~ ^{their} advantages for introducing new techniques. The designing of assemblable units, derived from the electric motors of one line, would mean a further step toward creating the conditions required for technical advancement. The soundness of this method has been proved by the Soviet norms for electric motors, for example ~~existing GOST 4542-52 to GOST 4542-52~~ GOST 4542-52. A comparison of these norms with electric motors of the same kind manufactured in Czechoslovakia reveals that there still are unexhaustable ~~possibilities for technical advancement in the production of electric motors~~

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possibilities in the field of standardization for the purpose of introducing new technical methods. Other examples could be cited in the production of Diesel engines, trailers, etc.

Thorough and methodical standardization forms the preliminary conditions to achieving a specialization of ~~the~~ machine industry plants.

The specialization of machine industry plants has significant economical effects; this arises primarily in mass- and large serial production. The constantness of identical production in large volume is characteristic of mass production. This insures and creates the best conditions for the introduction of new technical methods because it allows the highest degree of mechanization in all phases of the production process. It insures ^{flowing} ~~full~~ production lines and provides the conditions for the specialization of the factories.

Specialized plants make it possible ^{to the highest degree} to apply new technical methods and modern forms of organization in production. Workers in specialized factories have a ~~greater~~ ^{greater} possibility and ~~with~~ ^{with} more favorable conditions to master modern production methods more rapidly. They are able to exploit one-purpose machines ~~and~~, special machines, ~~and~~ tools and preparations, etc. more thoroughly. Specialization accelerates the change from piece- and small serial production to large serial and mass production, with all the advantages these production methods provide for the rapid introduction of new technical methods. Nor can the favorable effect of specialization be overlooked on the higher skill and qualifications of the workers. It enables them to better understand and master new production methods in the industry.

This uneven production of the machine industry factories, the lack of perspectives in the introduction of new techniques and the lack of thorough and purposeful standardization of machine industry products, and therefore ^{the} by the lack of specialization of the plants ~~are~~ - are the reasons why today the Czechoslovak machine industry shows ~~insufficient~~ deficiencies in some indexes which must be remedied in the shortest possible time.

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The modernization of plants has been totally neglected from the technological point of view. It is well known that the ~~skilled~~ ^{high skill and} qualifications of the Czechoslovak technologists have not been and are not on the desired level. Despite of this, they have been given complete charge of insuring the modernization of the Czechoslovak factories and of introducing technical developments in production. No practical aid has been given them. The full ~~expansion of~~ capacity of the planning sector has been assigned to new factories. This is the same mistake as if the entire capacity of the designing bureaus were to be assigned to ~~designing~~ new products. It will be necessary to check the activities of the planning organizations and to eliminate mistakes of this kind in the future.

There are also great deficiencies in the planning of the development ~~and introduction~~ of new technical methods, in their introduction into production, and also in the supervision of their introduction. Plans for the development and introduction of new technical methods are being drafted without consulting the achieved indexes in technical development abroad. In the past years practically none in Czechoslovakia has compiled ~~or~~ systemized or studied the available material on the technical level of production abroad and on technical development outside of Czechoslovakia. For this reason Czechoslovak plans ~~do~~ do not always contain the latest trends in the development of techniques.

The control of the plan ~~is~~ for technical development is basically restricted to ~~the~~ massing reported data and to compiling reports for higher organs, without proper analyses and without actively affecting the fulfillment of the state plan with respect to time and quality.

The planning of the introduction and control of new technical methods must be improved if it is to equal the further planned development of the Czechoslovak machine industry.

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It is necessary to be not only informed of production devices, but also to apply them in other factories. ~~It is necessary to frequently check up on this.~~ The Ministry for the Machine Industry ~~itself~~ does not issue orders to the factories prescribing the introduction of new production methods. Nor do production inspectors ~~or, other~~ officials of the ministry or other higher organs go to the factories to control how ~~the orders of the ministry~~ ministry orders pertaining to new production methods have been carried out. Such practices do not exist in the endeavour to spread modern production methods. For this reason, they cannot be considered as means for promoting a more rapid introduction of technical advancements.

In what ways should the pace of introducing new technical methods be accelerated in the machine industry?

1) It is necessary to unburden the chief officials of the machine industry and to make them available for the perspective planning of new technical methods. This can be achieved, among others, by insuring the evenness of production in the machine industry.

2) It is necessary to improve the attitude toward new techniques at all levels of the machine industry. It seems that it is not enough to appeal to the conscience of certain workers, or to mobilize collectives for introducing new technical methods. It is necessary to create objective conditions for the workers, from the factory director down to the last worker, making them interested in the application of new technical methods. It is necessary that on one hand the personal responsibility for introducing new technical methods in the machine industry be increased, and on the other hand it is necessary that the new techniques be advantageous^{er} for the factories which are to adopt them.

Furthermore it is necessary to end formalism in the planning of new technical methods, and also in the reports on the fulfilment of such plans. ~~The~~ New technical methods must not continue to be a burdensome task; they

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must be a factor, sometimes the sole factor, in insuring the planned tasks in production, in the increase of productivity and in the reduction of cost. The higher organs must give more attention and support to scientific and research work in the technology of production. They must direct such work from the very start, and ^{must} also determine the products or parts which can be manufactured with new methods.

3) It is necessary that the introduction of new technical methods ~~in~~ in production should have its ~~own~~ long range specific plans also in the factory, divided into stages. This plan will have to be modified in accordance with ~~the~~ research results ~~in the preceding years~~ of the current years. In the annual plans it will be possible to assign specific partial tasks stemming from ~~the~~ long range plan.

4) In connection with the drafting of a perspective plan for the introduction of new technical methods, it is necessary to devise also a perspective plan for the specialization of factories, ~~and~~ as well as a long range plan for the development of cooperation relations. It must be realized that the specialization and cooperation of the factories also have enormous influence on the pace of introducing new technical methods ~~into~~ production.

To create the conditions for a change to higher-level production, to insure the conditions for the application of technical developments to serial and mass production, to accelerate the rate of replacing machinery and installations - these are the only realistic ways for increasing the rate at which new techniques are introduced ~~into~~ the production of machinery and mechanical installations.

PART IV.

The Czechoslovak Machine Industry in Comparison to the Machine Industries of the Other People's Democracies.

A necessary condition ~~for the construction~~ for the construction of social-

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ism in the people's democracies is socialist industrialization. Only socialist industrialization enables the people's democracies to overcome their technical and economic backwardness, to create a material production basis for socialism, and to insure the firm conditions for the constant rise of production and the standard of living. Before World War II the ration of industrial production in proportion to other production (industrial and agricultural) was 47,6% in Poland, 53% in Hungary, 43% in Roumania, 33,8% in Bulgaria, 18,3% in Albania and in Czechoslovakia in 1929 it was approximately 64%. Besides this the economies of the people's democracies suffered considerable losses from the war and from fascist plundering.

The successful revival of the national economy in the first years after the war created in these countries a firm basis for ~~the reconstruction~~ socialist reconstruction. The main tasks of the first long-range plans in these countries ~~was to create the basis of socialism~~, similarly as in Czechoslovakia, was to create the basis of socialism. The main chapter of these plans was the socialist industrialization - the development of industry, and especially of the heavy industry. The socialist industrialization of the people's democracies has taken place and continue under more favorable historical conditions than formerly ~~in~~ in the Soviet Union. Each country has certain characteristics in its structure. In each case, the people's democracies are constructing socialism with the multilateral aid of the Soviet Union; and with mutual cooperation they are developing primarily those branches of industry which have the most favorable natural and economic conditions in the individual country. The entire national economy and primarily the industry of the countries belonging to the socialist camp are developing on the principle of the international division of labor and on the principle of mutual economic aid and cooperation among them.

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This method of conducting socialist industrialization has enabled the people's democracies in 1953 to surpass the pre-war level of their industrial production; 3,6 times in Poland; 3,5 times in Hungary; 3,4 times in Bulgaria and 2,5 times in Roumania. As a consequence of these changes, the ratio of industrial production in proportion to the total production (industry and agriculture) increased considerably. The countries mentioned have become agrarian-industrial countries with considerable industries, equipped with modern technical installations. In Poland the coal- and chemical industries have developed considerably, also the production of ~~rough iron~~ crude iron and construction materials. In this country in recent years the production of automobiles, tractors, ~~ships~~ the ship-building industry, the production of synthetic fibers, ball bearings, etc. ~~was~~ ^{were} developed. In Hungary the aluminum-~~ind~~ and machine industry have been developed to a considerable degree. In Roumania there is a marked development in the oil industry, oil refining, chemical industry and some important machine industry production has also been introduced. Thus, for example, the production of agricultural machinery, Diesel engines, tractors, ball bearings, ships etc.

In the people's democracies the development of production means was given priority in order to insure the basis for the further development of the entire national economy. Socialist industrialization meant a rapid increase in machine industry production in all people's democracies. Thus, in the years from 1950 through 1955 the machine industry production of Poland increased 145%, that of Hungary 127%, Roumania 192% and Bulgaria 154%. The general trend of the machine industry production of the individual countries differed somewhat ^{according to the} ~~production~~ degree of development in their entire industry, its structure and natural and economic conditions. The Czechoslovak machine industry has also contributed considerably to the

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rate of the development of industry in the individual countries, and especially to that of ~~the~~ ^{their} machine industry. Despite the fact that machine industry production in the people's democracies has increased considerably in comparison to the pre-war years or to 1948, the Czechoslovak machine industry still maintains first place among them. With respect to volume, the Czechoslovak machine industry is larger than that of the other people's democracies, with the one exception of East Germany. The trend of the Czechoslovak machine industry indicates ~~the~~ ^{certain} specialization, especially in the field of heavy and large power installations, chemical- and mining industry installations, etc. Because of this specialization, the Czechoslovak machine industry continues to be an important ~~economic~~ ^{key} factor in the further ~~development~~ industrial development of the individual countries of the socialist camp. In some branches of the machine industry, however, other people's democracies are in the lead, for example: East Germany, eventually Hungary and Poland.

A comparison of the importance and trend of the machine industries in the individual people's democracies is evident from the following figures of 1955 production. (The figures are ~~approximate~~ only approximately correct.)

The ~~given~~ figures on the machine industry production of the people's democracies gives an approximate picture of the development of the machine ~~industry~~ industry in comparison to the other countries. The figures are not entirely characteristic for all countries. Each country has its special branches. For example: East Germany occupies top place in the optical- and fine mechanics industry, Hungary is second.

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Year: 1955		Unit of measure	Czechoslovakia	East Germany	Poland	Hungary	Roumania	Bulgaria
Steam boilers	steam pressure per hour	100	84,5	21,7	5,9	12,1	3,5	
Steam turbines	MW	100	65,0	3,9	24,4	1,5	-	
Hydro-electric turbines	MW	100	4,0	-	9,0	-	6,0	
Diesel engines	1000 HP	100	83,5	9,3	105,0	17,7	0,4	
Milling machine tools	Number/tons	100	134,0	69,0	33,6	8,5	7,2	
Shaping machines (without blades and moving parts)	Number/tons	100	73,0	15,3	12,0	3,6	3,5	
Foundry installations	tons	100	83,0	63,5	7,4	7,5	2,2	
Chemical installations	tons	100	-	83,0	8,7	3,5	0,4	
Rolling mills	tons	100	68,5	-	2,8	3,4	-	
Tractors	Number	100	55,6	60,0	34,8	30,4	-	
Steam locomotives	Number	100	91,0	200,0	176,0	51,6	-	
Freight cars	Number	100	70,0	205,0	12,2	32,2	17,4	
Trucks	Number	100	125,0	107,5	42,2	25,8	-	
Cars	Number	100	145,0	26,7	-	-	-	
Electric bridge cranes	Number	100	82,4	112,3	36,0	20,7	18,9	
Compressors	Number	100	326,0	6,4	25,8	1,7	0,6	

Comments on the machine industries of the individual people's democracies:

The industrial production of East Germany represents approximately 25% of the total industrial production of Germany in 1936. While industrial production of East Germany increased 176% in 1953 in comparison to 1936, the production of the metal processing industry in the same year increas-

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ed to more than 210%.

The machine industry of East Germany surpasses in volume the needs of the country, and - similarly as in Czechoslovakia - it is a basic factor in the country's export trade. The German machine industry exports a considerable amount also to Czechoslovakia. ~~The export of machine tools in 1955~~ In 1955, for example, 37,5% of the entire German export to Czechoslovakia consisted of machines and mechanical installations; whereas only 8% of the Czechoslovak total export to East Germany in that year consisted of machines and mechanical installations. The East German machine industry is evidently trending toward the ~~expansion~~ production of high pressure power plants and - in conjunction with this - high pressure boilers. (For example: 244 steam pressure/hour and 152 atm. pressure boilers.) East Germany is also developing installations for the mining industry, high pressure containers for the chemical industry, agricultural machinery, etc.

East Germany plans to increase her production of Diesel ~~engines~~ engines to almost double, electric motors to approximately double, machine tools ~~to~~ to 1,5 fold, automatic machine tools almost 3 fold, rolling mill installations 2 fold. She also plans to expand the production of chemical installations and excavators, harvesting combines (more than 2 fold), tractors (2,5 fold), ~~freight cars~~ railway cars and trucks (more than 2 fold), cars (more than 4 fold), etc.

The volume of the Polish machine industry is smaller than that of Czechoslovakia. However, ~~the~~ ^{its} developments ⁱⁿ of recent years and the rate of further development indicate that Polish industry is becoming an important economic factor also in exports. From 1949 on in the next five ~~years~~ years machine industry production in Poland increased almost 3 fold, and its ratio in proportion to the total industrial production ~~has~~ reached 22%. The Polish machine industry is now manufacturing a series of pro-

~~continued~~

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ducts which formerly Poland was forced to ~~import~~ import, for example, cars and trucks, the greater part of machine tools, etc. In 1953 the exports of machinery and mechanical installations comprised 12,3% of the entire Polish export. In the future the Polish machine industry is trending toward the production of complex machinery and installations, as for example: machine tools, automobiles, agricultural machinery, excavators, construction and road machinery, etc.

Poland intends to develop the production of rolling mills, to double the production of the chemical industry, to increase the production of excavators almost 6 fold, the production of agricultural harvesting combines more than 10 fold, the production of trucks 50%, that of cars 6,5 fold, Diesel engines 3 fold, generators 4 fold, steam turbines 4 fold, machine tools 70% (this includes a more than five fold increase in the production of automatic and semi automatic lathes.

With respect to its volume and assortment of products, the Hungarian machine industry is also smaller than that of Czechoslovakia. Its technical level - with some exceptions, such as the electro-technical industry and the locomotive industry - does not reach the Czechoslovak level. Great importance is attached to the ^{future} development of the machine industry in Hungary. The machine industry in that country ^{must} trends primarily toward the production of machines for the mechanization of agriculture and for making ~~the~~ consumer's goods.

From the above review of the machine industries in the individual people's democracies it is evident that the Czechoslovak machine industry - with regard to its traditions, past experience in production, mechanical equipment - will continue to be an important factor in the further economic development of the other people's democracies. Czechoslovakia, however, must take into consideration that the demands of the people's democracies will increase in comparison to ~~previous~~ former years; these demands will center around machines and installations of high performance, technically pretentious and of the most modern design.

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International Economic Cooperation in the Machine Industry.

It must not be forgotten that competition between the socialist and capitalist economic systems is not a mere phrase but an objective necessity, in which technical development has a decisive role.

To set the direction and the pace of competition between the two economic systems, it is necessary to study thoroughly the state of technical development abroad and to master it. One of the factors in increasing the pace of the introduction of technical developments in Czechoslovakia is the exploitation of scientific and technical cooperation ~~between the countries of the socialist camp~~ among the peoples democracies and the Soviet Union, ~~and~~ and also their economic cooperation. The results must be introduced in the entire national economy rapidly and systematically. A

A firm support for the further technical development of the Czechoslovak machine industry and for the increase of the productivity of labor in this industry is undoubtedly the increase of the volume of large serial and mass production; ~~the increase of the volume of large serial and mass production~~ by coordinating the production programs among the ~~socialist~~ countries of the socialist camp through an international distribution of labor. Without a properly functioning economic cooperation, it is hardly possible to ~~fulfill all the great tasks which the~~ in the coming years will face the Czechoslovak national economy, and primarily the machine industry.

Economic relations ~~between~~ among the countries of the socialist camp are in accordance with the basic economic principle of socialism and the principle of methodical and proportional development, subject to the social aim of satisfying as completely as possible the constantly increasing demands of society, by constantly increasing production with the aid of new technical developments. Economic cooperation among the

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countries of the socialist camp are based on the new socialist international division of labor. Socialist division of labor among states is conducted by closely coordinating their national economic plans, especially the plans for investment constructions, and by specialization and cooperation among the most important branches of industry.

This economic cooperation is a new type of international relations, unequalled in the history of civilization. The international division of labor (in the form of dividing production, development and research programs) is of enormous significance to industry, especially to the machine industry. Namely, on the basis of definite specialization and supply it is possible to increase and change piece production to serial- and even large-serial production with all its eventual advantages. The division of labor among the individual people's democracies is very advantageous for the machine industry where the assortment of products is such wide, and where a considerable number of machines and mechanical installations are manufactured in small series or by piece production. The results of such cooperation would necessarily bring considerable economic advantages to the participating countries.

Another important factor in economic cooperation is the saving of investments in the individual countries, because overlap and duplicity in production, development and research is eliminated.

By reducing the number of products (narrowing ~~down~~ the assortment of products), a smaller assortment of machine models and mechanical installations can be changed to production employing modern technical methods. Consequently, this results in ~~the~~ increased productivity and economicalness of production. ~~The distribution~~

The division of labor among countries with plan economies provides further possibilities to eliminate ^{their} economic dependence on the capitalist countries; to increase serial production; ~~and~~ to concentrate tech-

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At present a series of bilateral negotiations, concerning the most various branches of the machine industry, are in progress. They concern, for example, machine tools, power installations, construction industry machinery, automobiles, tractors, etc.

In negotiations on economic cooperation and division of production programs, the issues taken into consideration are: the utilization of favorable economic conditions in the individual countries, their experience in ~~production of complete units~~ a certain industrial field, their capacity, home demand etc. Through negotiations it is desired to achieve in the shortest time possible:

- 1) a better utilization of the already existing capacities, a ban on superfluous constructions and investments for unjustified new production capacities in one country or the other;
- 2) more favorable conditions for the further rationalization of production; more serial production and effective cooperation;
- 3) ~~more effective cooperation~~ cooperation in the planning and production of complete investment units, for both domestic demand and export;
- 4) the closest possible cooperation in research and testing on a wider scale, for the purpose of forming larger groups of co-workers in the respective fields, thereby accelerating such activities.

PART V.

The Tasks Of The Machine Industry in Connection With The Further Construction Of Socialism in Czechoslovakia.

During the past ten years Czechoslovak industry has achieved considerable results, primarily in the rate of its development, in ~~the~~ its readjustment and in the increase of its production volume. These results can be attributed to the preferential development of the production of production means which are the bases of the development of production resources and

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of the increase of technical development.

Despite these results, it cannot be denied that the application of new techniques and of modern technology has not achieved so far a decisive influence on the increase of production and its ~~productivity~~ economicalness - although these very effects are a factor of industrial development. In some branches of industrial production, Czechoslovak industry has achieved the world level. However, the over-all rate of technical development is not satisfactory. Some branches of industry are lagging behind the world level. The present pace of technical development does not meet the requirements of the tasks set by the second Five Year Plan in connection with the development of technics. These tasks should be fulfilled with the aid of the vast resources which can be made available with the introduction of new techniques.

The industrial potential and capacity of the entire national economy is judged not solely on the basis of its absolute volume, i.e. irrespectably of the number of the country's population. It is judged also on the basis of the economic ^{ability} ~~productivity~~ of industry and of the entire national economy to satisfy the needs of the country and of its population - i.e. by the amount of production which falls on ~~average~~ one person. The results of the competition between the two economic systems, i.e. between socialism and ~~capitalism~~ capitalism, can be followed with the aid of these very indexes.

To win this competition and to create a communist society means that it is necessary to surpass economically the leading capitalistic countries, primarily in the average amount of industrial production per person. Naturally, this is not a question of achieving the same average production share per person. It is considerably more important to exploit the industrial potential for the benefit of society much more effectively than this has been done in the countries mentioned. In the past years, that is

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in the years of ~~reconstruction~~ industrial reconstruction in Czechoslovakia, a series of results have been achieved in the development of the country's industrial potential. These results are best reflected by comparing the pre- and post-war average share of industrial production per person in Czechoslovakia and in the leading capitalistic countries. (The output of the power and coal industries, the production of crude steel and cement are the most decisive indexes for judging the economic development of a country):

Production per person	Czechoslovakia		Britain		West Germany		France		US	
	1934	1954	1934	1954	1934	1954	1934	1954	1934	1954
Power (in kWh)	285*	1051	512	1468	-	1385	487	1067	1136	3354
Coal (in kgs)	1890	3500*	5165	4449	-	3630	1076	1271	3488*	2338
Crude iron (in kgs)	116	215	182	238	-	254	192	209	293	328
Crude steel (in kgs.)	159	330	279	370	-	352	192	248	399	493
Cement (in kgs.)	96	198	156	238	186	328	104	224	156	281

*Brown coal (lignite) expressed as coal with a coefficient of 1,7

These figures indicate the exceptionally rapid increase in the industrial potential of Czechoslovakia after World War II. Before the war the average volume of industrial production per person in Czechoslovakia was far behind that of the leading capitalistic countries, for example, with respect to coal, crude steel output, etc. After the completion of the first Five Year Plan and the successful development of the Czechoslovak economy in the years 1954 and '55, the average share of industrial production per person is higher than either in France or Canada; it has reached the level of Britain and West Germany, and has neared the pre-war production of the United States. This fact is of great significance with respect to the further

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development of Czechoslovakia. It serves as a basis of comparison and determines certain phases in the further development of the Czechoslovak national economy. In the near future Czechoslovakia will soon surpass England and West Germany with respect to the indexes mentioned. At a further stage, only the United States will remain as a competitor from among the capitalistic countries. The means by which these victories can be achieved is the fulfillment of the tasks of the second Five Year Plan.

An analysis of the levels achieved in the Czechoslovak national economy, in comparison with the leading capitalistic countries, has revealed that

1) Czechoslovakia is somewhat behind in the electrification of the country because the present index of the average share of the power supply per person is lower than in the leading industrial countries;

2) Czechoslovakia lags behind the industrially developed countries in the mechanization of her economy;

3) The situation is similar with respect to automatization, in comparison ~~to~~ to the United States, Britain, etc.

The analysis has also revealed certain insufficiencies in the proportional development of the Czechoslovak economy. There is a certain disharmony between the fuel and raw material resources and ~~the requirements~~ ~~the~~ the industries manufacturing consumer's goods.

To satisfy the ^{increasing} ~~basic~~ material and cultural needs of the Czechoslovak people, and to overtake and surpass the leading capitalistic countries in industrial production per person, a large scale development of the national economy, and primarily of the machine industry, will occur in the second Five Year Plan. In the second Five Year Plan the Czechoslovak machine industry will have to achieve the world level in the production of a series of vital products, such as automobiles, tractors, crude oil engines, electric locomotives, large machine tools and shaping machines, certain installations

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for the food industry, etc. This of course does not include products in which Czechoslovakia has already achieved the world level or is nearing it, for example: the production of motorcycles, refrigeration installations, Kaplan turbines, adding machines and certain unique machines.

In 1960 the volume of gross production will be approximately 83 percent higher than in 1955. Simultaneously at least a $2/3$ increase in the productivity of labor must be insured in comparison to 1955. A considerable saving of materials and raw materials is planned because Czechoslovak machines in general are heavier than the ones manufactured abroad. For this reason, from 1960 on, a number of machines and installations will be redesigned and modernized, waste of material will be substantially reduced and the use of plastic materials will be increased.

With the aid of the investments planned under the second 5 Year Plan in Czechoslovakia, machine industry plans will be considerably modernized and the conditions for the mass introduction of modern production methods in the machine industry will be insured.

To achieve a substantial increase in the entire level of the Czechoslovak national economy it is necessary first of all to insure the development of new techniques.

For this reason the development of machine industry production, especially the production of new machines, installations and instruments, must be considered the basic rule in ~~the~~ developing the national economy. Furthermore, an incomparable more rapid pace must be achieved in the ~~introduction~~ introduction of new techniques.

To enable the Czechoslovak machine industry to fulfil these tasks in the coming years, it is necessary to remedy certain serious deficiencies in its technical level within the shortest time possible, because they are hampering the quality of production.

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Losses
 The technical ~~state~~ of production, especially the ~~technical~~ state and technical level of the machinery and installations, and their practical utilization are of the greatest significance for the technical level of the entire machine industry.

The machine stock of the Czechoslovak machine industry to-day is mostly universal and corresponds to the technological level of the pre-war years. Regretably, little has been done under the first Five Year Plan to change the situation. Also the composition of the machine stock of shaping machines and their average age fail to meet the ~~average~~ requirements of modern technology in the leading industrial countries.

Until now little attention has been paid not only to the structure of the machine stock, but also to its replacement.

The production of machines also shows certain signs which must be urgently eliminated. Development and research in the field of shaping machines is altogether neglected. In the United States and the Soviet Union, for example, drill bits are already manufactured by twisting the profile of the drill bit; small balls, barrels and cones for ~~excavator~~ ball bearings are manufactured by shaping; gears in these countries are ^{manufactured} much more economically than in Czechoslovakia where technological methods of the past decade are still used.

The situation ~~is~~ is somewhat better in the production of milling machine tools, especially the ones ~~with~~ of a heavier type. Czechoslovakia, however, is lagging behind in the utilization of special machinery and ~~of~~ aggregate units, also in equipping machinery with accessories. The best proof ^{of} ~~of~~ this deficiency are the accessories of automobiles, motorcycles, ball bearings, refrigerators and other consumer goods.

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Another characteristic trait of the modernization of technology in the machine industry is the ratio of machine work in proportion to manual labor per ~~workshop~~ production unit. Naturally, this index is unfavorably influenced by the insufficiencies in the structure of the machine stock and in the utilization of modern ~~technical~~ technical methods in production.

In order to increase the technical and technological level of machine production, ^{The} development of machine tools is planned under the second Five Year Plan. These will be both milling tools and shaping tools. Furthermore, the degree of mechanization and automation will be increased by the vast use and introduction of additional installations, by installing electronic controls for the machine tools; high-precision machinery will be used, especially one-purpose machines and aggregate units; the pace of developing milling- and shaping-tool production will be substantially increased, their designs will be typified and ~~unified~~ standardized to a wide extent. By 1960 a series of forging presses will be gradually developed and placed into production. These presses will be vertical and horizontal ones with a performance of up to 4,000 tons. Likewise, a series of pneumatic hammers with a performance of up to 2,500 tons, hydraulic presses with a performance of up to 10,000 tons, automatic presses for the mass production of ball bearings, screws, nuts, bolts; ^{also} turret lathes, automatic lathes, semi-automatic lathes, instruments, scales, rapid heating furnaces, installations for the automatization of production in the foundries and forging plants, automatic machine for pressure casting, new types of machines for automatic welding etc.-will also be introduced.

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The forging shops and foundries of the machine industry are equipped with ~~a~~ obsolete machinery and installations and are hampered by the insufficient mechanization of strenuous ~~jobs~~ manual operations. To improve the work of these branches of the machine industry, large scale mechanization will be undertaken, especially in the forging shops.

A series of new technological work- and production methods have been introduced during the first Five Year Plan in order to increase the productivity of labor and to reduce production cost; also to insure the needed development of economy in the use of materials and raw materials. However, the tracable effects of these methods on the national economy are not satisfactory. The new methods are not generally widespread and are not being used. Their introduction is progressing only gradually.

To accelerate the spreading of new and modern technological processes and production methods, ~~improving~~ casting, shell casting, precision forging, economical surfacing will be introduced; the automatic heat control of forging ovens, etc. will be expanded.

The mechanization and automatization of the maintenance of machine tools and shaping tools will be considerably developed. Also a series of highly productive- and one-purpose machines will be introduced. The number of such machines will increase ten fold in comparison to 1955. A considerable number of assembly- and production lines will be placed in operation. It will be necessary to increase substantially the production of goods from powdered metals, etc. The change to modern production methods demands a substantial improvement in the work of the Czechoslovak shops.

It is necessary to increase the items of the plan. The primary purpose of these items will be to conduct the modernization and

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substantial improvement in the vast majority of machine-industry plants. The conditions for the introduction of new, highly effective shaping- and ~~milling machines~~ milling machine tools, combined automatic machines, one-purpose machines, automatic production and assembly lines must be insured. These will be the chief means for completing the task of altering the structure of the machine stock from the present ratio of approximately 8:2, in favor of milling machines, to a ratio of 7:3.

Coal is the basic and the most important raw material in the Czechoslovak national economy. Its development is affected to a considerable degree by coal production. In the next years the rapid development of Czechoslovak industry will depend on the total of the coal output and on the degree of economy in using coal.

For the further development of the Czechoslovak national economy it is necessary to insure the maximum increase in coal output in the present mines, and the rapid construction of new mines. Simultaneously it is also necessary to insure the desirable substitution of coal with lignite by the appropriate development and construction of new capacities. For this reason the basic task of the Czechoslovak machine industry in the second Five Year Plan will be to insure in every possible way the construction of new mines by supplying them with the necessary machinery and mechanical installations. Along with this it is necessary to ~~insure~~ insure the appropriate capacities in the processing of coal ~~by~~ by building new coal washing plants, primarily for the processing of coal suited for coke making. Coal grading installations should be reconstructed and new ones built. Provisional coal grading installations should be erected, especially for the grading of coal from small mines.

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By manufacturing suitable and effective installations and by increasing the volume of the reconstruction operations, the Czechoslovak machine industry must take part in forming the conditions necessary for a marked increase in the economical use of fuels. ~~These~~ (Maximum economy in the use of ~~such~~ fuels, especially in the use of coal and graded lignite, the increased use of less valuable fuels in all branches of the national economy.)

To increase the economical use of fuels, the machine industry must insure that in its factories installations are reconstructed which use coal or graded kinds of lignite, especially where there have been found resources of lignite powder. Increased output of fuels and greater economy with these basic raw materials depends in a large extent on the Czechoslovak machine industry.

Under ~~During~~ the first Five Year Plan, the Czechoslovak machine industry has already insured the conditions for fulfilling these tasks. Wheeled excavators, weighing 1,084 tons ~~with~~ a dredge volume of 650 liters and a performance of 1000 cubic meters per hour, have been placed into operation; also ~~loading~~ loading machines with a dredge volume of 1200 -, respectively 1800 liters and a performance of 1,300-, respectively 1800 cubic meters per hour. Bucket excavators are also being manufactured and ^{the} buckets of the respective models have a volume of 0,5 to 2,5 cubic meters. The new models which are being prepared correspond to the world level.

Other machines are also being developed to satisfy the needs of the ~~Czechoslovak mining industry~~ Czechoslovak mining industry. Mines are getting railed excavators with a dredge volume of 400 and 800 liters and a theoretical performance of ~~for~~ 400 and 1000 cubic meters per hour, etc. For export purposes, besides the dredge excavators already mentioned, four other types of floating excavators,

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suction pumps with a performance of 400 cubic meters per hour and dredge baggers with a performance of 500 " " " " are being planned and designed.

Along with the construction of lignite surface mines, it is also necessary to create the conditions required for a further substantial increase in coal output from the underground mines. In connection with the opening of new mines, the Czechoslovak machine industry is planning to perfect the present mining installations, mining machines and pit equipment. For the mechanization of mine work, the machine industry is preparing a series of excavating and loading machines, coal cutters, drills, combines, loaders, mining machines, etc.

To satisfy the needs of the Czechoslovak mining industry, the production of the ~~excavating~~ machine industry will be widened to include several modern installations for this industry. The most significant of these will be a coal washing plant operating with heavy liquids.

Increasing the technical level of the national economy presupposes an adequacy of power, especially electrical power. The introduction of new technical methods in production, the mechanization, automatization, the development of chemical processes - all this is not possible without a rapid increase in ~~power~~ electric power output. Power consumption is the basic standard for measuring ^{the} technical level of production.

The above-mentioned comparison with the capitalistic countries reveals that Czechoslovakia is somewhat behind in supplying the national economy with electrical power - measured on the basis of the average power consumption per person. ~~Excavating machine industry~~
~~excavating machine industry~~

In order to make an increase in the productivity of labor possible after 1960, primarily by increasing the technical level of pro-

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duction, it is necessary to insure the rapid growth of electrical power output, and to insure the necessary reserves in the installed capacities of the power plants.

Another basic task under the second Five Year Plan ~~will be to~~ ~~the expansion and modernizing~~ for the purpose of reducing coal consumption will be the rapid construction of power plants using ~~inferior~~ inferior grades of brown coal for fuel.

To insure the increased effectiveness of production in the Czechoslovak national economy, it is necessary - among other things - to eliminate the superfluous losses of energy in the shortest possible time and to increase the conversion of power in all power operations. For this reason the machine industry, in planning and designing installations for power plants, must insure the production of such machinery which lowers the specific use of fuel for ~~the same~~ power generation and which is comparatively of a high level in comparison to the leading industrial countries of the world. The aim is to acquire one kW of power on a maximum of 0,515 kilograms of medium grade fuel.

In order to extend considerably the use of less valuable fuels for the generation of power in the power industry, it is necessary not only to place in operation new power plants ~~operating~~ operating on such kinds of fuel, but also to reconstruct in the shortest possible time the existing power plants which are using costly ~~inferior~~ grades of black coal.

For this reason the construction of the power industry is one of the basic preliminary conditions for the extensive application of new techniques in all branches of the national economy.

~~Already~~ Already under the first Five Year Plan, the Czechoslovak

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Slovak machine industry has installed a series of new steam- and hydroelectric power plants and has equipped the existing power plants with new installations which give a higher performance and quality indexes. Thus, for example, ~~the~~ steam power plants have been supplied with boilers having a performance of 220 tons of steam per hour at a pressure of 100 atmospheres and a temperature of 525 degrees Celsius; steam turbines with a performance of 50 MW at a steam pressure (before entering the turbines) of 90 atmospheres at 510 degrees Celsius; nitrogen-cooled turbogenerators with a performance of 62,500 KVA at a tension of 10,500 V etc. ~~manufacturing~~. Also in the second Five Year Plan, the Czechoslovak machine industry will be faced with new tasks in the construction of steam power plants. These tasks arise from the need to develop the Czechoslovak power industry further and to supply the national economy with electric power. In the light of the existing possibilities, it is necessary to achieve the most economical use of fuels and to resort to the use of less valuable fuels and waste fuels to the highest possible extent. These both needs stem from the ~~existing situation~~ existing situation in the Czechoslovak coal industry. Because higher grade coal is reserved for the iron and steel industry, the chemical industry, the railroad and for heating ~~factories~~ - the power plants must make a better use of lower grade fuels, waste fuels and coal dust for generating current.

The need to increase fuel economy implies the task of achieving the highest degree of economy in heating, this should be done in the shortest possible time and in such a way as to catch up with the leading industrial countries. In the modern condensation type power plants the average heat requirement is from 3200 to 3400 kilo-calories/kWh. In the leading industrial countries

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these figures are ~~lower~~ often lower. At the present the average heat consumption in the Czechoslovak power plants -including the former power plants as well as the obsolete ones still in operation - is approximately 4900 kilo-calories per ~~kWh~~ kWh. Such conditions will be created in the ~~near future~~ near future that they will enable the Czechoslovak power industry to reduce ~~this~~ this average to 4525 kilo-calories/kWh by 1960. A further and more important task will be, however, the construction of new condensation type power plants and heating plants. These new plants must ~~be~~ operate at the greatest possible degree of economy and reliability. For the very purpose of achieving high economy, ~~in the power industry~~ ^{for} the perspective plan new power plants calls for steam units of ~~great~~ high performance (125 and 230 tons of steam per hour) and with high steam parameters (100 ~~atmospheres of pressure~~ atmospheres of pressure at 510 degrees Celsius); also steam turbines with a performance of ~~2~~ 50 and 100 MW respectively ~~at~~ with parameters of 90 atm. at 510 degrees Celsius. With the exception of the 100 MW turbines, such units have already been designed and their production tested.

In the construction of the power industry it will be necessary to pay more attention to auxiliary installations. In this field Czechoslovakia has not achieved the desired level. At the present level of technical development these installations could be designed in such a way as to increase their performance by 10 to 15 percent, economizing thereby on fuel.

The perspective plan for the development of the power industry requires extensive tasks from the Czechoslovak machine ~~and~~ industry also in the field of hydroelectric power plants. The construc-

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tion of a number of hydro-electric power plants has been considered and some of them have already been designed. With regard to size, some of them are of world significance. Thus, for example, Kaplan turbines will be installed with a performance of 100 MW with a fall of 70 meters. All these tasks place ~~exceptional demands~~ extraordinary demands on designers, research workers, constructors and on production.

In 1955 the electrification of the Czechoslovak railroads has reached only 2% of the entire track length of the railroad network. In comparison to this in 1951 in many European countries the electrification of the railroads has achieved tens of percents of the total track length. Railroad electrification ^{is widespread} in the leading industrial countries because it means a considerable increase in the speed of transportation and the capacity of the tracks increases by approximately 30%. ~~For every 100 kilometers of double track line~~ On every 100 kilometers of double track 200,000 tons of locomotive coal are saved annually. Because of these indexes, a considerable pace of rail electrification has been planned for the coming years.

Besides electrification - which ~~brings~~ provides new possibilities for economy and capacity increase - the replacement of steam locomotives with Diesel-electric ones has a considerable effect on transportation. For example, ^{in recent years} in the United States and also in England, ~~steam~~ steam locomotives are rapidly being replaced by Diesel-electric locomotives. This process is going on also in Czechoslovakia, only very slowly. Although it is a well known fact that the power conversion of steam locomotives varies only between 6 and 9 percent, whereas Diesel electric locomotives convert power to from 20 to 30 percent, nevertheless very few such locomotives are used in Czechoslovakia. After the effectiveness of Diesel locomotives had been established in the United

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States, the following changes have been made in the American locomotive stock in a very short time:

On the first class railroads the following changes have occurred:

Number of	In the beginng of	
	1947	1955
Diesel locomotives	4,441	23,531
Steam "	37,551	8,650
Electric "	-	658

One electric locomotive saves 2000 tons of high-grade coal. The Czechoslovak machine industry must pay more attention to the development of Diesel electric locomotives.

In the stock of locomotives it is necessary to achieve at least the same rate of reconstruction as in the United States. By the 1960 the ratio of Diesel electric locomotives in proportion to the entire number of locomotives will be at least 9 percent.

The electrification of mines, agriculture and other branches of the national economy has the same economical effects.

The chemical industry in Czechoslovakia has not reached the same degree of development as, for example, in the United States, Great Britain, etc. Especially the production of plastic materials is lagging very far behind, in comparison to the production of the leading industrial countries. Its present volume is not enough to cover the increasing needs of Czechoslovak industry. The volume of plastic production and its assortment are very restricted because of the slow development of this industry. For this reason it will be necessary to accelerate the development of polyvinyl-chloride production and to increase substantially its capacity before 1960. The task of the

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Czechoslovak machine industry will be to insure the supply of the necessary chemical installations demanded by the chemical industry, both in the production of the mentioned raw material (plastics) and also for the production of synthetic polyester fibres.

The present development of metallurgical production does not meet the increased requirements of the machine industry for the supply of metals. For this reason, in the next few years, it will be necessary ~~to increase the capacity of the metallurgical industry~~ to rapidly develop the metallurgical industry. It is the task of the machine industry to enlarge the capacities of the open hearths in the shortest time possible.

The extensive increase in production demands extraordinary measures in the respective enterprises. The entire development shows a trend toward rolling mills operating on a continuous basis. They by far surpass the performance of the present rolling mills. ~~There~~ The most timely needs seem to be continuous mills for steel-plate, wire and soft-metal ~~rolling~~ rolling. To provide them will be the task of the machine industry in the coming years.

The Mechanisation Of Production Processes - One Of The Outstanding Features of The Second Five Year Plan. Outstanding Features

In ~~Czech~~ Czechoslovakia the main requirement for increasing the technical level is the mechanization of production processes in most industries. The present results in mechanization are only partial ones. It is necessary to increase the pace of mechanization in transportation, in underground mining, in the construction industry and in the production of construction materials. Production methods in the stone quarries, brick factories, lime kilns, etc. are very obsolete.

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The thorough mechanization of production processes is an economic necessity in the era of the construction of socialism. A constant and rapid rise in industrial production in Czechoslovakia can be assured only through a constant perfection of techniques and through an all-round mechanization of production processes. Mechanization of production processes is the decisive factor without which it is not possible to insure the high pace and the enormous increase of production which is expected in Czechoslovakia in the coming years.

Mechanization during the second Five Year Plan, therefore, must become one of the chief sources for the increase of labor productivity and for the elimination of tedious and heavy work. ~~By~~ Before 1955 certain results have been achieved in mechanization in the industries. In steam power ~~plant~~ plants, for example, the cleaning of furnaces and ~~fueling~~ ^{stacking} operations have been mechanized to an optimal degree. In the foundries 59 percent of the entire work has been mechanized, and in six foundries all operations have been mechanized. In the forging shops mechanization has reached an average of 53%. In the construction industry the mechanization of soil work, in comparison to 1949, has increased more than 50 percent. The handling of coal, work in the railroad depots, unloading operations in highway transportation have been completely mechanized. The Czechoslovak chemical industry has begun the mechanization of work which is tedious or harmful to health. Mechanization has developed also in the coal and ore mines, and certain steps have been taken to mechanize some sectors of the food industry.

These partial results, however, do not exhaust by far the great possibilities in connection with ^{the} mechanization of labor. Compared to developed industrial countries, mechanization is at a low level. Namely, the Czechoslovak industry has been unable to develop and expand complex mechanization.

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The main obstacle which prevent a full use of mechanization are primarily the lag in the development of new mechanization implements, insufficient planning, improper investments, the lack of interest on ~~part~~ part of the managers, etc.

The lack of mechanical equipment prevents a substantial increase of of mechanization in loading and unloading operations on the Czech slovak railroad. In 1955 loading and unloading operations here were mechanized to the extent of 63 percent. With a further 20-30 percent mechanization 20,000 workers could be spared. To increase the degree of mechanization, it has been planned to supply the following: more dump-cars for the narrow-gauge railroads; carts for the ministry^{ies} of transportation, light industry and food industry; rubber belt transporters for the ministries^{ies} of the foundry industry, construction and light industry; self-dumping cars for the ministry of the foundry industry; automatic loading machines for the loading of grain and potatoes for the ministry of agriculture; machine shovels for the ministries of transportation, construction and commerce~~x~~ and for the food industry; universal dump carts for the ministry of transportation; electric^{ies} winches for the ministry^{ies} of commerce~~x~~ and transportation; a ~~series~~ series of other mechanical installations for all branches of the national economy. (Some of these have not been manufactured previously in Czechoslovakia.) With the aid of such measures, loading and unloading operations on the ~~the~~ Czechoslovak railroad will be mechanized at least a 85% by 1960.

In motor transportation the extent of mechanization of loading and unloading operations will be increased from ^{the present} 40 % to 85 % by 1960. For this purpose the Czechoslovak machine industry will supply a quantity of special installations ~~and~~, as for example: belt and buckle

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conveyers, loading baggers, crane trucks, winches, dumpers, mechanical loading shovels, excavating shovels, etc. The introduction of trucks equipped with loading devices for lighter cargo has been planned. One-purpose vehicles, for example: trucks for the transportation of cement, milk etc., will also be introduced.

The mechanization of underground mines is at a very low level. The mechanization of surface lignite mines has attained the world level. Here it is necessary to mechanize only some of the manual dumping operations, ~~and~~ the laying and relaying of tracks, and to develop a more economical method of transporting coal and earth from the tunnels. (Other than rail transport). By 1960 the level of mechanization will reach 95 % in comparison to 89 % in 1955. In some of the larger coal fields mechanization has increased. But the mechanization of the smaller coalfields remains inadequate. Namely there still remains the mechanization of cutting and loading coal, and of loading in ^{grading} ~~sorting~~ and ^{maintenance} ~~transportation~~ operations. ^{of mines}

Compared to ~~the~~ mechanization/in the Soviet Union, the Czechoslovak mining industry lags far behind in the use of combines. Only 3,4% of the coal output is mined with the aid of combines, whereas in the Soviet Union combines account for 28% of the mining industry's total output. There the ^{grading} ~~sorting~~ of mine products is also done with the aid of combines. The Soviet Union is helping the Czechoslovak ~~xx~~ mining industry especially by ~~introducing~~ developing new, complex, mechanized methods of mining. To increase the level of mechanization in the Czechoslovak underground mines, it has been planned to increase the number of loading machines, mine carts, grading combines for narrow veins ~~(~~xxxxxx~~)~~ in low tunnels/, to start the production of pneumatic or electric powered drills, etc.

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In the field of construction material production, complex mechanization is being conducted only in the output and processing of gravel. This achieved a degree of approximately 13% in 1955. The situation in the stone quarries is unsatisfactory. In connection with the mechanization of the construction industry it is planned to complete the simple mechanization of soil and concrete work, and to achieve an 80% mechanization of complex soil work, and of complex cement work to 60%. For this reason the production of construction- and road machinery will increase almost 2,4 fold by 1960, and the number of these machines will increase 2,2 times.

To increase the degree of mechanization in ^{forestry,} the lumber and milling industries, the Czechoslovak machine industry will supply a series of machines and equipment before 1960, for example: motor saws, loading machine, winches, small universal tractors with accessories, sowing machines, machinery for planting nurseries, machinery for digging out saplings, planting drills, etc.

In the food industry, mechanization will be conducted especially in bakeries, slaughter houses and meat packing plants. For mechanizing work in the bakeries, a series of machines will be manufactured for continuous dough making, continuous dough cutting, kneading; also automatic production lines for bread etc. For the mechanization of the slaughter houses, the Czechoslovak machine industry will provide continuous lines for the slaughtering of hogs and cattle. It has been planned to supply the meat packing industry with new machinery of high performance, for example: meat cutting ~~machines~~ machines with automatic feeding, continuous vacuum presses, mechanized processing lines for guts and tripe, tunnel spray installations, refrigeration equipment, automatic production lines for sausages and cold meats, etc. Machinery and installations will be manufac-

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tured for the dairy industry, canneries and beverage bottling plants for example: continuous separators, mechanized production lines for canned fruits, etc.

The extensive mechanization of farm work and the complete utilization of modern technical methods in agricultural production are the preliminary conditions for the rapid growth of crop yield.

Mechanization is especially low in the cultivation of sugar beets; in the harvesting of potatoes, corn, cotton, sugar beets, fodder in the gathering of straw; in the spreading of fertilizer; and in silage operations. The Soviet Union is using harvesting combines on a large scale, for the harvesting of potatoes, corn; and also silage combines. Some leading countries, for example the United States, also have their crop cultivation mechanized to a considerable degree.

Only the harvesting of grain has achieved a somewhat better level in Czechoslovakia. But also in this field Czechoslovak agriculture is lagging behind modern world methods.

The degree of mechanization in the transporting of fodder and manure, in conducting silage operations, in the preparation and storage of fodder are not solved ~~completely~~ to satisfaction. Similarly as in the mechanization of crop cultivation, here too it is ~~essential~~ necessary to strive toward complex mechanization.

To insure ~~the~~ rapid rate of mechanization in Czechoslovak agriculture, the production of tractors and agricultural machinery is being expanded to a considerable extent. The output of wheel- and caterpillar ~~tractors~~ tractors is increasing ~~and~~ (18, respectively 35 HP). ~~Before~~ Before 1960 the production of the ~~following~~ following ~~looking~~ machines will be introduced: machinery for the complex cultivation and harvesting of sugar beets, potatoes and hops; machinery for the complex harvesting of grain and fodder; the much needed machinery for the complex mechanization of animal husbandry on the basis of

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standardized operations. Besides all this there still remains the task of typifying and standardizing agricultural machinery.

To a certain extent it is possible to develop and improve the technical level of the basic tools through so-called "small mechanization". By various and often inexpensive adjustments, it is necessary to increase the capacity of the machinery and installations, to speed up production processes, to mechanize tedious work, to improve the technology of ~~press~~ production, etc., creating thereby the conditions necessary for the constant increase of the productivity of labor.

In order to provide the material conditions for the introduction of the small mechanization of labor, it is necessary that the ministries of the machine industry ~~and~~, of local economy, and the Central Council of Cooperatives study the development and normalization of production and of certain small ^{and} frequently used mechanisms, for example: ~~rolling mill~~ rolling tracks, ~~transporters~~ conveyers, hoists, mechanical shovels, etc.

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To insure the needs of the national economy under the Second Five Year Plan, the Czechoslovak machine industry is faced with the following tasks:

a) a quantitative task, to insure the large volume of machinery and mechanical installations for investment constructions, export, market funds and national security,

b) a qualitative task, i.e. to manufacture and export many machines of high performance, and new installations of a world technical level; such machines and installations can increase the productivity of labor in all branches of the national economy. Furthermore the machine industry must make a decisive change in the ~~construction~~ technics and technology of the machine industry itself, thereby increasing the productivity of labor and making machine industry production entirely more economi-

~~ally~~

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The fulfilment of the qualitative task will require exceptional effort, great activity and the mobilization of all workers in the machine industry.

The outstanding results achieved in technical development during the first Five Year Plan affected mostly unique and outstanding cases they were solved by small collectives of workers. ~~During~~ Under the second Five Year Plan, however, the aim is to achieve ~~further~~ ~~the~~ ~~world~~ ~~level~~ ~~on~~ ~~the~~ ~~entire~~ ~~sector~~ ~~of~~ ~~machine~~ ~~industrial~~ ~~production~~ ~~world~~ level on the entire sector of machine industrial production.

The further increase of ^{Czechoslovak} ~~the~~ production resources depends to a considerable extent ^{on how} ~~to which~~ the machine industry will fulfil these tasks in the second Five Year Plan. For this reason the machine industry ~~remains~~ continues to be a decisive factor in the development of the Czechoslovak national economy also ^{under} ~~during~~ the second Five Year Plan. The machine industry is the basic means for achieving enormous progress in all branches of the national economy.

Automatization And The Production Of Measuring ~~Devices~~ Devices And Installations For Automatization.

The automatization of production processes is the highest stage of the introduction of new techniques into production. At its present stage Czechoslovak industry already has the conditions required for the gradual introduction of automatization, especially in those branches of industry where production has achieved a high degree of mechanization, as for example the power ~~industry~~, fuel-, chemical-, smelting industry, etc. The automatization of production processes is determined by the very character of modern techniques. It opens new ways for achieving a high productivity of labor. The utilization of the newest developments in physics, especially in electron-

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ics, provides almost unlimited possibilities and perspectives for directing automatization and controlling production processes. Photoelectronic and thermoelectronic units, radio spectroscopes, ultrasonic waves and other physical phenomena and instruments are extensively used in modern automatization. The use of electronic devices helps to increase ^{the} ~~the~~ speed and precision ~~in~~ ~~of~~ ~~the~~ ~~recording~~ ~~devices~~ ~~and~~ ~~of~~ ~~regulating~~, ~~registering~~ ~~and~~ ~~processing~~ recorded data; thereby it contributes to the development of automatic control in production. High and very low temperatures, high pressures and deep vacuums, high tensions ~~and~~ various technological parameters - all this makes possible and demands complex mechanization of production processes as a whole.

In Czechoslovakia so far automatization has not become one of the outstanding forms of organizing and controlling production. Many production processes are not yet sufficiently analyzed from the point of view of ~~the~~ ~~possibility~~ introducing complex automatization. In the machine industry enterprises automatization is used only partly. Pressing and forging, for example, provide ample opportunity for the introduction of automatization. The ~~long~~ length of machine operations in shaping, bending or in guided forging is usually measured by ~~seconds~~ ~~the~~ fractions of a second. On the other hand, the manual application and removal of the material, ~~and~~ the transportation of parts from one press to another require much time. The automatization ~~of~~ of auxiliary operations can increase production considerably.

The economic significance of complex automatization is considerably great. For example, the introduction of automatic production lines in the production of nuts and bolts in the Soviet machine industry increased the productivity of labor 4 and even 5 fold and reduced production cost by 20-30 percent. According to the experience of leading industrial countries, the introduction of complex automatization insures a two to three fold ~~increase~~

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increase in the productivity of labor, and very often even ~~more~~
~~from~~ 5 to 10 fold.

In the new factory of the Ford Motor Company in Cleveland, Ohio a 500 meter long production line is used with 540 different operations; ^{it makes} ^{blocks} and 100 motor ~~cutting~~ per hour. Formerly 117 workers were required for this production line, now their number has dropped to only 41. A similar, 105 meter long aggregate, mechanically and electronically controlled, conducts 500 operation on motor blocks in the company's Canada plant; it also supervises the products and marks every piece that does not meet requirements.

In the automobile factory of the Morris Company in England, an aggregate, supervised by two workers, conducts over 400 production operations (multilateral lathe cutting, drilling and threading) on cylinders in $3\frac{1}{2}$ minutes. In the production of 155 mm shells for the US Navy in the government factory operated by US Industries INC. in Rockford, Illinois, the entire production process is directed by a series of stations, respectively by two workers who are equipped with numerous ~~logic~~ control devices.

In the machine industry, however, it is not always possible to use complex automatic installations of the described type. Production without basic changes is not always conducted in sufficient quantity to make possible the use of such devices as described above. The easily adjustable ^{of} ^{design} individual machines ~~with~~ ~~in~~ a more automatized ~~construction~~ are in demand. Of course, auxiliary chores are also being automatized. For example: the transporting and fastening of parts, the cleaning away of shavings, the testing and grading of parts, the serialization of machines, etc. The acquisition price of automatized machines is from 20 to 100 % ~~more~~ ~~expensive~~ higher than the price of the normal machines. Despite this, however, these

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hour. It is expected that with modern methods ten workers will assemble 500 doors per hour.

The aims, however, are different. In Czechoslovakia automatization is desired in the interest of the workers. In Britain it is used in the interest of the stock-holders. After automatization is completed in England, the employers will profit by it. To make use of these advantages, the BMC, for example, has already laid off the first 6000 workers.

If Czechoslovakia desires to surpass soon the productivity of the most developed industrial countries, and if she ~~desires~~ ^{wishes} to continue the rapid increase of the technical level of production in the individual industries, then it is necessary to develop the modern methods for controlling and directing production.

~~With modern production methods, greater production volumes~~

Modern production methods allow the use of greater volumes, better ~~utilization~~ utilization of materials and power, increasing production temperature and pressures are being ~~used~~ constantly used in modern production. ~~It is~~ It is unthinkable to master modern production processes without precise automatic installations which operate constantly and are always on guard against disturbances in production.

To-day it is evident that one of the major topics in the development of modern production means is the control and automatization of production and auxiliary operations.

To-day abroad exceptional importance is given to the development and production of ~~measuring instruments and machinery~~ computing regulating devices and of machinery for regulating and automatic control. Great results have been achieved in the field of regulating and automation. Thus, for example, in the Soviet Union and the United States the production volume of

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micromotors is greater than that of normal electric motors.

The basic units of regulating and automatic control are:

1) registering machines which ~~control~~^{check} the state and technological changes of physical and chemical qualities,

2) program guides which -on the basis of registrations or of/ex-^{the}pired time - automatically determine the next phase of the production program and outline the specific functions of the installation,

3) technical signal transmitters which affect the further ~~units~~ ~~of~~ ~~the~~ ~~regulating~~ ~~or~~ ~~automatic~~ ~~installation~~,

4) devices which carry out the technical signals of the transmitters; with the aid of electromagnets or electric motors, they set into operation mechanical, hydraulic or pneumatic devices controlling the regulating elements of the machine tools and installations.

Automatization permits a better utilization of production installations without greater physical effort; it ~~provides~~ makes possible economy on materials and raw materials; gives quality, precise and safe production operations; a constant improvement of sanitary conditions of labor in the industries. The development of automatization, and primarily of automatic regulation, is not satisfactory in Czechoslovak industry, - despite the fact that its principles are not new or unknown.

The automatization of production is one of the main decisive factors in the development of production resources and one of the greatest reserves of socialist economy; as an integral part of the application of new techniques in production, it is a decisive factor for eliminating the differences between physical and intellectual work.

So far not enough attention has been paid to the introduction of automatization. The production of appliances for computing and automatization is not a major branch of industry in Czechoslovakia, as it is, for example, in the Soviet Union, the United States, England, West Germany

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or East Germany.

Automatisation in Czechoslovakia is very unsatisfactory. For example, the hydro-electric power plants have automatization for only 8,5 % of their eventual operations. In the steam power plants the automatic regulation of combustion processes has been introduced only to an extent of 16% of the installed possible operations. In the foundry industry automatizations is only now developing. Only in a very small percentage of the Siemens-Martin hearths is heat regulated automatically, whereas in the Soviet Union automatization of such hearths amounts to 87%. In the paper and cellulose industry devices are installed at random, without any effort at complex mechanization. The state of automatization in other industries is equally insufficient.

A more rapid introduction of automatization in Czechoslovak industry is hampered to a considerable extent by the lack of designing of aggregate units. Very often in the projects the automatization of the respective production is not taken into consideration. Similarly, many production installations are not designed and manufactured with ^{an eye for} ~~regard to~~ the possibility of introducing automatization.

The main trend in the technical development of the Czechoslovak national economy under the second Five Year Plan will be the mechanization of heavy and tedious operations. In comparison to former years, the rate of developing automatization will be increased. Special attention will be paid primarily to the measuring and regulation of heating processes.

The installation of automatic measuring and regulation devices for heating processes will have first preference in the coke making plants, gas factories, power plants etc. Heating operations will be automatically controlled to a considerable degree in the blast fur-

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naces, open hearths and Siemens-Martin hearths.

In the chemical industry completely automatic production will be installed especially in the production of sulphic acid, nitric acid also in the factories for processing coal tars. Oxygen plants, cellulose plants, etc. will be equipped with measuring and regulating devices.

In railroad transportation the use of automatic switches will be increased and a series of railroad stations will be equipped with the necessary automatic installations.

Automatisation will also increase in the machine industry during the second Five Year Plan. It will be achieved primarily in the production of automobiles, Diesel engines, ball bearings, etc. Automatic production lines will be installed in other industries, for example, in the lumber processing industry, furniture industry etc.

More than 80% of the ~~the~~ possible operations in the hydro-electric power plants will be controlled by automatization.

Considerable attention will be paid to ~~dispatching~~ ^{communication} installations, especially in the power industry, in the mines and in some chemical industry plants. It is expected that by 1960 all surface and underground mines in the Czechoslovak republic will be equipped with automatic ~~dispatching~~ ^{communication} installations. By 1960 the entire power network will be equipped with automatic ~~dispatching~~ ^{communication} installations.

The possibilities of using television in industry and transportation will be studied and tested under the second Five Year Plan.

To insure the fulfilment of this program requires an exceptionally rapid development of the production of measuring and regulating devices.

Int. ... Czechoslovakia has been manufacturing devices and installing them for hydraulic regulation and high pneumatic regula-

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tion. In principle the development of low-pressure regulation has also been solved. Furthermore Czechoslovakia manufactures: various electric regulators and devices, electronic regulators for switching production processes, electronic regulation devices for electric welding and rectifying. For automatic classification an electronic measuring device was developed for remote measuring, also a dispatcher transmitting various remote data.

Devices for measuring and automatization have not been developed ~~so far~~, nor have preparations been made to manufacture them in the sufficient quantity, assortment, precision and quality. Namely, Czechoslovak production lags behind world development, especially with respect to the practicalness of ~~production~~ the design and the quality of the devices. An exception to this are some measuring and laboratory instruments, for example: electric measuring instruments, polarographs, pH meters, etc. Czechoslovakia should not console herself with the fact that she occupies second place after ~~Germany~~ East Germany with respect to the theoretical and practical developments in this field.

To insure the production of measuring and regulating devices, it will be necessary to increase the present volume of production to at least twice as much by 1960. This involves the expansion of the present fields for development and production, the equipping of production enterprises with modern installations and testing devices, the ^{skilled} grooming of "cadres" ~~in this field~~, improving the quality and precision of the manufactured devices, and expanding ~~the assortment~~ their assortment. Furthermore it is necessary to speed up the development of those machines which are not yet ~~being~~ manufactured, but are necessary for the regulation and automatization of pro-

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duction processes. Besides all this it is also necessary to revise the present designs which have become obsolete.

It is expected that by 1960 the following tasks will be accomplished: to complete the development and start the production of low-pressure pneumatic regulators; to revise some ~~existing kind of~~ ~~mechanisms~~ the obsolete designs for high-pressure pneumatic regulation, namely the regulation of combustion in boilers; to begin work on designing a more practical system for regulation, especially for furnaces with high steam parameters; to develop a new system for regulating the stoking of boilers and ~~mechanisms~~ ~~of~~ steam temperature; to develop reliable units for the remote transmission of data on high temperatures, and also signaling devices to indicate production data and disorders in steam power plants.

With respect to liquids, it is necessary to develop new devices for the measuring and regulation of the liquid level, ~~oxygen~~ oxygen- and carbon dioxide contents; and also for regulating the portioning of acids. The chemical industry requires electronic pH regulators and meters, chemical analyzers and other devices for caustic and explosive elements. It is necessary to develop regulators for the Siemens-Martin open hearths in the foundries and to introduce complete automatization in the rolling of pipes, bars and plates. ^{steel}

In the hydroelectric field it is necessary to solve the problem of automatic control in the small hydroelectric power plants, also the remote control of tension in the large power plants, the automatization of water cascades and sluices.

In the paper industry it is necessary to solve the automation of paper ~~and~~ industry machines. For the various other branches of industry it is necessary to provide automatic scales, meters and

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installations for automatic production control.

Important tasks have to be solved also in industrial electronics. Its use in industry is not sufficiently recognized. In the course of future development it will be necessary to modify a series of electronic regulators for the purpose of adapting them also to heavy production operations (rolling mill installations, mining machinery); the series of direction control devices will have to be supplemented; current alternators will have to be developed; remote registering devices will have to be revised on the basis of the newest scientific developments in the field of electronics.

The results of the negotiations among the people's democracies concerning economic cooperation will naturally affect the development and production of measuring and regulating devices in Czechoslovakia. A greater production volume, narrower specialization in development and production will allow a greater assortment of devices and will speed up their wide use in all branches of the national economy.

The Division of Tasks.

The directives of the second Five Year Plan ~~are~~ set high and exacting tasks. The road to their fulfilment is mapped out by the Czechoslovak Communist Party Central Committee and the government in their joint thesis on the future development of Czechoslovak industry. In all branches of the national economy the increase in production and labor productivity depends on the machine industry.

The workers of the Czechoslovak machine industry must realize that the entire technical future of the country rests in their hands.

"Comrades, workers, craftsmen, technicians and engineers!

"The machine industry must equip ~~the entire country~~ all branches

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of the national economy with modern techniques. Center your efforts primarily on ^{such} ~~the~~ vital sectors of socialist construction as fuel- and ore mining, the power-, metallurgical- and chemical industries, agriculture, the construction industry and communication. Support them by giving them ^{technically perfect,} highly effective, productive and reliable machines, installations and tools. Continue to insure the demands of national ~~security~~ defense, export shipments and the assortment and quality of consumer's goods.

"The machine industry must also insure the development and production of modern machine tools, shaping tools, welding and other machines for the replacement and modernization of its own machine stock. These machines must also correspond to the newest developments in science and technics.

"The lag in the development and production of new machines and devices must be decidedly overcome; care must be taken to see that they ~~are~~ ^{meet} the world level with respect to performance, weight, economy of operation, control and price. The ^{ultimate aim/technical} ~~development~~ in ~~the~~ development must be mechanization and automatization of all production processes in all branches of the national economy. Let us appreciate the work of the designers - the creators of new technics, ^{our} technologists, metallurgists and ~~of the~~ other creative technical workers.

"Workers of the ministry and research institutes!
work.

" Improve the ~~specifications~~ of the scientific institutes, increase their role and improve the organization of research work. ~~Support~~ Maintain a closer link with every-day life and seek the assistance of the workers in solving the complex problems of modern science and technics.

" A change must be made also in connection with plan investments. Construction- and reconstruction projects must apply the newest developments of technics. The basic aim of investment policies must be

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the modernization of the shops and factories.

"On the basis of the perspective production plans, it is necessary to increase constantly the specialization of factories and to create the conditions for an extensive application of modern techniques.

"The level of management must be raised considerably. The practice of degrading problems of technical progress must stop. The leading workers must feel responsible for the technical level of their factories. The chief engineers must be given more authority and be placed in charge of technical development.

"Managers, you must decidedly end your attitude of contempt for technics. Technical problems must be objects of constant interest and concern to all workers of the machine industry.

"An indispensable condition for the complete utilization of the technics is better organization of production. Obsolete methods of production organization are a great handicap to technical progress.

"Technics cannot be isolated from economics. New ~~techniques~~ techniques must lead to the reduction of labor in production; savings on fuel, material and power; to a constant increase of labor productivity and and reduction of production cost.

"Designers and technologists! In your work pay more attention to the economic indexes. Think of time- and material norms in connection with new techniques. Rely more on economic analyses.

"Economists! Widen your knowledge of technics and observe the effects of technics on economics.

"Let us speed up the pace of technical development and utilize more fully the experience and aid of the Soviet Union and of the other countries of the "Peace Camp".

"More care must be given to the spreading of ~~technical~~ information ~~on technical progress and economics~~ on technical progress and economics, to the organization of documentation services, and to the full utilization

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of technical and scientific publications and libraries.

"Boundless resources are ^{concealed} ~~hidden~~ in the creative initiative of the workers.

"Leading economic workers! Insure the conditions for the wide development of socialist labor competitions and of the inventor-, innovator movement. Organize exhibitions on new technical developments and help spread new production methods.

"Machine industry workers! Be ~~valiant~~ fighting fighters for technical progress, for a substantial increase in the productivity of labor and the rapid development of the Czechoslovak machine industry. The fulfillment of these tasks is a just cause and a patriotic duty.

"Under the leadership of the Czechoslovak Communist Party and ~~of~~ the Popular Front government, arise to fight for the completion of the second Five Year Plan." *

~~the declaration issued by~~ ^{an engineer}
* Excerpt from ~~the national conference of Czechoslovak machine and~~
~~industry workers.~~

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