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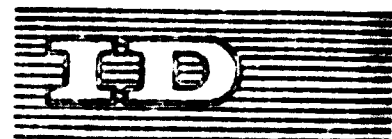
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REPORT ON MACHINE TOOLS IN URUGUAY ^{1/}

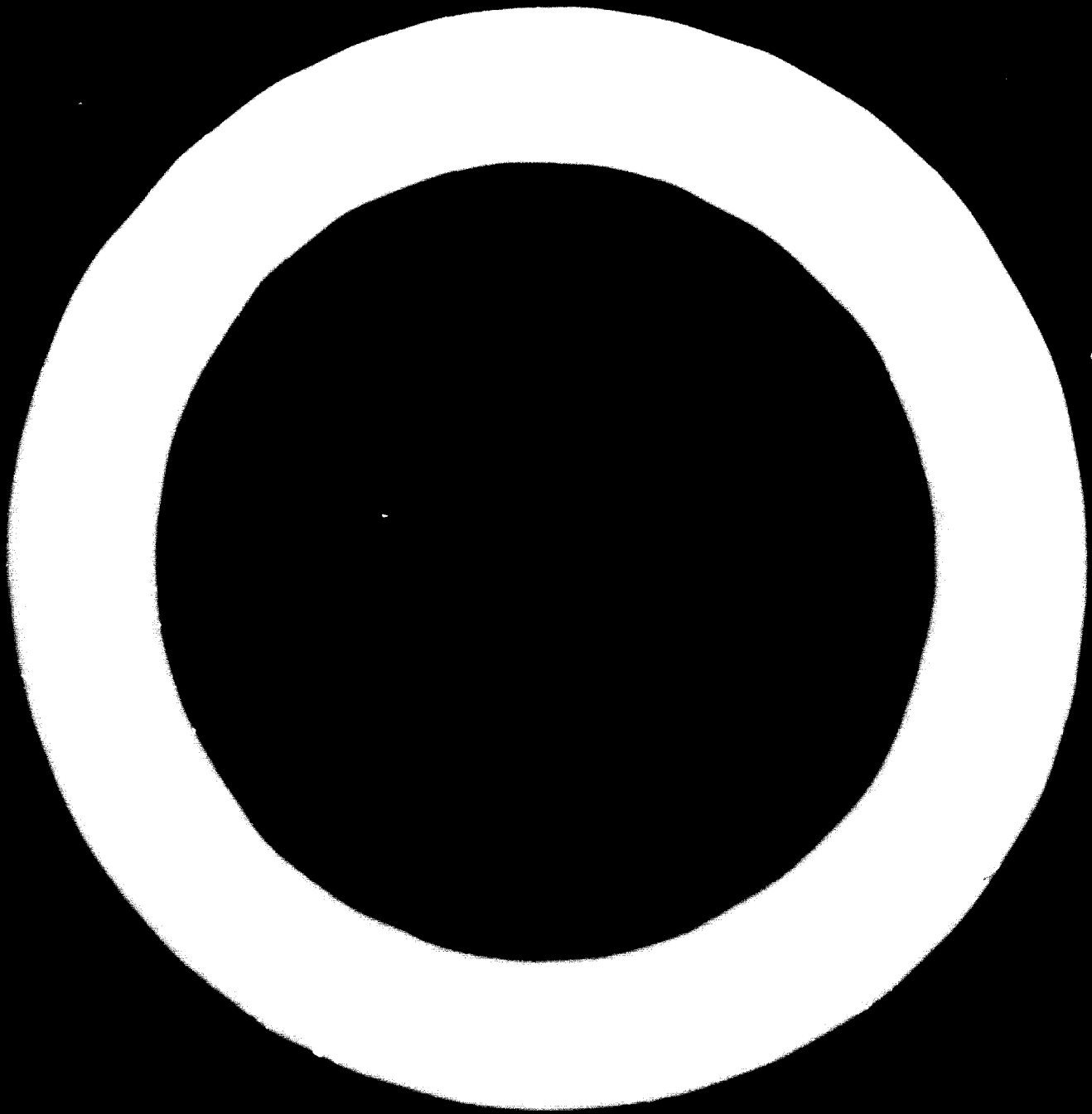
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Part I. Economic aspects

Introduction

The Uruguayan machine tool market is small owing to the fact that the metallurgical industry in this country has found it difficult to develop, more because of the limited size of the domestic market (in the range of 3 million inhabitants), a shortage of domestic raw materials and insufficient capital than because of a lack of human resources capable of making this industry function.

Although certain types of machine tools have been produced in the country, the development of this industry requires a market expansion and capital investment which cannot reasonably be expected to come from within the country itself. The production and marketing of machine tools in Uruguay is thus directly linked to the country's international trade and if Uruguay is to benefit from such trade to the maximum, two factors should be taken into account. Firstly, the country must be able to select for import the best products from both the economic and technological point of view, taking the characteristics of the domestic market and of the national metallurgical industry into account. Secondly, Uruguay must increase its efforts in fields in which it can compete effectively on the world market, particularly the Latin American market. It can achieve rapid growth in areas which require the development of specialized technology, such as those related to the machine tool industry, if the necessary stimulus is provided.

In this report, a brief study will be made of the Uruguayan machine tool industry in order to give a general idea of the extent of the existing stock in so far as this may be deduced indirectly, since no specific data on the subject is available. Data available on the quantities of equipment imported and the laws governing importation is also given. In addition, the conditions in which machine tools operate in Uruguayan industry are examined, thus making it possible to arrive at conclusions and recommendations for the development of this sector.

Machine tools in Uruguay

Neither the specialized bodies nor the private organizations concerned in Uruguay possess data on the basis of which the existing stock of machine tools in the country can be assessed. In fact, the only information which has anything to do with the existence, utilization, production or import of machine tools in Uruguay is that contained in the economic reports provided by the Central Bank and in two surveys conducted in 1963 and 1968 respectively by the General Statistics and Census Board. These surveys did not include questions on the number or type of machines and the Central Bank's information is confined to some economic indicators and to values of imports in dollars. Thus, in order to estimate stocks and consumption of machine tools in Uruguay we must use an indirect approach and examine the economic and technological characteristics of those branches of the metallurgical industry in which machine tools are most widely used. In historical terms, the Uruguayan metallurgical industry developed after 1930 on the basis of import substitution; it has always been designed to meet the requirements of the domestic market and has received substantial protection from the State.

The raw materials are imported and the technology is usually national although licences from foreign firms are also used in the case of more sophisticated products.

In view of the limited size of the domestic market, production must be diversified and versatility in functions and equipment is needed. For this reason, the acquisition of highly specialized equipment is generally avoided, efforts being made to perform several operations with one and the same piece of machinery which is selected on the basis of its versatility. Likewise, the need for versatility of production means that the workers employed in Uruguayan industry rapidly acquire a high degree of training because they have to perform a variety of tasks with equipment which is not highly automated.

Development of the metalworking and engineering branch during the period 1960-1971

The index of the physical volume of production in various branches of the metallurgical industry is given in figure 1. This index, which is expressed as a percentage, taking 1961 as the base year, was prepared by the Central Bank using a cross-section of establishments. Analysis of figure 1 shows a great variation in production which is the result of the fluctuations in and instability of the domestic market and of official economic policy.

Greater stability has been achieved during the last five years, but at low production levels. The trend curves (dotted lines) clearly show the general decrease in metallurgical and engineering production - a direct result of market contraction. There are no major trend differences between the three major groups of industries: major group 35 which covers the manufacture of metal products with the exception of machinery and transport equipment; major group 36 which covers the manufacture of machinery, except electrical machinery; and major group 37 which covers the manufacture and repair of electrical machinery, etc., as listed in the appendix.

Figure 2 shows variations in the wholesale price index for major group 35 which is expressed as a percentage in terms of 1961 levels, and which shows a steady rise - the result of the difficult situation of industry. The relevant data was provided by the Central Bank.

On the basis of the above data and the information given in the 1963 and 1968 surveys, charts showing variations in the real volume of production and the fixed capital of the metalworking and engineering sector were prepared. It was assumed^o that the structure of fixed capital has remained unchanged, because the majority of investments have merely been used for repairs and replacements. This theory is borne out by samples taken on a small scale. The charts showing the real volume of production and fixed capital (figures 3 and 4) clearly illustrate the tendencies already mentioned: variations resulting from economic and import policy, susceptibility to the fluctuations of the domestic market, and a general downward trend.

The lack of data makes it difficult to gauge accurately how the production of or demand for metallurgical products is affected by the different economic variables. However, the sensitivity of this type of industry to market expansion is shown clearly in the automotive industry (major group 38, not included in the figures and tables). In this sector, bilateral agreements under which parts could be exported to Argentina have been concluded. As a result, there was a very substantial increase in the gross value of production in the sector concerned between 1968 and 1971.

Tables 1 and 2, which give an idea of the size of establishments and the number of persons employed, complete the study of the metalworking and engineering sector. Table 1 shows the proportion of small enterprises as against the total, while table 2 indicates the number of persons employed in different categories and types of establishment.

Imports and the legislation in force

Since no data on imports of specific types of machinery is available, we can only gain an idea of the total imports of machine tools into Uruguay during the last decade. This total is given in figure 5, which indicates the value in dollars of machine tools imported since 1960. On the basis of the total import figure, it can be established that no more than a few score of machine tools of any significance were imported annually. In the last few years, some of these imports have taken place under the AID system, which is described below.

Between 16 December 1971 and 9 March 1972 the following equipment was imported into the country under the AID system: 7 engine lathes; 4 milling machines; 1 grinding machine and 1 threading machine, representing a total value of US\$100,198. By comparison with the total imports given in the figure it can be seen that imports under AID represent a substantial part of the imports of Uruguayan machine tools.

The AID provisions are based on a regulation governing the domestic use of dollar credits for the private sector for terms ranging from six months to ten years. Goods may be imported from the United States of America and the American countries south of the United States. For goods to be imported from Latin American countries, their CIF price must be lower than the CIF price of equivalent products in the United States. The minimum transaction is US\$5,000 and the maximum US\$250,000. The approval of AID/M must be obtained for larger transactions. Amounts are payable half-yearly. Transactions are recorded in foreign exchange and the banks may charge 4 per cent per year in all. This loan is operated on the basis of the list of United States correspondents: Chase Manhattan Bank N.Y., etc. The credit does not include freightage or insurance unless the goods are shipped in vessels flying the United States flag and insured through firms specially authorized by AID/M.

A guarantee for all these imports is provided in advance by the Central Bank of Uruguay.

Apart from the AID system, imports of machine tools are governed by Uruguay's current import regulations which include the surcharges listed below, with a tariff rate of US\$5.385/kilo.

Import surcharge	150%
Charges of the Bank of the Republic	1 + 0.5%

In addition:

Harbour charges	18% of CIF value
Customs duties	25% "
Costs	3% "

For the import of capital goods valued at more than US\$10,000, the Central Bank requires deposits (for six months, later refunded), as follows:

- (a) If external financing is available for more than three years, no deposit is paid.
- (b) If financing is provided for two or three years, the following deposits are required:
 - (1) Through the Latin American Free Trade Association (LAFTA) 105%
 - (2) In another form 150%
- (c) If financing is for one or two years:
 - (1) Through LAFTA 210%
 - (2) Other 300%
- (d) If financing is for less than one year:
 - (1) Through LAFTA 315%
 - (2) Other 450%

In addition, a foreign letter of credit is required. For this the private bank imposes charges amounting to 10 per cent of the CIF value.

At present, the Central Bank issues dollars for imports at the rate of 544 pesos to the dollar.

Dollars used to pay interest on financing must be bought on the open market at approximately 860 pesos to the dollar. The entire transaction is carried out through an exchange broker who charges 5 per cent of the CIF value.

Future prospects

The future of the Uruguayan metallurgical industry, and consequently future demand for machine tools, depend on the industrial development achieved by the country. In Uruguay, metallurgical development cannot be the motive force of economic development, but it is a prerequisite for such development because the metallurgical industry

provides support for the development of others. In order to develop the metallurgical and engineering industry in Uruguay, the existing stock of machine tools must be renewed at a much faster rate than is now the case. In fact, the existing stock of Uruguayan machine tools is on average very old and does not incorporate the most recent technological advances, such as the growing tendency towards automation, numerical control, etc. In addition, metallurgical development requires an expansion of the existing stock of machine tools because, while it is true that underutilization is considerable in some cases, this is due partly from the very structure of industry (a large number of small enterprises with no specific production lines).

Thus, demand for machine tools in Uruguay may increase to several times its present level if the metallurgical industry expands. Even in this case, however, it seems reasonable to establish a machine tool industry directed at the Uruguayan market unless other conditions, such as those discussed below, arise.

Production, importation and selection of machine tools in Uruguay

An attempt has been made to produce various types of machine tools in Uruguay, in particular lathes, minting mills and medium-size presses, and some equipment continues to be manufactured. This scheme had support from the State in the form of bans on competitive imports. However, these plans were in general thwarted by the lack of a market and this, together with other limitations, caused many of the projects to be abandoned. If the production of machine tools on any significant scale is to become a feasibility in Uruguay, markets must be expanded through agreement with other countries. The conclusion of such agreements can be justified by the fact that Uruguay possesses a sufficiently large skilled labour force and can rapidly build a technological base sufficiently strong to tackle in earnest the establishment of a precision machine industry. Unless there is an opportunity to expand markets so that it can sell its products, Uruguay must be content to import most of its machine tools.

Training and technical assistance required

The machine tools imported by Uruguay are usually selected with an eye to economic and financial factors, with the result that in many cases the equipment imported is not that most suited for use in the Uruguayan industrial context and that a stock of extremely varied machine tools has been built up, with no quality control. It is therefore clear that one of Uruguay's most pressing requirements is the establishment of criteria for the selection of imports which are suited to national conditions, particularly in regard to the degree of automation, versatility, etc.

In addition, the country must be in a position to enforce conditions regarding acceptance, standardization and quality control, which are essential if a high output is to be obtained from its stock of machine tools.

These requirements must be met without delay by means of a technological development programme incorporating the points outlined in part II of this report. It is clear that the existence of a sound technological infrastructure is of great importance to the country at any time, but it is in addition absolutely essential for any future industrial development in Uruguay.

Part II. Technical aspects

As a first step in the technological improvement of the machine tool sector, the country should acquire the capacity to carry out control or checking tests on machine tools and to conduct studies in order to bring tools and parts into line with international standards.

Bearing in mind that during the next few years Uruguay will be importing most of its machine tools, the country should have an agency which can give advice on the type and quality of machines which are more readily adaptable to industrial conditions in the country and can carry out expert studies in order to determine the quality and construction characteristics of the machines which are imported.

Technologically sound selection is a must if the underutilization of equipment by Uruguayan industry is to be reduced. On the basis of the data provided by the General Statistics and Census Board, it is possible to determine the idle capacity of the metallurgical industry, defined as follows:

$$S = \frac{MP - RP}{MP} \times 100$$

where MP = maximum possible production

RP = real production

S is an average for various industries, and in 1968 it was as follows:

S = 57.7% for Group 35 (see appendix)

S = 61.5% " 36

S = 49.6% " 37

One of the main causes of underutilization is the fact that the machines selected are too specialized or too large in relation to the other phases of the industrial process. In other words, the need for versatility in view of the size of the Uruguayan market and for selection in the light of local characteristics are ignored.

Well-directed technical efforts in this area would save the country much of the money used to buy underutilized machinery. The technological upgrading of Uruguayan personnel in the machine tool field is also important for enabling the country to tackle the problems of the construction, repair and maintenance of equipment in a systematic manner. Since most of the equipment used in Uruguay is imported, effective work in this field would lead not only to a positive saving for the country in foreign exchange but would also make Uruguayan industry more independent, eliminating many of the drawbacks and costs caused by delays in importation, inability to obtain spare parts, etc.

Another field in which the technological upgrading of Uruguayan personnel is extremely important is in the training of personnel to use numerically controlled machine tools.

Although the initial cost of such machinery is high, it appears to be very suitable for the type of production characteristic of Uruguay. In fact, the Uruguayan market displays the characteristics which call for the use of numerically controlled machine tools: its production ranges are small and the type of work done is extremely varied; thus, versatile equipment with minimal preparation costs is required.

The introduction of numerically controlled equipment would represent a major step forward for industry, since it would not only bring about increased productivity by comparison with conventional machines but would make it possible to manufacture items which it is impractical to machine at present. Furthermore, the quality of products machined by such equipment is substantially higher. All these improvements are extremely important for Uruguayan industry which could and should raise its standards to the point where it can compete with international market prices. If numerically controlled equipment is used, local personnel must have thorough technical training and programming skills. There can be no doubt that Uruguay has enough personnel of the necessary calibre to assimilate rapidly the techniques required to operate and programme numerically controlled equipment; all that is required for the country to be in a position to operate this equipment is supplementary training for such personnel.

Conclusions

In conclusion, it is clearly extremely desirable for Uruguay to develop a centre which can give advice on the selection of machine tools to be imported, can control the quality of these machine tools, give advice on repair and rebuilding and train local personnel to perform these tasks and to keep the stock of machine tools in the country in good repair.

This centre can also provide technological training for Uruguayan personnel in the design and programming of numerically controlled equipment. This task could be entrusted to the specialized academic institutions, which already have some of the facilities, experience and technical capabilities required to provide such training in their research and experimental laboratories. If these laboratories were supplemented by equipment suitable for work with machine tools and, in the first instance, with technical assistance, substantial assistance could be given to Uruguayan industry.

INDEX OF INDUSTRIAL GROUPS

- Major group 35 Manufacture of metal products, except machinery and transport equipment. Metal stamping, forging, soldering; manufacture of radiators, chains, agricultural and rural implements and stainless steel, copper and bronze articles, etc.
- Major group 36 Manufacture of machinery, except electrical machinery. Industrial engineering factories and workshops. Manufacture and repair of machines and tools.
- Major group 37 Manufacture and repair of electrical machinery, apparatus, appliances and articles.

TABLE I
NUMBER OF ESTABLISHMENTS

Staff employed

Group	1 - 19		20 - 49		50 - 99		100 or more		TOTAL
	No.	%	No.	%	No.	%	No.	%	
35	51	46%	38	34.2%	12	10.8%	10	9%	111
36	22	50%	14	29%	6	12%	0	0%	42
37	27	46%	15	25%	10	17%	7	12%	59

TABLE II

SALARIED PERSONNEL EMPLOYED IN NOVEMBER 1968

Group	TOTAL	Professional and technical	Administrative	Skilled workers	Labourers
35	3998	195	555	1346	1792
36	1131	54	173	474	430
37	3618	251	714	990	1663

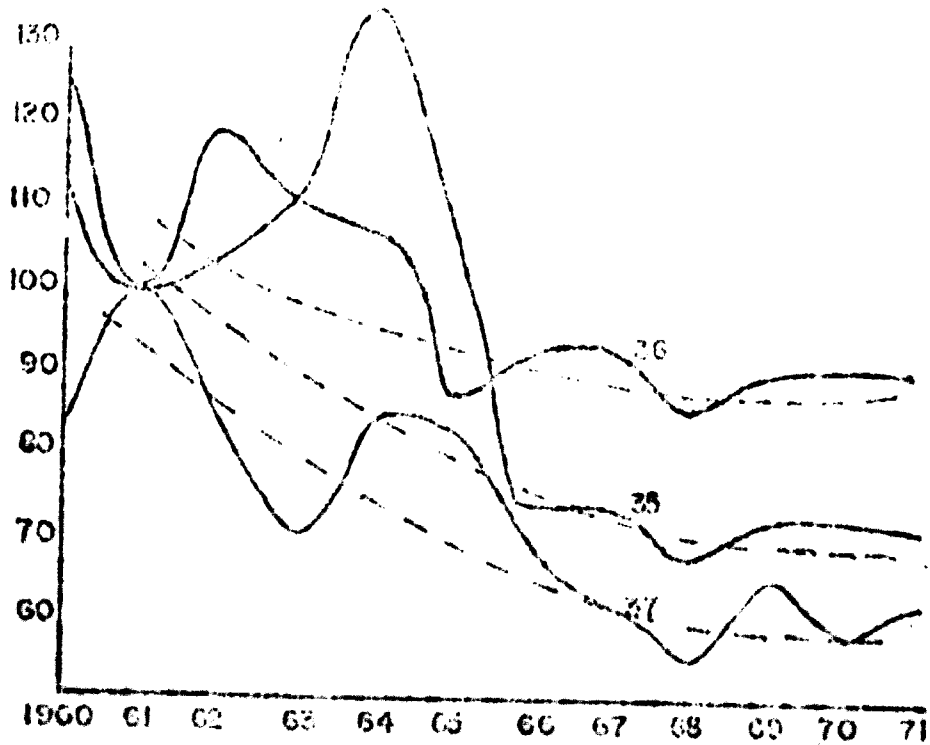


FIG. 1 INDICES OF PHYSICAL VOLUME

1961=100

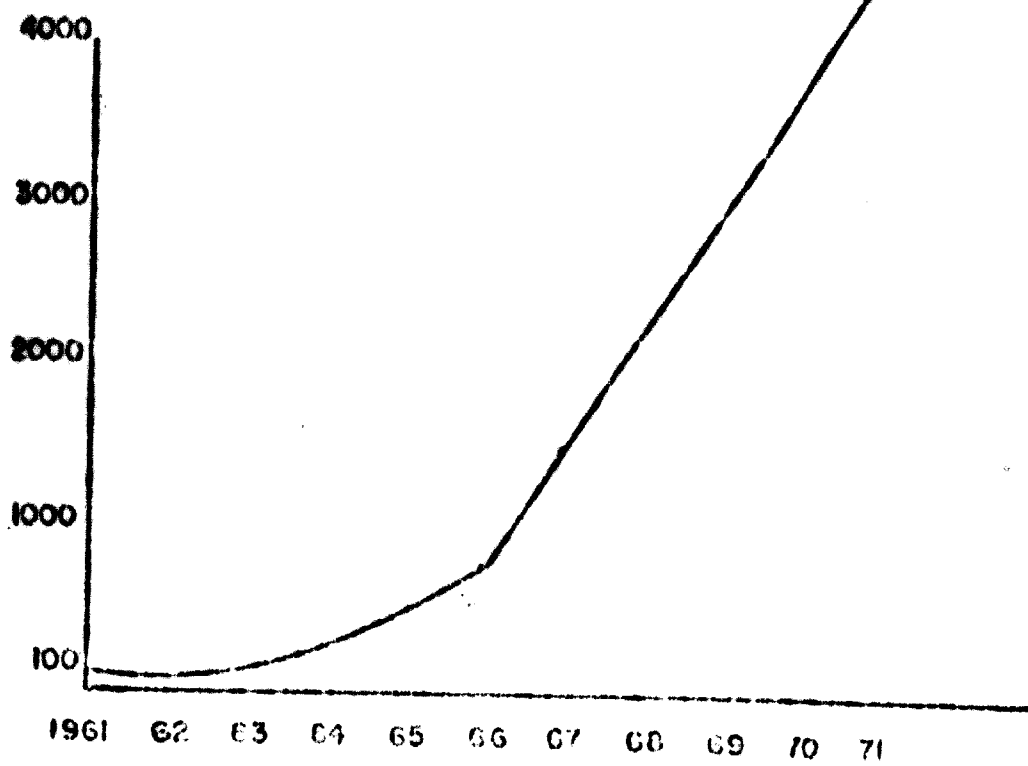


FIG. 2 POWER INDEX

1961=100

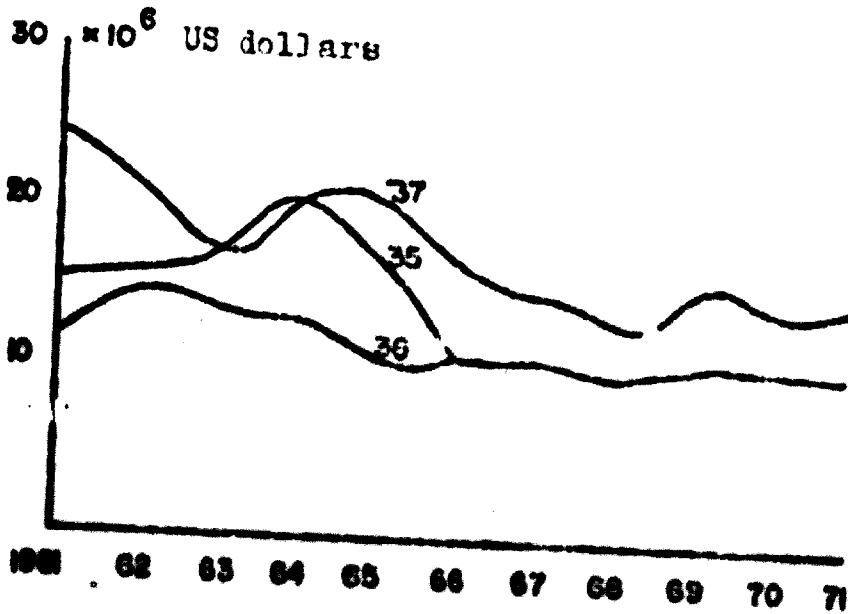


FIG. 3 REAL INDUSTRIAL PRODUCTION

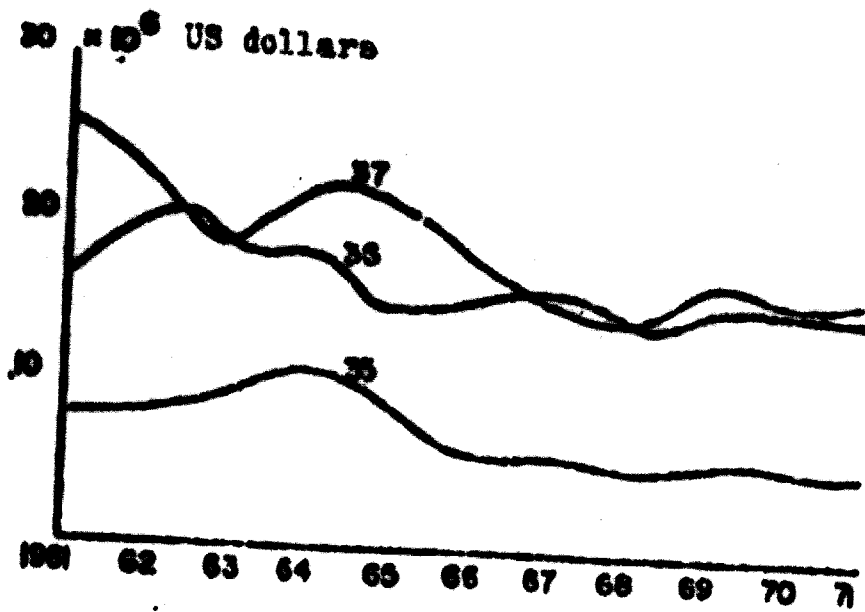


FIG. 4 FIXED INDUSTRIAL CAPITAL

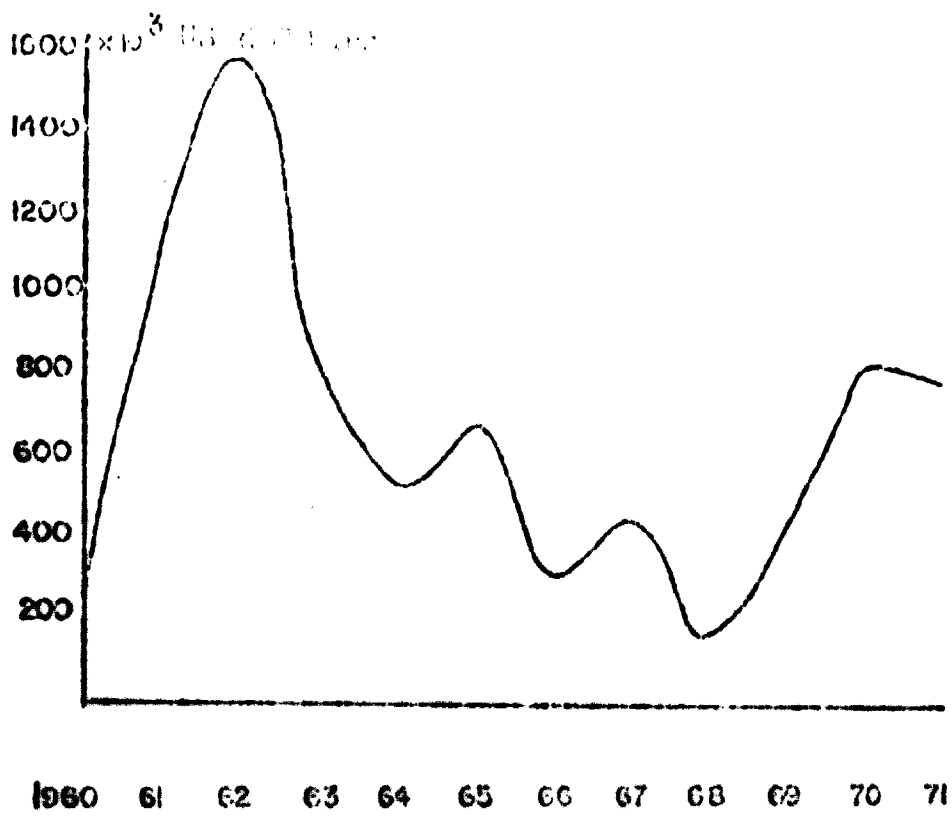
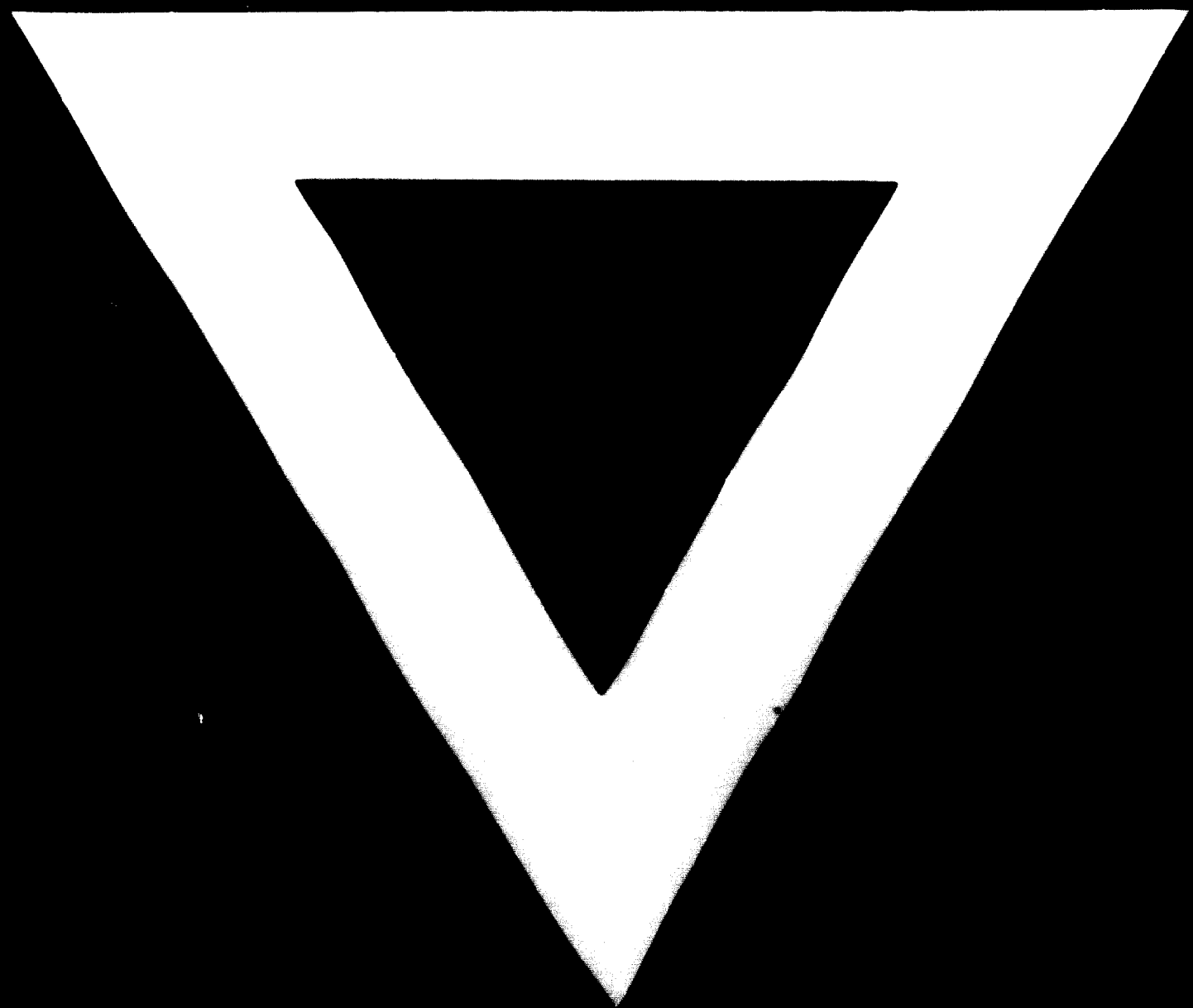


FIG. 5 IMPORTS OF MACHINE TOOLS





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