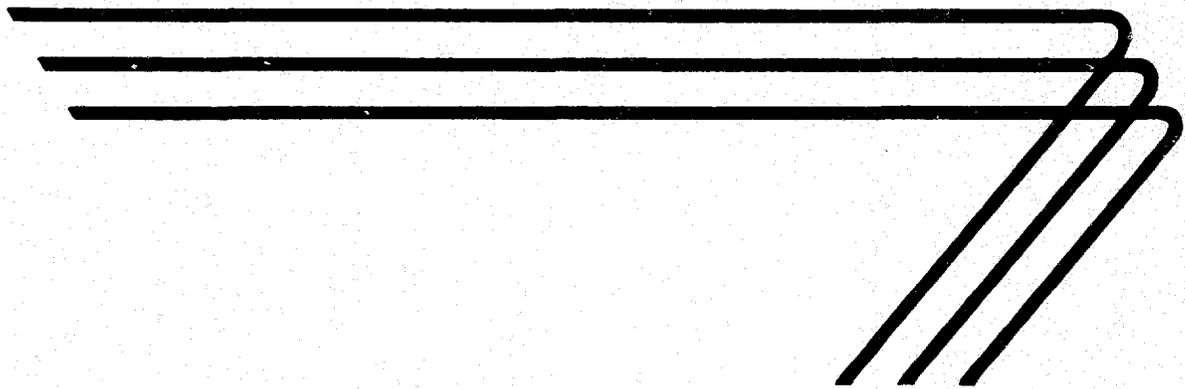


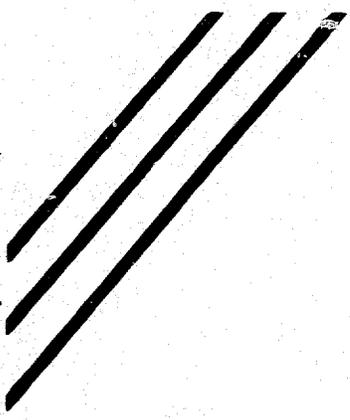
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PR-18

PLANT REQUIREMENTS TO SET UP AND OPERATE A JOB MACHINE SHOP



TECHNICAL AIDS BRANCH
INTERNATIONAL COOPERATION
ADMINISTRATION
Washington, D. C.



A.I.D.
Reference Center
Room 1656 NS

FOREWORD

This manual is a revision of an earlier report of the same type issued in 1955. This revised version includes current costs of labor, machinery, equipment and supplies, as well as additional information relative to engineering, training, safety, markets, sales, financial, and economic factors.

* * * * *

This manual is designed to provide a general picture of the factors which must be considered in establishing and operating a small scale factory of this type. It should prove useful in creating interest in the subject, and serve to give enough understanding of the related considerations to help government officials, other leaders and businessmen to determine whether the potential deserves more detailed attention.

However, it is important to note that in most cases plans for the actual development and installation of a plant will require expert engineering and financial advice in order to meet specific local situations. For further information and assistance, readers should contact their local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

Mention of the name of any firm, product, or process in this manual is not to be considered a recommendation or endorsement by the International Cooperation Administration, but merely a citation that is typical in its field.

* * * * *

The original report was prepared by the Methods Engineering Council, Pittsburgh, Pennsylvania.

* * * * *

This manual has been revised and rewritten by George H. Andrews Engineering Associates, Inc., 411 Southern Building, Washington 5, D.C.

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P L A N T R E Q U I R E M E N T S
T O S E T U P A N D O P E R A T E
A J O B M A C H I N E S H O P

INTRODUCTION

The purpose of this report is to present basic information for establishing and operating a job machine shop in a foreign country.

A job machine shop may be defined as a plant where special machinery and repair work is done. However, the job machine shop described in this report can also do production work for industries. Generally, a moderate sized job machine shop is equipped to do the following operations:

1. Machine building
2. Tools, dies and fixtures
3. General repair work
4. Sheet metal work
5. Welding and cutting
6. Production work for industry.

Specialization in any one or more of these categories may prove advantageous depending on the location.

The small job machine shop described in this report is typical of those operating in the United States.

GENERAL ASSUMPTIONS

In order to make realistic estimates in this manual, certain assumptions are made. These are:

1. The costs of the building and general facilities are based on United States prices.
2. Material costs are based on sizes and specifications of materials used in the United States.
3. Labor costs are based on the average for the industry as recently published by the United States Bureau of Labor Statistics.

4. Adequate power and water are available at the plant site.
5. Adequate transportation facilities are available at the plant site.
6. The plant operates eight hours a day, five days a week, and fifty weeks per year.
7. No special provision is made for the training of new personnel. It is assumed that learners' rates are paid in such cases.
8. The following items cannot be estimated realistically:
 - A. Land value.
 - B. Distribution and selling costs.
 - C. In-freight and out-freight.
 - D. Administrative costs.
 - E. Taxes.

While general estimates will be made of each of these items, for the purpose of completing cost estimates, adjustment should be made in accordance with actual local costs.

In fact, all cost estimates contained in this report should be adjusted to conform to local conditions.

9. Columns are provided in the tables included in this report to facilitate the conversion of cost figures to conform with local costs.

PRODUCT SPECIFICATIONS

Job machine shops in the United States are usually equipped to do a great variety of work, as shown on page 1. It is considered a profitable business requiring only a moderate amount of capital investment.

A machine shop may serve farmers by doing repair work and building small tools. It may serve the building industry by supplying such items as eaves and downspouts. It may serve manufacturing plants by building experimental machines; repairing machine tools; building and repairing tools, jigs, dies, and fixtures; sharpening cutting tools and production machinery parts. It may serve the

domestic household by supplying sheet metal and other repair work.

It is obvious that owing to the general nature of job machine shop work no standard specifications are applicable.

MANUFACTURING UNIT

There is no manufacturing unit as such. There are seldom two jobs exactly alike.

The nature of the work done in a job machine shop requires that cost be computed on each job.

The direct machine hour method of figuring cost would be complicated in a job shop since some of the work may be hand work only, and often the machine work will be minor in comparison to the amount of hand work involved in disassembling and re-assembling.

A simple accurate method of determining costs and selling prices which will not be time consuming is shown on page 14.

DIRECT MATERIALS

A job machine shop usually stocks a small amount of the materials that will be required often, such as hot and cold rolled steel, brass, bronze, sheet steel, bolts, nuts, washers, screws, rivets, and welding rods. Special materials are generally ordered upon receipt of the job.

Prompt service on most repair work is essential. For this reason arrangements should be made with a warehouse to supply the special requirements of materials on short notice. It would not be economically feasible to stock all the various kinds of material that may be required.

Some of the repair work will require very little or no materials. In many cases, specially on work done for industry, the materials are supplied by the customer.

It is important that allowances be made for waste materials. It is not always possible to use small left over pieces of materials. Therefore, an adequate allowance for waste should be included in the cost of materials.

COST OF MATERIAL

Past experience in job machine shops indicates that the average cost of materials amounts to about 21 percent of gross sales. Based on this percentage, the raw materials are estimated at \$40,000.

MANUFACTURING OPERATIONS

The operations performed in a job machine shop will vary depending on the type of repair work done.

For example, a repair job might consist of only a welding operation on a broken shaft or casting. Other repair work may use only the sheet metal equipment. Some repair work may require the use of the machine tools only. Much of this repair work will include disassembling before the repair work and reassembling after the repair work is completed.

The operations are so varied in a job machine shop that a logical sequence of operations cannot be established.

Most job machine shops do some regular production work for local industries. It often happens that an industry does not have the required machine tools to machine a certain part, or the industry may require assistance to produce and ship its orders on schedule. A broken machine tool might develop work for a job machine shop in two ways:

1. To repair the machine tool.
2. To do production work for the industry while the machine tool is being repaired.

When a job machine shop is doing production work for an industry a definite sequence of operations can and should be established. However, the sequence of operations will vary with the nature of the work.

It will be noted that the direct labor requirements provide for six skilled machinists and four machine operators, one assembler and a truck driver who also does assembly work.

It will also be noted that the number of machines required exceed the number of direct workers shown.

The reason for this is that the job machine shop must be adequately equipped to do many types of repair and production work. Therefore, some of the equipment will be idle part of the time depending on the type of work being done.

Since there are more machines than operators, the six skilled workers must be versatile and able to operate several different machines as required.

PLANT LAYOUT

A plant layout is shown on page 26 of this report.

PLANT SITE

To provide for eventual expansion, the land for the plant site should contain at least 15,000 square feet. The site should be level, well drained, and should be located as advantageously as possible with respect to transportation, power, water, fuel, sources of markets, and labor. The cost of such a site is estimated at \$500.

BUILDING

A one story building, 60 feet by 100 feet, or 6,000 square feet, will provide ample space for all operations, including an office. It may be constructed with any suitable building material. It is estimated that the complete building, including adequate plumbing, wiring, heating, and ventilation, will cost about \$4.00 per square foot, or a total of about \$24,000.

POWER

About 40 horsepower connected load is required. All machines will seldom be operated at the same time. The annual cost of power is estimated at about \$4,000.

FUEL

It is estimated that the fuel consumption for production, heating and sanitary purposes will amount to about \$400 per year.

WATER

Very little water is required for production purposes. Water requirements for the purposes of heat, sanitary facilities, drinking purposes and fire protection is estimated at \$100 per year.

TRUCK

A one ton cab pickup and delivery truck is included in Other Tools and Equipment. The maintenance and operating cost is included in Supplies and the cost of the truck driver is included in Direct Labor.

* * * * *

DIRECT LABOR

<u>Classification</u>	<u>Number Needed</u>	<u>Hourly Rate</u>	<u>Annual Estimated</u>	<u>Cost Actual</u>
Skilled machinists	6	\$ 2.00	\$ 24,000	_____
Machine operators	4	1.80	14,400	_____
Material handlers and assemblers	1	1.50	3,000	_____
Pickup truck driver and assembler	<u>1</u>	1.50	<u>3,000</u>	_____
Total	12		\$ 44,400	_____

INDIRECT LABOR

<u>Classification</u>	<u>Number Needed</u>	<u>Hourly Rate</u>	<u>Annual Estimated</u>	<u>Cost Actual</u>
Manager - estimator	1		\$ 9,000	_____
Foreman	1		6,000	_____
Bookkeeper	1		5,000	_____
Receiving - shipping and tool crib	<u>1</u>	\$ 1.60	<u>3,200</u>	_____
Total	4		\$ 23,200	_____

PRODUCTION TOOLS AND EQUIPMENT

<u>Item</u>	<u>Number Needed</u>	<u>Unit Cost</u>	<u>Total Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Power hack saw	1	\$ 800	\$ 800	_____
Planer	1	19,000	19,000	_____
Boring mill	1	25,000	25,000	_____
Surface grinder	1	5,000	5,000	_____
Deep throat press with punch and die sets	1	800	800	_____
Box and pan brake	1	500	500	_____
52" Foot operated squaring shears	1	600	600	_____
24" Contour saw	1	1,800	1,800	_____
48" Power forming rolls	1	1,100	1,100	_____
15" Drill press	2	350	700	_____
Radial drill press, 4½' arm	1	9,000	9,000	_____
Universal tool grinder	1	13,000	13,000	_____
Vertical spindle milling machine	1	2,300	2,300	_____
16" X 8' Engine lathe	1	4,200	4,200	_____
10" X 4' Tool room lathe	2	2,500	5,000	_____
Arc welder	1	350	350	_____
Oxy-acetylene kit	1	300	300	_____
Heat treat furnace	1	800	800	_____
Electric forge	1	300	300	_____
Anvil	1	100	100	_____
Air compressor	1	850	850	_____
Total			\$ 111,000	_____

The above machine tools are priced to include the necessary cutting tools such as drills, reamers, milling cutters, saw blades, grinding wheels and other accessories.

A horizontal precision band cutoff saw is a recent development that works within a few thousandths of an inch. On an operation fifty percent larger than the sales assumed in this report its cost (\$5,200) will be justified by the fact that it will save time on milling machine operations and there will be a reduction of the amount of metal lost. It is built to use the most modern high speed steel blades for accuracy and speed.

If lathe work of more than eight feet in length and sixteen inches in diameter is required a larger engine lathe would be needed. This would increase the cost of equipment from fourteen to sixteen thousand dollars depending on the size of lathe required.

OTHER TOOLS AND EQUIPMENT

<u>Item</u>	<u>Number Needed</u>	<u>Unit Cost</u>	<u>Total Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Inspection equipment such micrometers, height gauges surface gauges, calipers, hardness tester, and surface plate			\$ 1,000	_____
A-frame chain hoist	2	\$250	500	_____
Hand tools			300	_____
Factory trucks			300	_____
Work benches, racks and bins			500	_____
Pickup truck			2,400	_____
Total			\$ 5,000	_____

FURNITURE AND FIXTURES

<u>Description</u>	<u>Number Needed</u>	<u>Unit Cost</u>	<u>Total Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Desks and chairs	3	\$100	\$ 300	_____
Drawing board and tools	1	125	125	_____
Filing cabinets	2	62.50	125	_____
Typewriter	1	125	125	_____
Adding machine	1	125	125	_____
Total			\$ 800	_____

SUPPLIES

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Lubricants	\$ 100	_____
Hand tools	200	_____
Cutting tools and grinding wheels	1,000	_____
Welding rods and gas	200	_____
Auto - gas, oil and maintenance	500	_____
Total	\$ 2,000	_____

DEPRECIATION

<u>Item</u>	<u>Estimated Cost</u>	<u>Years Life</u>	<u>Annual Estimated Cost</u>	<u>Actual</u>
Building	\$ 24,000	20	\$ 1,200	_____
Production tools and equipment - durable	111,000	15	7,400	_____
Other tools and equipment	5,000	10	500	_____
Furniture and fixtures	800	10	80	_____
Pickup truck	2,400	4	<u>600</u>	_____
Total			\$ 9,780	_____

MANUFACTURING OVERHEAD

<u>Item</u>	<u>Annual Estimated Cost</u>	<u>Actual</u>
Depreciation	\$ 9,780	_____
Indirect labor	23,200	_____
Supplies	2,600	_____
Power	4,000	_____
Water	100	_____
Fuel	<u>400</u>	_____
Total	\$ 39,480	_____

MANUFACTURING COST

<u>Item</u>	<u>Annual Estimated Cost</u>	<u>Actual</u>
Direct materials	\$ 40,000	_____
Direct labor	44,400	_____
Manufacturing overhead	<u>39,480</u>	_____
Total	\$ 123,880	_____

FIXED ASSETS

<u>Item</u>	Total Cost	
	<u>Estimated</u>	<u>Actual</u>
Land	\$ 500	_____
Building	24,000	_____
Production tools and equipment	111,000	_____
Other tools and equipment	5,000	_____
Furniture and fixtures	800	_____
Pickup truck	<u>2,400</u>	_____
Total	\$ 143,700	_____

WORKING CAPITAL

<u>Item</u>	<u>Time</u>	Annual Cost	
		<u>Estimated</u>	<u>Actual</u>
Direct materials	30 days	\$ 3,300	_____
Direct labor	30 days	3,700	_____
Manufacturing overhead	30 days	3,300	_____
Reserve for sales collections	30 days	<u>16,700</u>	_____
Total		\$ 27,000	_____

CAPITAL REQUIREMENTS

<u>Item</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Fixed assets	\$ 143,700	_____
Working capital	<u>27,000</u>	_____
Total	\$ 170,700	_____

SALES REVENUE

An average annual sales revenue for a job shop of this capacity in the United States would be about \$190,000. Therefore, this manual is based on annual gross sales of that amount.

The cost of direct materials will vary with the type of work done. On production work for industries the materials are usually furnished by the industries. For the purpose of this manual the cost of direct materials used per year will be figured at \$40,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

<u>Item</u>		Annual Cost	
		<u>Estimated</u>	<u>Actual</u>
Direct material	\$40,000		_____
Direct labor	44,400		_____
Manufacturing overhead	<u>39,430</u>		_____
Total manufacturing cost		\$ 123,830	_____
Interest on loans	3,700		_____
Insurance	400		_____
Legal	1,200		_____
Auditing	1,800		_____
Unforeseen expense	<u>6,020</u>		_____
Total administrative cost		\$ 13,120	_____
Sales commissions		9,000	_____
Travel, freight-out, bad debts, discounts and allowances		3,000	_____
Profit before taxes		<u>41,000</u>	_____
Total annual gross sales		\$ 190,000	_____

COST ACCOUNTING

The administrative and sales cost contains an item of unforeseen expense. This is allowed to provide a reserve for any unusual expense such as power breakdowns, increased import duties, delays in the delivery of materials and other items of cost that could not be anticipated. This item amounts to \$6,020.

In the operation of a job machine shop there may be times when work is not available for every employee. There may also be times when a job will require more labor and material than was specified in the cost estimate. To allow for these and other contingencies an adequate allowance should be added to the direct labor in all cost computations. Since the overhead is applied to the direct labor this will assure protection against loss in both labor and overhead.

The exact percentage to add to the direct labor can not be determined accurately until the business has operated for a reasonable period of time. It is recommended that in the beginning 25% be added to the direct labor to cover contingencies.

Six of the direct operators are paid \$2.00 per hour. The other six are paid slightly less. To provide a safety factor in costing each job, all labor should be figured at the rate of \$2.00 per hour. Adding 25% to the direct labor cost to cover contingencies, the labor rate to be used in figuring cost would amount to \$2.50 per hour.

The annual cost of direct labor amounts to \$44,400. The annual cost of manufacturing overhead is \$39,480. The annual administrative cost is \$13,120. The total cost of manufacturing overhead, administration and sales amount to \$64,600. Dividing this figure by the direct labor cost gives a total overhead of 146% of the direct labor.

Adding 146% to the direct labor cost will collect the full amount of direct labor, overhead and administrative and sales costs.

Since the cost of direct labor is \$2.50 per hour, to adequately cover all cost factors, the labor rate on all jobs should be figured at $1.46 \times \$2.50 + \$2.50 = \$6.16$ per hour.

The above charge of \$6.15 per hour includes all costs incurred except the cost of materials.

Since it is necessary to carry an inventory composed of a variety of materials, representing an investment, and since there will be short ends and small pieces left over on jobs that are not usable, all material costs should be figured as follows:

- A. All charges, such as freight-in, delivery to plant, import duties, should be added to the cost of all materials at the time it is received and placed in stock.
- B. To this cost, for the purpose of collecting carrying charges, loss from obsolescences and waste, 25% should be added to the total cost of all materials at the time it is placed in stock. The price of all materials thus arrived at should be used in computing the material cost for each job.

The cost of materials should be added to the cost of direct labor with overhead included, which has been figured on the basis of \$6.15 per hour. This will provide the complete manufacturing cost of the job.

To arrive at the selling price, the desired profit must be added. For the purpose of this manual the profit desired will be considered as 20 percent.

If a 20% profit is desired then the total manufacturing cost is automatically 80% of the total price of the job as shown below:

<u>Desired Profit</u>	<u>Manufacturing Cost</u>	=	<u>Selling Price</u>
10%	90%	=	100%
20%	80%	=	100%
25%	75%	=	100%
30%	70%	=	100%

Multiplying the manufacturing cost by the percent of desired profit will not return the desired profit on the selling price. The profits will be collected on the manufacturing cost only.

The following method is recommended to assure the collection of the desired profit on the total selling price which in this case is 20%. Divide the manufacturing cost by 80 and multiply the answer by 100. This will provide 20% of the selling price as profit.

An example of figuring the cost of a complete job follows:

Actual Direct Labor	-	10 hours	
Actual Materials used	-	\$8.00	
Profit desired	-	20%	
Direct Labor, including overhead, 10 hours @ \$6.15	=	\$61.50	
Materials at stock room prices		<u>8.00</u>	
Total Manufacturing Cost		\$69.50	
<u>\$69.50</u> ÷ 80 = \$8.688		\$8.688 X 100 = \$86.88	Selling Price

To prove these figures use the following method:

$$\$86.88 - \$69.50 = \$17.38 \text{ Profit}$$

$$\text{Sales price } \$ 86.88 \times 20\% = \$17.38 \text{ or } 20\% \text{ Profit on sales.}$$

If the desired profit had been 30% the same method would have been followed except that the manufacturing cost would have been divided by 70 and multiplied by 100.

In the average job machine shop costing is of the utmost importance since there are a large number of jobs to figure and errors may adversely affect profit. Therefore, the costing method must be simple and accurate and not time consuming.

The percentage of profit to be used will, of course, depend to some extent on local conditions. For example, if competition is not keen a higher percentage of profit could be used in figuring cost.

Consideration might also be given to the type and volume of work. On production work, for example, where a good volume of work is available, the percentage of profit might be figured at a lower percentage than would be used on a single special job of low volume.

* * * * *

BUDGET CONTROL:

A requisition form designed to provide accurate records of procurement and indicate the purpose of procurement with the least amount of time and effort is shown on the following page.

This form has an account number for each type of the various expenditures which the manager will review in detail, monthly or oftener, in order to control his expenses. Some items, such as power and water, are usually under contract and are easily checked by reference to monthly bills. For simplification, items (marked with an asterisk below) are omitted from the purchase requisition. Variations in the labor costs are easily reviewed by examination of the payroll vouchers. The simplified type of control thus provided makes certain that the manager can control expenditures promptly.

Following the requisition form, a sample voucher check is shown. Voucher checks should be used for the payment of all expenditures and the appropriate book account number placed on each voucher.

At the end of each month the manager will receive a statement of all expenditures broken down by budget accounts. If the expenditures exceed the budgeted monthly allowances of any of the accounts, the bookkeeper will furnish the manager with a break-down of all expenditures relative to the budgeted accounts exceeded. All these supporting data can be secured by reference to the purchase requisitions and the check vouchers. This reference will enable the manager to determine what caused the over-expenditure and take corrective action.

If at any time during each month it becomes apparent that expenditures will exceed any of the budget accounts, the bookkeeper will bring this to the attention of the manager for his information and action.

BUDGET CONTROL ACCOUNTS:

Account Number	Monthly Expense	Monthly Budget	Annual Budget	Actual
10 Administrative	\$ _____	\$ 592	\$ 7,100	\$ _____
20 Sales	_____	1,000	12,000	_____
30 Direct Materials	_____	3,333	40,000	_____
40 Supplies	_____	166	2,000	_____
51 Power*	_____	333	4,000	_____
52 Water*	_____	8	100	_____
53 Fuel	_____	33	400	_____
60 Unforeseen Expense (Reserve Account)	_____	501	6,020	_____
71 Direct Labor*	_____	3,700	44,400	_____
72 Indirect Labor*	_____	1,100	23,200	_____
80 Depreciation (Reserve Account)	_____	--	9,780	_____

R. W. MITCHELL MANUFACTURING COMPANY

1422 BOSWORTH STREET, S. E.

65-22
514

ANYWHERE, U. S. A. _____ 19____ No. **10000**

PAY _____ DOLLARS \$ _____

TO THE ORDER OF

TO **FIRST NATIONAL BANK**
ANYWHERE, U. S. A.

R. W. MITCHELL MANUFACTURING COMPANY

BY **SAMPLE CHECK**

VICE PRESIDENT

ACCOUNT NUMBER

Sample voucher check to be used for the payment of
all expenditures in connection with Budget Control.

R. W. MITCHELL MANUFACTURING COMPANY

ENGINEERS:

The services of professional engineers are desirable in the design of this plant, even though the proposed plant is small.

A correct design is one which provides the greatest economy in the investment of funds and establishes the basis of operation that will be most profitable in the beginning and will also be capable of expansion without expensive alteration.

The addresses of professional engineers who specialize in industrial design, some of whom may be willing to undertake such work on low cost projects overseas, can be secured by reference to the published cards in various engineering magazines. They may also be reached through their national organizations, one of which is the

National Society of Professional Engineers
2029 K Street, Northwest,
Washington 6, D. C.

Manufacturers of industrial equipment employ engineers familiar with the design and installation of their specialized products. These manufacturers are usually willing to give prospective customers the benefit of technical advice by those engineers in determining the suitability of their equipment in any proposed project.

The equipment manufacturers also know, and can recommend, professional engineers in private practice, who are willing and able to provide appropriate consulting services.

TRAINING:

Manufacturing an inferior quality of product during the training period could create sales resistance that might be difficult to cope with later. To avoid such possibilities, the quality of the product should be maintained at all times, including the training period.

In some areas skilled operators may be available locally. In other areas all the operators may have to be trained.

If skilled operators are not available, adequate training would be assured by using one or more of the following methods:

- A. If the plant is designed and installed by a competent engineering firm, the contract should be negotiated, if possible, on a turn-key basis. On this basis the contractor agrees to operate the plant and produce the quality and quantity of the product stated in the contract for an agreed period of time. Such a contract would assure adequate personnel training, since full quantity and quality could not be produced with an untrained organization.
- B. The engineering firm that designs and installs the plant can usually make training arrangements to have key personnel placed, for training purposes, in a foreign industry that produces the same type of product. This would provide training for the key personnel while the plant is being installed.
- C. If neither of the above methods is possible, then qualified and experienced individuals should be employed for the key positions, either permanently or temporarily, to perform the key operations and assist in training the organization, even if they must be secured outside the country.
- D. The manager should have years of successful experience in this type of business and be fully qualified in all phases of management, including the training of employees.

SAFETY:

There is always danger of accident and injury in any industrial plant. Because of this, the manager should take specific action to bring to the attention of each employee the importance of safety precautions and intelligent first aid.

Practically all machines have safety appliances, and the manager should see that these are in good working condition and that the operators are making full use of them.

In addition to constant watchfulness to make sure that all practicable safety precautions are taken, first aid supplies should be readily available. One complete first aid kit should be maintained near the manager's office, and others at appropriate places throughout the plant. Some of the employees should be trained to provide first aid service.

The use of accident posters in the plant have proved to be of value in reducing accidents. It is recommended that such posters be used, and that some direct special action be taken by the manager, at least once each month, to bring to the attention of all personnel the importance of safety precautions.

A fire brigade should be established and each member trained as to his responsibility in case of fire. Fire drills should be conducted periodically.

It is recommended that the employees be encouraged to offer suggestions or recommendations relative to prevention of accidents, removal of fire hazards and maintaining general interest in all safety factors.

OTHER CONSIDERATIONS

There are other important subjects, shown below, that should be fully investigated and considered. Information on these subjects is usually available from such sources as banks, government agencies, exporters and importers, wholesalers, retailers, transportation companies and manufacturers.

MATERIALS AND SUPPLIES

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Is satisfactory delivery of local materials assured at reasonable prices?
4. What materials and supplies must be imported?
5. Are they available in world markets at competitive prices?
6. Would prompt delivery of imported materials and supplies be assured so that large inventories would not be required?

MARKET FACTORS

1. Is there already a demand for the product?
 - A. Who are the principal consumers?
 - B. Who are possible new consumers?
2. How is demand for the product now satisfied?
 - A. By local production? If so, what is the volume of annual production?
 - B. What percentage of consumption is filled by local production?
 - C. By imports? If so, what is the volume of annual imports?
 - D. What percentage of consumption is met by imports?
 - E. From what areas are imports derived?
3. What is the estimated annual increase in local consumption over the next five years?
 - A. How were such estimates made?
 - B. By reference to official figures on population growth, family budgets, imports, etc.?
 - C. By consultation with trade or industry, ministries, associations, bankers, commercial houses, wholesalers, retailers, industrial consumers, etc.?

4. If the product is already being manufactured, can the existing and estimated future local market absorb production of the new plant without price-cutting or other dislocations?
5. Would the estimated sales price and quality of the new product make it competitive with an imported equivalent?
 - A. After adjusting cost to local conditions, is the estimated sales price of the product so high that tariff protection is necessary to protect it from imports?

EXPORT MARKETS:

1. Could the product compete in export markets on the basis of price, quality and dependability of supply?
2. Can export markets for the product be developed?
3. If so, in what areas and in what annual volume?
4. What procedures would be necessary to develop export markets?
5. What would it cost?

MARKETING PROBLEMS:

1. In calculating costs of the product, has adequate allowance been made for the expense of a sales department, advertising and promotion that might be required?
2. Do consumer prejudices against locally manufactured products exist?
 - A. If so, why?
 - B. Would they apply to the new product?
 - C. If so, how could they be overcome and what would it cost to do so?
3. Do marketing and distribution facilities for the product exist?
 - A. If not, can they be set up?
 - B. What would it cost to do so?
4. Will the product be sold to:
 - A. Wholesalers?
 - B. Retailers?
 - C. Direct to consumer?
 - D. Other industries?
 - E. Government?

ECONOMIC FACTORS:

1. How much foreign exchange (and in what currency) is required to import machinery, equipment and supplies:
 - A. How much foreign exchange (and in what currency) is required for annual interest payments and amortization of any loans contracted to import machinery and equipment, or for payment of royalties and technical services?
 - B. How much foreign exchange (and in what currency) is required for annual import of raw materials and supplies?
 - C. What are estimated annual foreign exchange earnings and in what currencies?
 - D. Has careful consideration been given to the possibility of depreciation in the foreign exchange value of the local currency?
 - E. Has careful consideration been given to the possibility of import controls, or restrictions on availabilities of foreign exchange necessary to operate the business?
 - F. What benefits would the new business bring to the economy in the use of local raw materials: in employment and in technology?
 - G. Do dependable facilities exist for transportation, power, fuel, water and sewage?
 - (1) If not, can existing deficiencies be eliminated satisfactorily?
 - (2) What would be the cost to do so?

PERSONNEL:

1. Is there an adequate labor supply near the plant location?
 - A. If not, how can the problem be solved?
2. Can the problem of training competent management and supervisory personnel be solved?
 - A. Also, the training of skilled labor?
 - B. Is technical advice available in the locality?
 - C. If not, where can it be obtained and what will it cost?

LAWS AND REGULATIONS:

1. Do existing labor laws, government regulations, laws and taxes favor establishment of new business?
 - A. If not, can existing obstacles be removed?
 - B. If so, how and when?

FINANCIAL FACTORS:

1. Technical advice on selection of machinery and equipment.
 - A. In selecting the machinery and equipment for the new plant, have reputable and competent engineers and technicians been consulted?
 - B. Have they been asked for advice on the most suitable types of machinery and equipment for the process and locality?
 - C. Have they carefully compared costs of various suppliers?
 - D. Credit terms offered purchasers?

FINANCIAL REQUIREMENTS OF THE PROJECT:

1. In estimating the cost of the project, has careful consideration been given to:
 - A. The effect on costs of delays in construction schedules?
 - B. In delivery and installation of machinery and equipment?
 - C. In import of essential raw materials and supplies?
2. In calculating cash flow and working capital requirements, has careful consideration been given to:
 - A. Maintaining adequate inventories of raw materials?
 - B. Supplies and spare parts?
 - C. Seasonal fluctuations in the business?
 - D. The time required to liquidate credit sales to customers and bad debts?
 - E. The period necessary to get the plant into production?
 - F. Cash required to amortize its principle loans?
3. If the economy is in a period of inflation, has full allowance been made for the influence of rising prices and wages on the cost of the project and on working capital requirements?

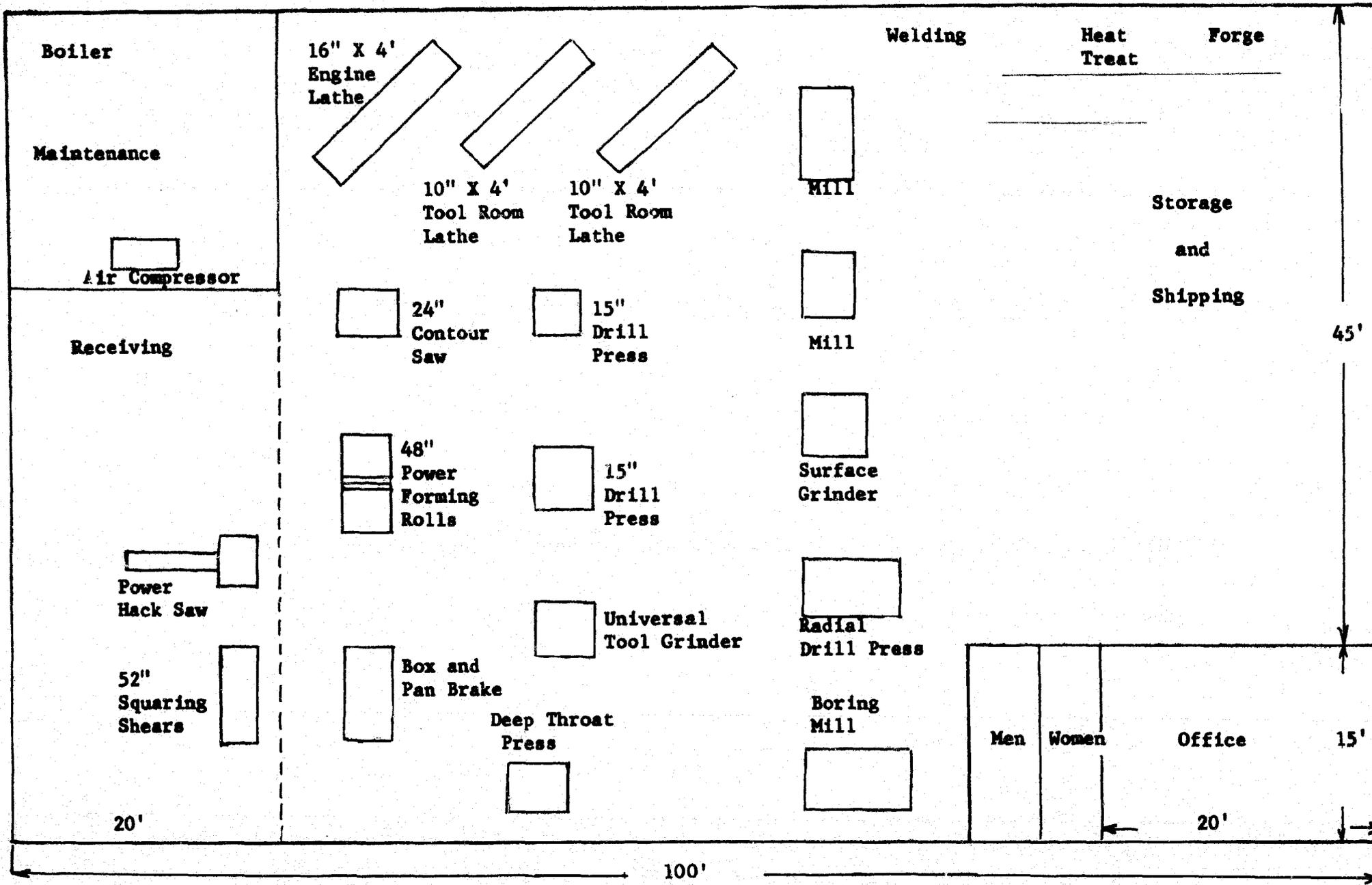
SHORT TERM BANK CREDITS:

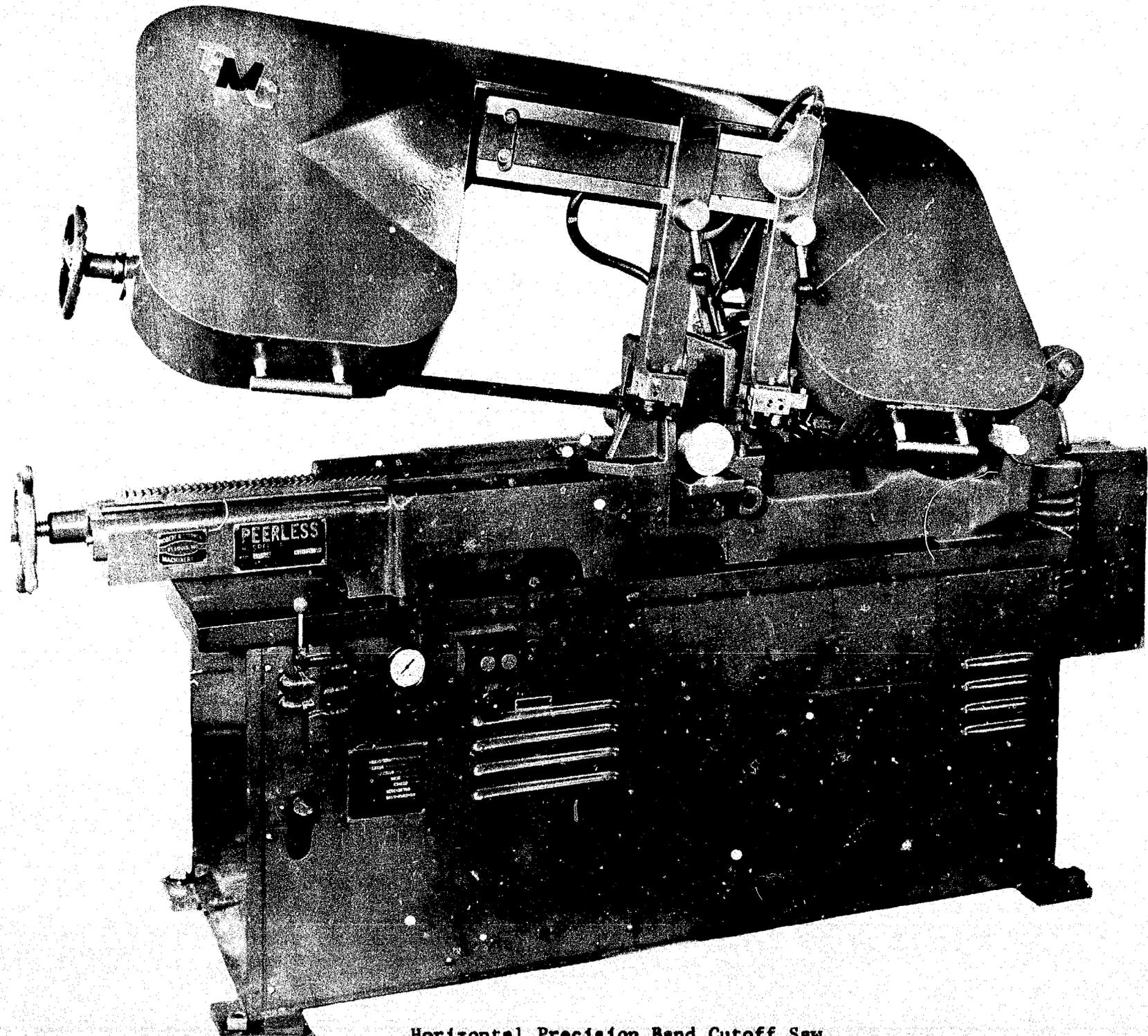
1. Has it been possible to make arrangements with local banks to finance short-time working capital requirements of the business?

FINANCIAL PLAN:

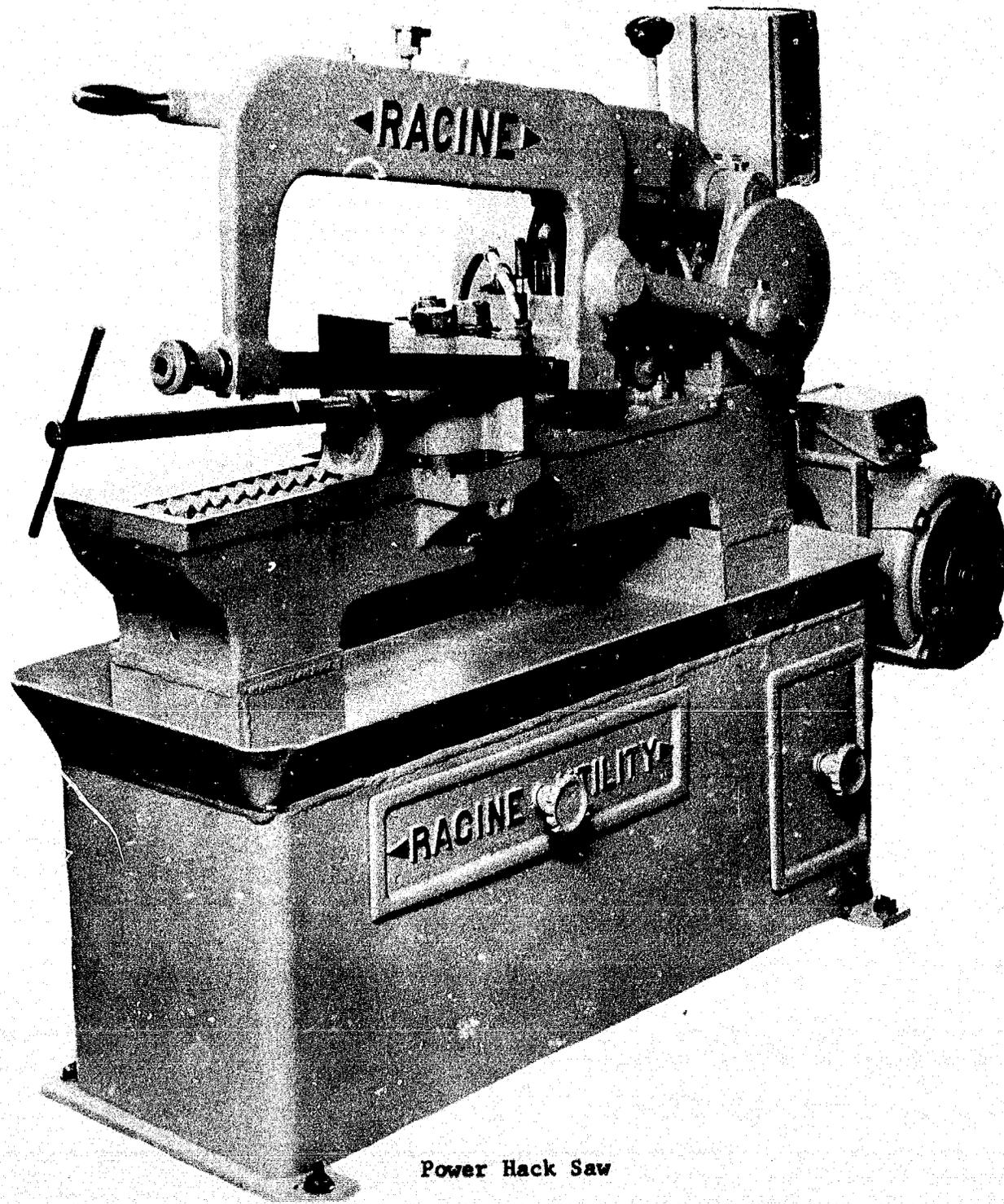
1. Has a definite plan to finance the project been worked out?
 - A. Is sufficient capital available locally?
 - B. If not, what is the plan to obtain the required capital?

PLANT LAYOUT

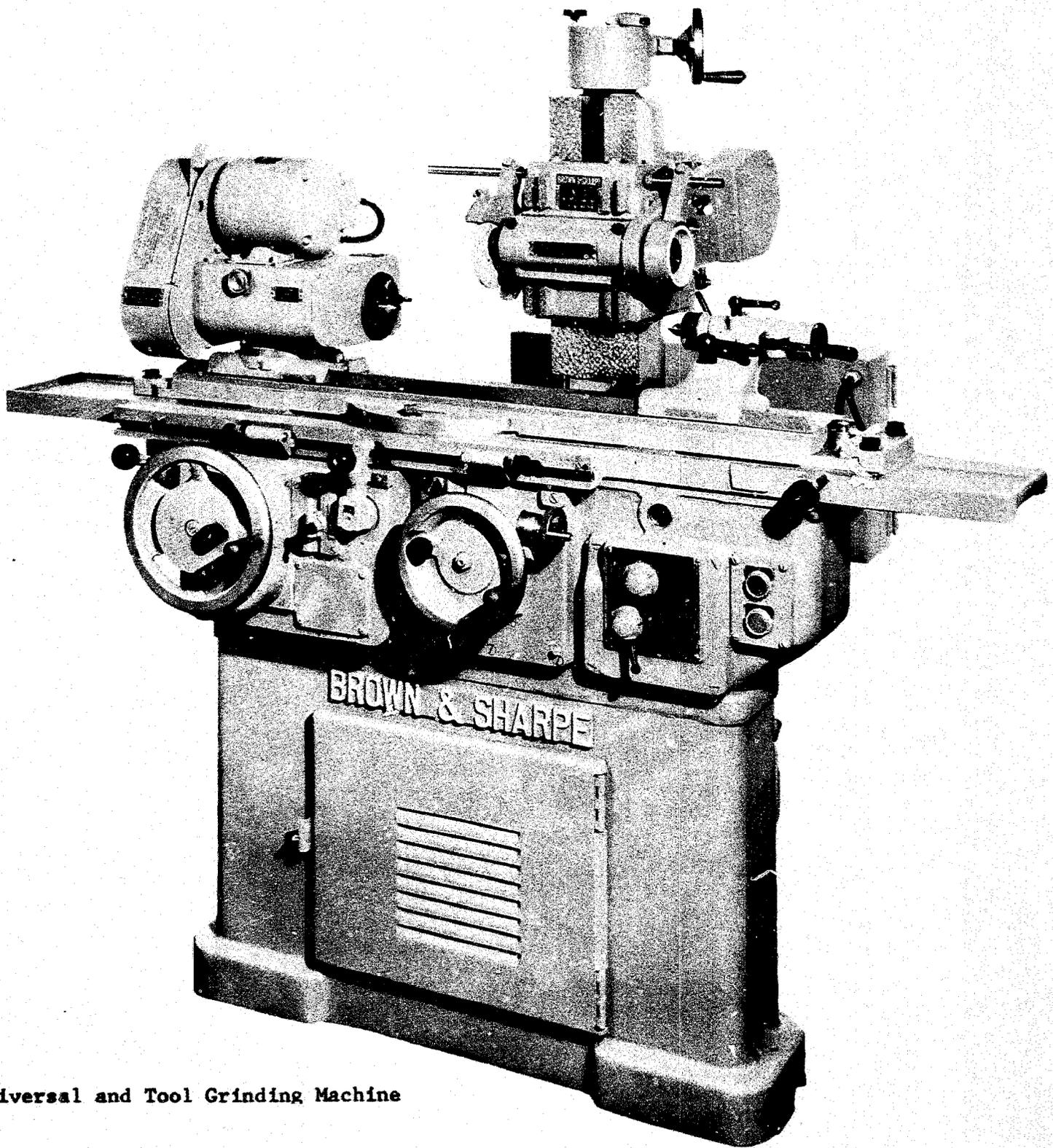




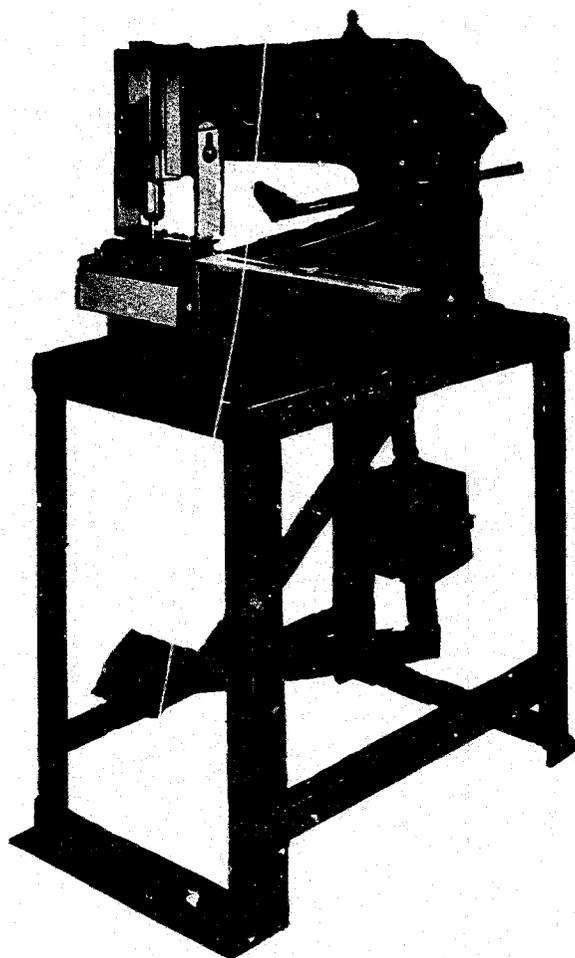
Horizontal Precision Band Cutoff Saw - 27 -



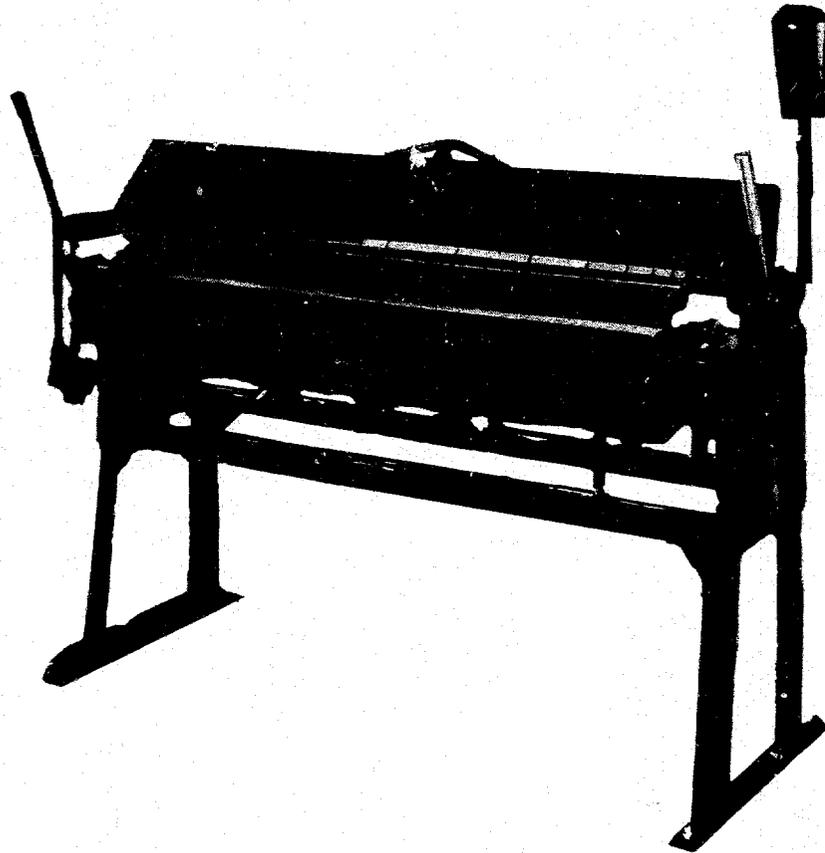
Power Hack Saw



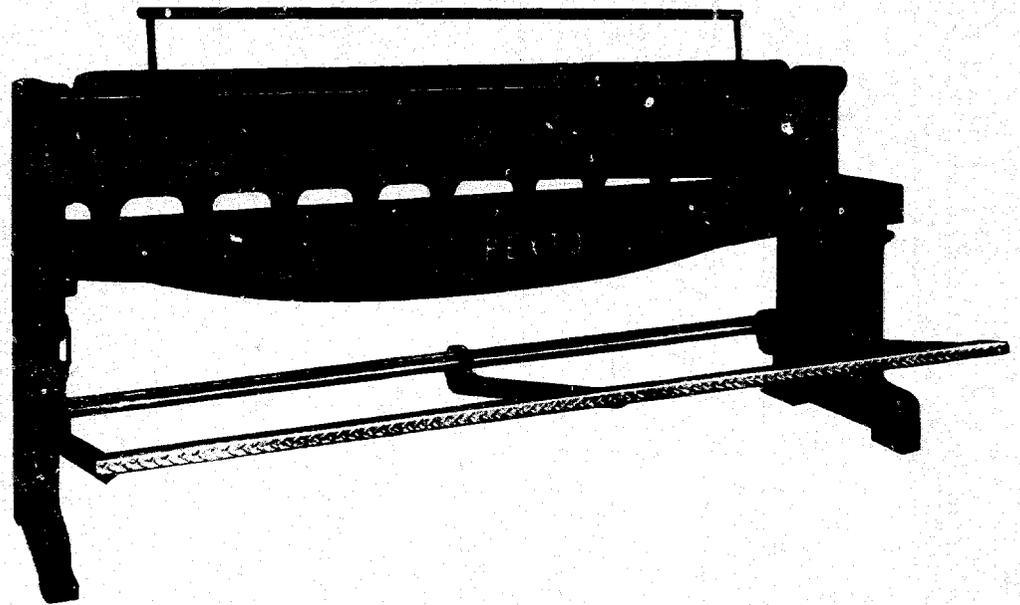
Universal and Tool Grinding Machine



Five Ton Deep Throat Foot Press



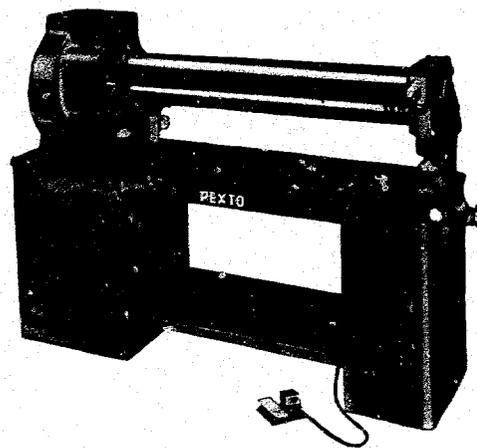
Box and Pan Brake



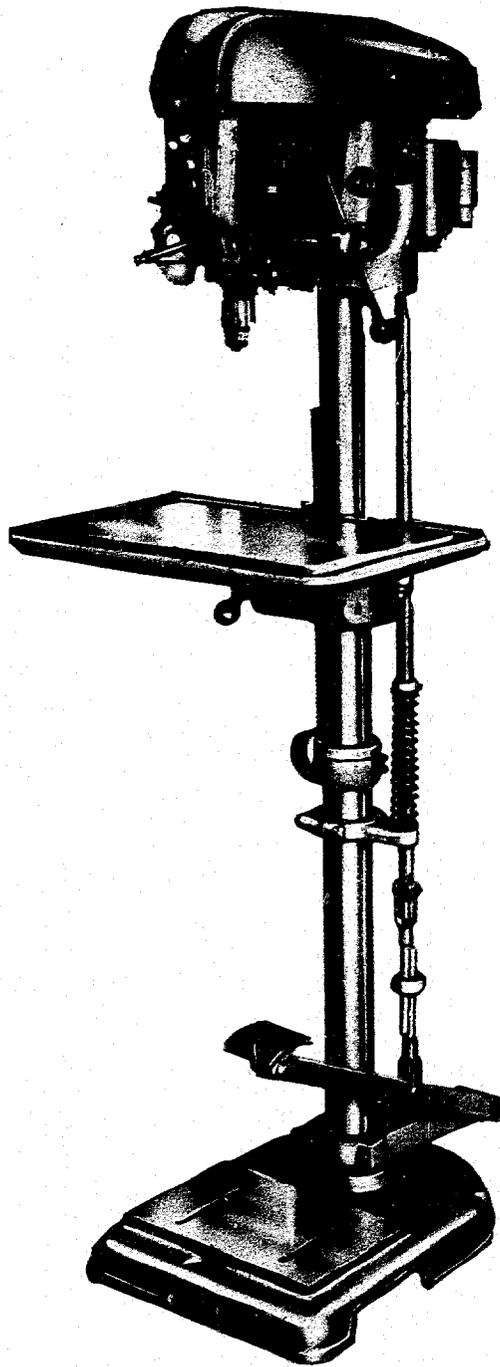
Foot Squaring Shear



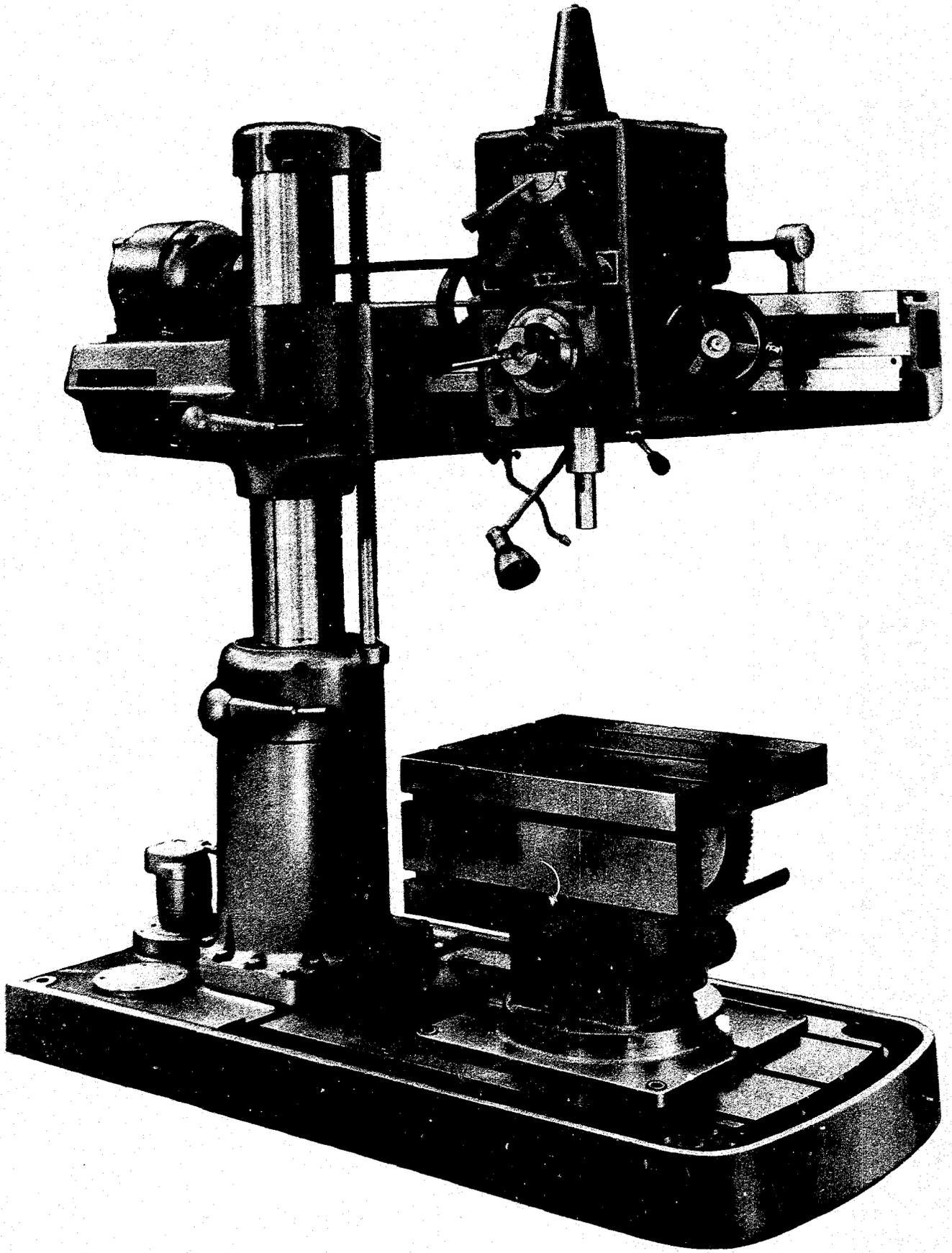
Contour Saw



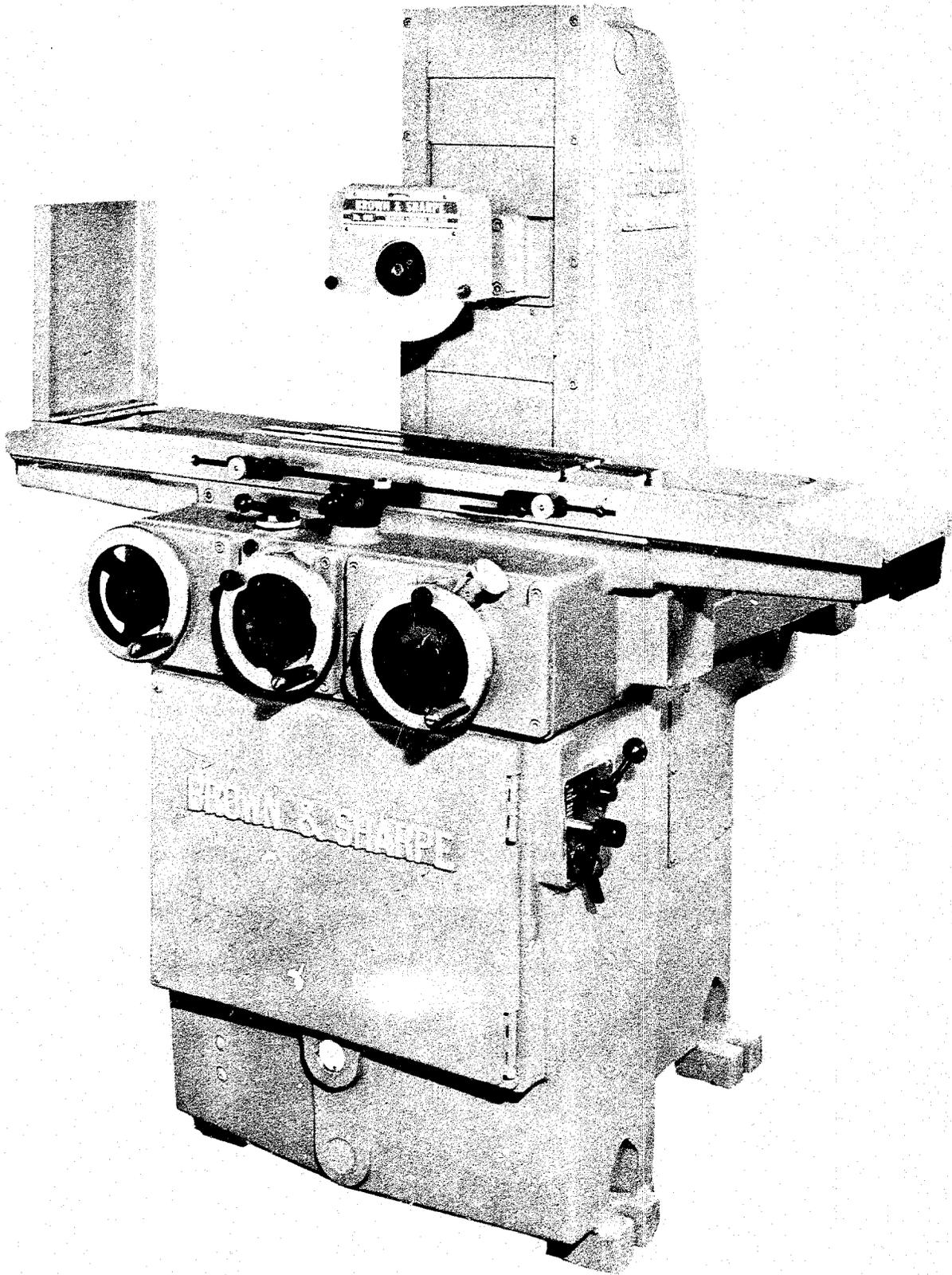
48" Power Forming Rolls, 16 - 18 Gauge



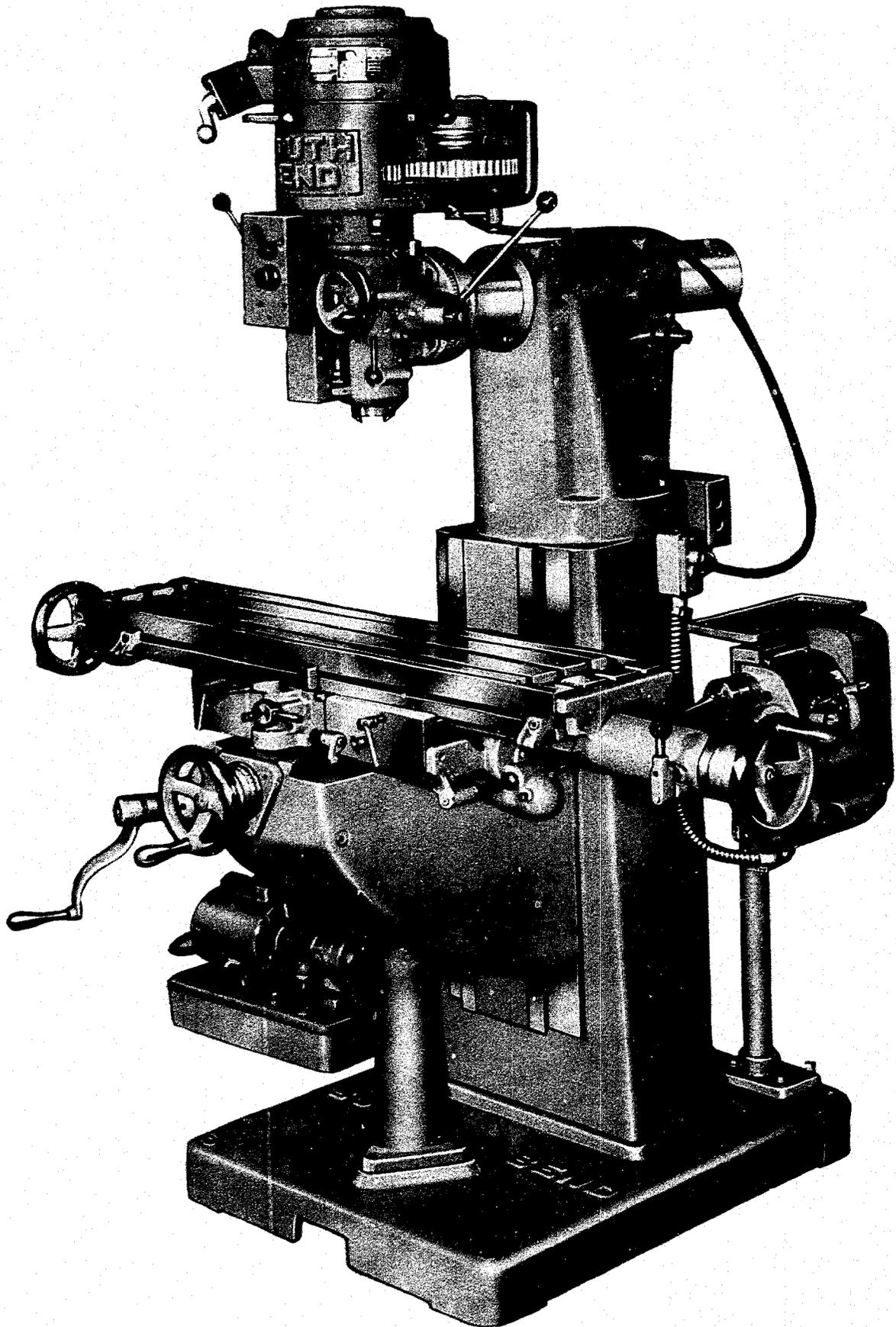
New Delta 15" Drill Press



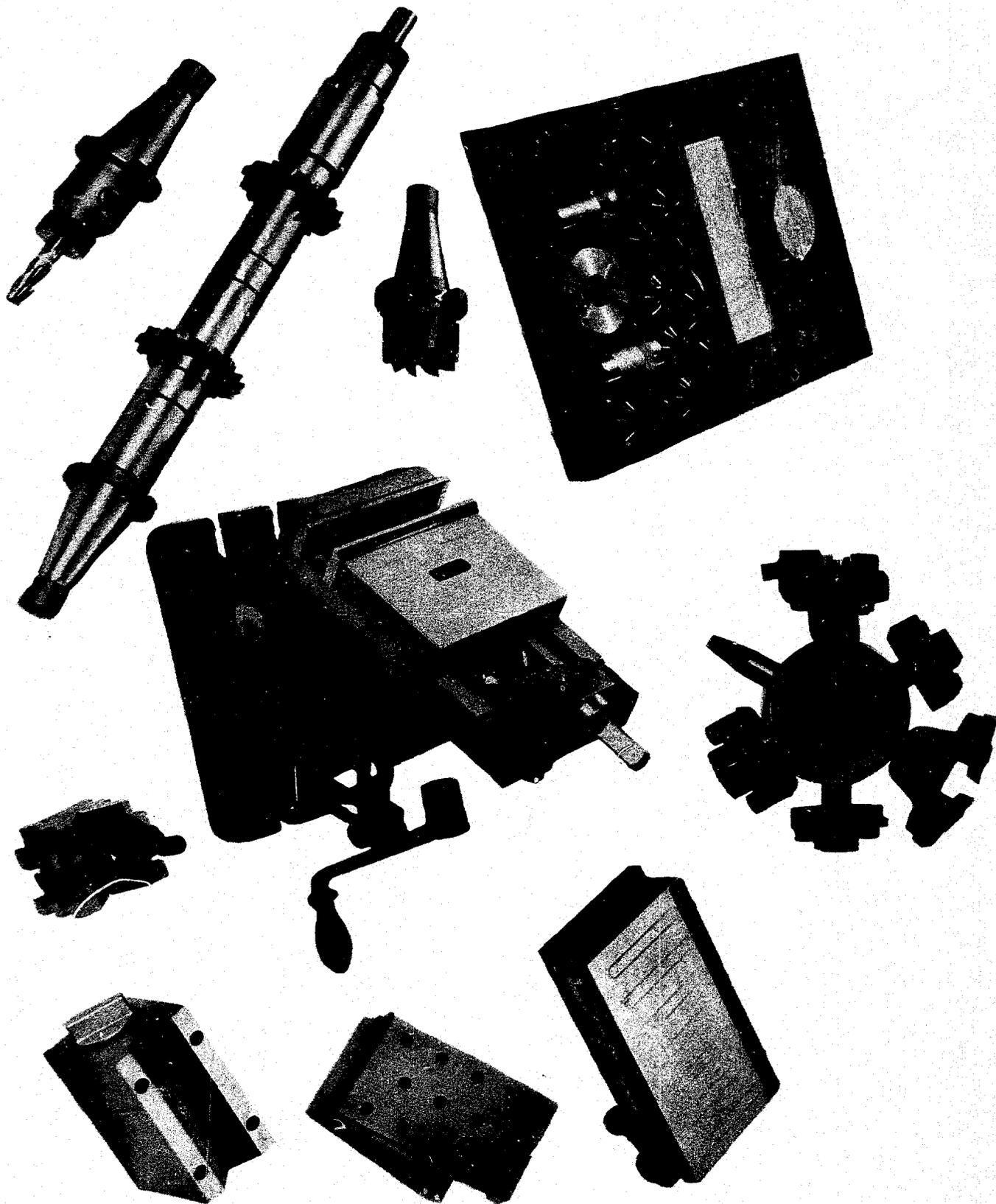
Radial Drill



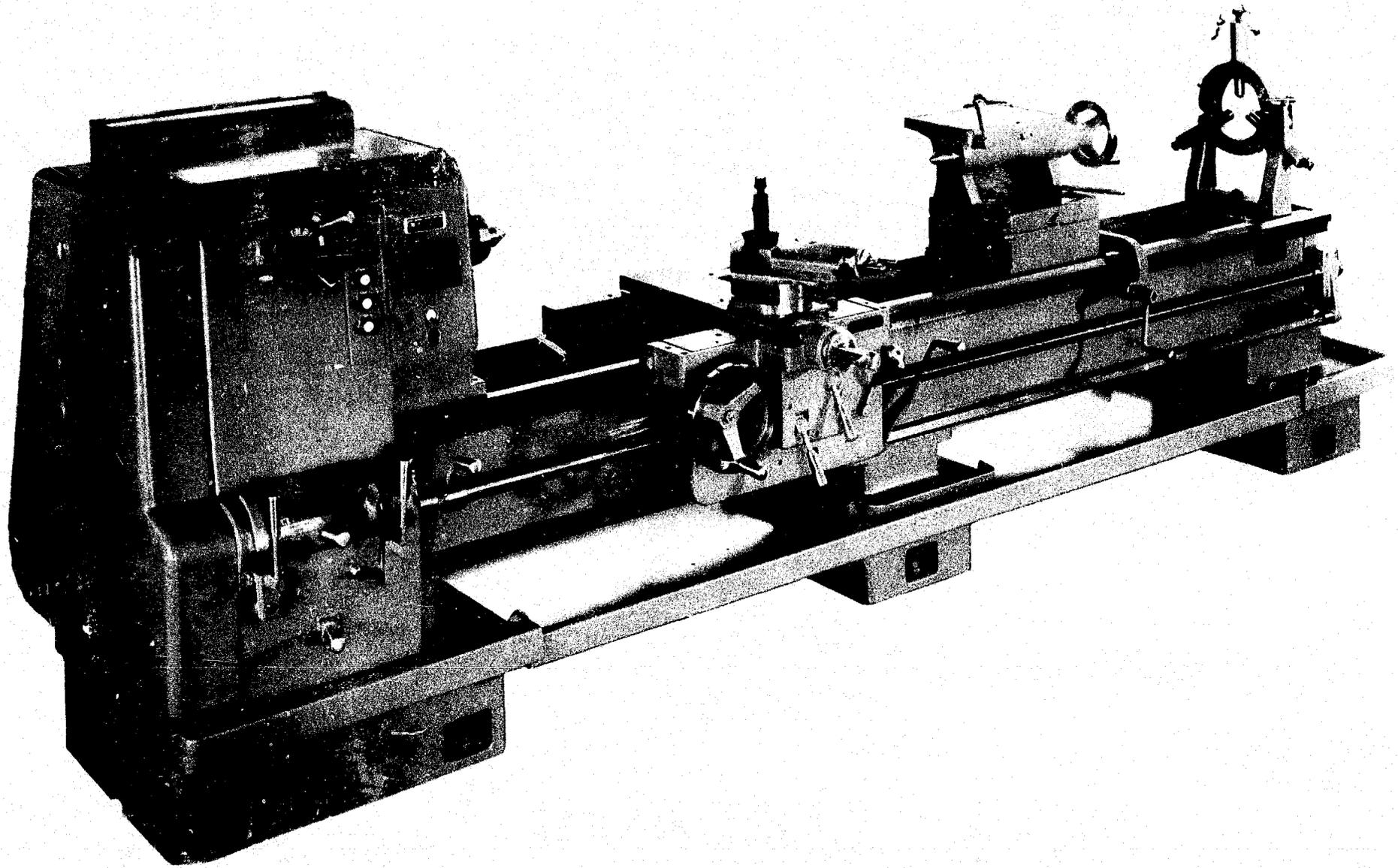
Surface Grinder



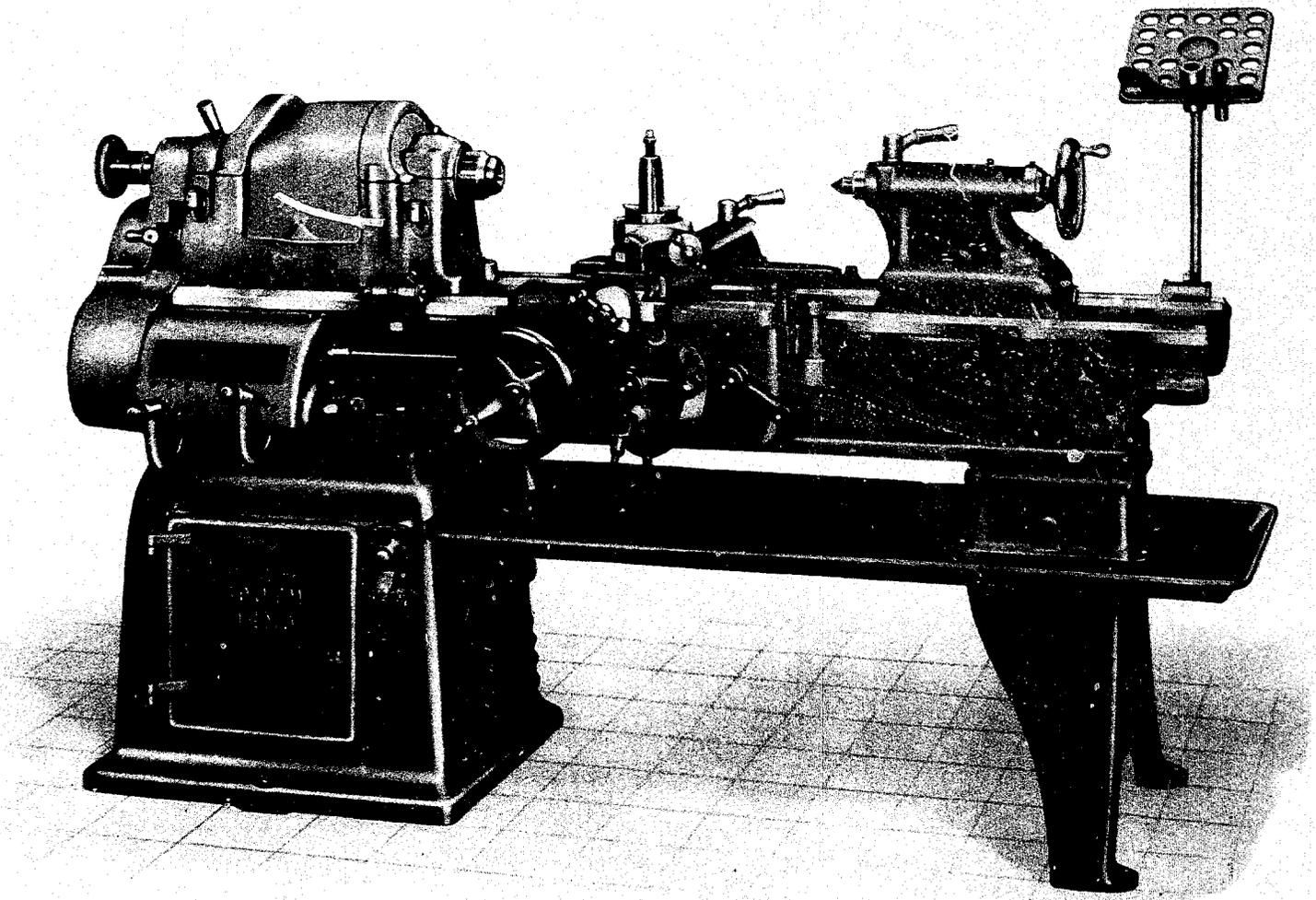
Vertical Spindle Milling Machine



Standard Milling Machine Accessories



Engine Lathe



Tool Room Lathe



Arc Welder

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