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REQUIREMENTS FOR MANUFACTURE OF WOOLEN YARN

TECHNICAL AIDS BRANCH

INTERNATIONAL COOPERATION ADMINISTRATION

Washington, D. C.

A.I.D.
Reference Center
Room 1656 NS

FOREWORD

This brochure is one of a series of reports resulting from overseas technical inquiries on factory or commercial establishments, operation, management, and engineering. The report is designed to provide only a general picture of the facts that must be considered in establishing and operating a factory of this type. In most cases, plans for actual installations will require expert engineering and financial advice in order to meet specific local conditions.

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

The original report was prepared by Barnes Textile Associates, Inc., Boston, Massachusetts.

Technical information, as well as review, was provided by R. Poliakoff, Industrial Consultant, 126 Eleventh Avenue, New York 11, N. Y.

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For further information and assistance, contact should be made with the local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

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WOOLEN YARN

INTRODUCTION

The plant described in this report is intended to manufacture woolen yarn. Compared with the yarn industry in the United States this is a small plant. However the machinery and equipment listed in this report is capable of producing woolen yarn on a competitive basis in a foreign country.

GENERAL ASSUMPTIONS

In order to make realistic estimates in this report, 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 twenty-four 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 learner's 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

The specifications of this product is 3-1/4 run yarn suitable for weaving purposes.

PRODUCTION CAPACITY

The annual capacity of this plant is about 400,000 pounds or 200 tons. This production is based on the plant operating twenty-four hours a day, five days a week.

MANUFACTURING UNIT

The manufacturing unit for this plant is one pound of woolen yarn.

MANUFACTURING OPERATIONS

Scoured wool is generally delivered to the woolen spinning mill in

bags or bales. The wool is blended and picked as received or stock dyed prior to the blending and picking operation according to the specifications.

Blending and picking are the first operations. The wool is inspected for blending and placed in weight boxes according to the blending mix required.

The weighed stock is then passed through a screen type condenser to remove the dust and dirt and conveyed to the mixing pickers. Spraying type oiling equipment is often used at the conveyer for oiling the wool prior to its delivery to the mixing picker.

The wool is blown by air from the picker to bins in the carding department. The wool is then passed through the carding machines. The last card separates the carded wool into narrow ribbons which pass through a rub roll apparatus forming round roving, which are wound on jack spools ready for spinning.

The spools are delivered to the spinning department where the wool is spun ready for packaging and shipping.

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DIRECT MATERIALS

The cost of wool shown below is for scoured wool delivered at the plant.

Item	Annual Requirements	Annual Cost Estimate	Annual Cost Actual
Wool	505,000 lbs.	$555,000	_____
Packaging		4,000	_____
TOTAL		$559,000	_____

SUPPLIES

Item	Annual Cost Estimate	Annual Cost Actual
Lubrication	$ 100	_____
Hand tools	100	_____
Maintenance	600	_____
Spare parts	1,000	_____
Office supplies	200	_____
TOTAL	$ 2,000	_____

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimate	Annual Cost Actual
Open blend pick	3	$1.50	$ 9,000	_____
Carding	6	1.50	18,000	_____
Spinning	3	1.50	9,000	_____
Receiving clerk	1	1.50	3,000	_____
TOTAL	13		$39,000	_____

INDIRECT LABOR

Description	Number Required	Annual Cost Estimate	Annual Cost Actual
Manager	1	$ 8,000	_____
Foreman	1	6,000	_____
Office staff	1	4,000	_____
Maintenance	1	4,000	_____
TOTAL	4	$ 22,000	_____

PRODUCTION TOOLS & EQUIPMENT

Description	Number Required	Unit Cost	Total Cost Estimate	Total Cost Actual
Picking & blending	2	$ 9,500	$ 19,000	_____
60 x 60 Cards	2	55,000	110,000	_____
Peralta Rolls	2	6,500	13,000	_____
Spinning frames				
5" ring, 6½" gauge	4	22,000	88,000	_____
Foundations and installations			40,000	_____
			$270,000	_____

OTHER TOOLS AND EQUIPMENT

Description	Number Required	Total Cost Estimate	Total Cost Actual
Fork truck	1	$ 7,500	_____
Baler	1	2,500	_____
Floor Griuder	1	700	_____
Traverse grinders	1	400	_____
Vacuum stripping system		2,800	_____
Jack spools, bobbins		1,100	_____
		$15,000	_____

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimate	Cost Actual
Desk & chair	2	$125	$250	_____
File cabinet	2	75	150	_____
Typewriter	1	150	150	_____
Adding machine	1	150	150	_____
TOTAL			$700	_____

PLANT LAYOUT

A plant layout and work flow is shown on the last page of this report.

PLANT SITE

About 12,000 square feet will be required for the plant site. It should be located as advantageously as possible with respect to transportation, power, water, fuel, sources of labor and markets.

The cost of the plant site is estimated at $500.

BUILDING

A one story building 60 feet by 100 feet or 6,000 square feet is required for the manufacture of woolen yarn. The total cost of the building is approximately $21,000

POWER

The connected load requirements for this plant amount to about 50 horsepower. The estimated annual cost of power is $4,000.

WATER

Water is used in this plant for sanitation, fire protection and a small amount for production. The annual cost of water is estimated at $180.

FUEL

For purposes of heating and production about 6,000 gallons of oil is needed annually. The estimated cost of oil is about $420 per year.

DEPRECIATION

Description	Est'mated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 21,000	20	$ 1,050	_____
Production tools and equipment	270,000	10	27,000	_____
Other tools and equipment	15,000	10	1,500	_____
Furniture and fixtures	700	10	70	_____
TOTAL			$ 29,620	_____

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Annual Cost Actual
Depreciation	$ 29,620	_____
Indirect labor	22,000	_____
Supplies	2,000	_____
Power	4,000	_____
Water	180	_____
Fuel	420	_____
TOTAL	$ 58,220	_____

MANUFACTURING COST

Item	Annual Cost Estimated	Actual
Direct materials	$ 559,000	_____
Direct Labor	39,000	_____
Manufacturing overhead	58,220	_____
TOTAL	$ 656,220	

FIXED ASSETS

Item	Cost Estimated	Actual
Land	$ 500	_____
Building	21,000	_____
Production tools and equipment	270,000	_____
Other tools and equipment	15,000	_____
Furniture and fixtures	700	_____
TOTAL	$ 307,200	_____

WORKING CAPITAL

Item		Cost Estimated	Cost Actual
Direct materials	30 days	$ 46,600	_____
Direct labor	30 days	3,400	_____
Manufacturing overhead	30 days	5,000	_____
Reserve for sales collections	30 days	75,300	_____
TOTAL		$130,300	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Cost Actual
Fixed assets	$ 307,200	_____
Working capital	130,300	_____
TOTAL	437,500	_____

SALES REVENUE

The estimates in this report are based on the production of 200 tons of wool yarn or 400,000 pounds per year. The price of wool yarn is about $2.25 per pound. The annual sales revenue for 400,000 pounds of woolen yarn is 400,000 x $2.25 or $900,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$ 559,000		_____
Direct la[illegible]	39,000		_____
Manufacturing overhead	58,220		_____
Total manufacturing cost		$656,220	
Interest on loans	13,000		_____
Insurance	1,000		_____
Legal	1,200		_____
Auditing	2,400		_____
Unforeseen expense	9,180		_____
Total administrative costs		$ 26,780	_____
Sales commissions		18,000	_____
Travel, bad debts, discounts and allowances, freight-out		10,000	_____
Profit before taxes		189,000	_____
TOTAL ANNUAL GROSS SALES		$900,000	_____

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	$_____	$ 1,550	$ 17,600	$_____
20	Sales	_____	2,333	28,000	_____
30	Direct Materials	_____	46,583	559,000	_____
40	Supplies	_____	166	2,000	_____
51	Power*	_____	333	4,000	_____
52	Water*	_____	15	180	_____
53	Fuel	_____	35	420	_____
60	Unforeseen Expense (Reserve Account)	_____	703	9,180	_____
71	Direct Labor*	_____	3,233	39,000	_____
72	Indirect Labor*	_____	1,833	22,000	_____
80	Depreciation (Reserve Account)	_____	2,466	29,620	_____

PURCHASE REQUISITION	COMPANY NAME	DATE

- ☐ 10 AIMINISTRATION
- ☐ 20 SALES
- ☐ 30 MATERIALS
- ☐ 40 SUPPLIES
- ☐ 50 UTILITIES
- ☐ 60 UNFORESEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

- ☐ DIRECT MATERIALS
- ☐ MAINTENANCE MATERIALS
- ☐ MAINTENANCE SERVICES
- ☐ OPERATING SUPPLIES

	PLEASE ORDER THESE MATERIALS OR SERVICES	DELIVERY WANTED	
QUANTITY	DESCRIPTION	UNIT	TOTAL

QUOTES FROM		REQUISITIONED BY	
QUOTES FROM		APPROVED BY	
QUOTES FROM		ORDER NO.	ORDER DATE

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

R. W. MITCHELL MANUFACTURING COMPANY

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

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 grea[illegible] economy in the investment of funds and establishes the [illegible] of operation that will be most profitable in the beginn[illegible] 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 resistence 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?

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P. Alexander and R. F. Hudson
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Rumhold Publishing Corporation
430 Park Avenue
New York 22, New York

A comprehensive treatment of the chemical and biological characteristics of wool.

Periodicals -

A. "World Wool Guide," Annually $10.00

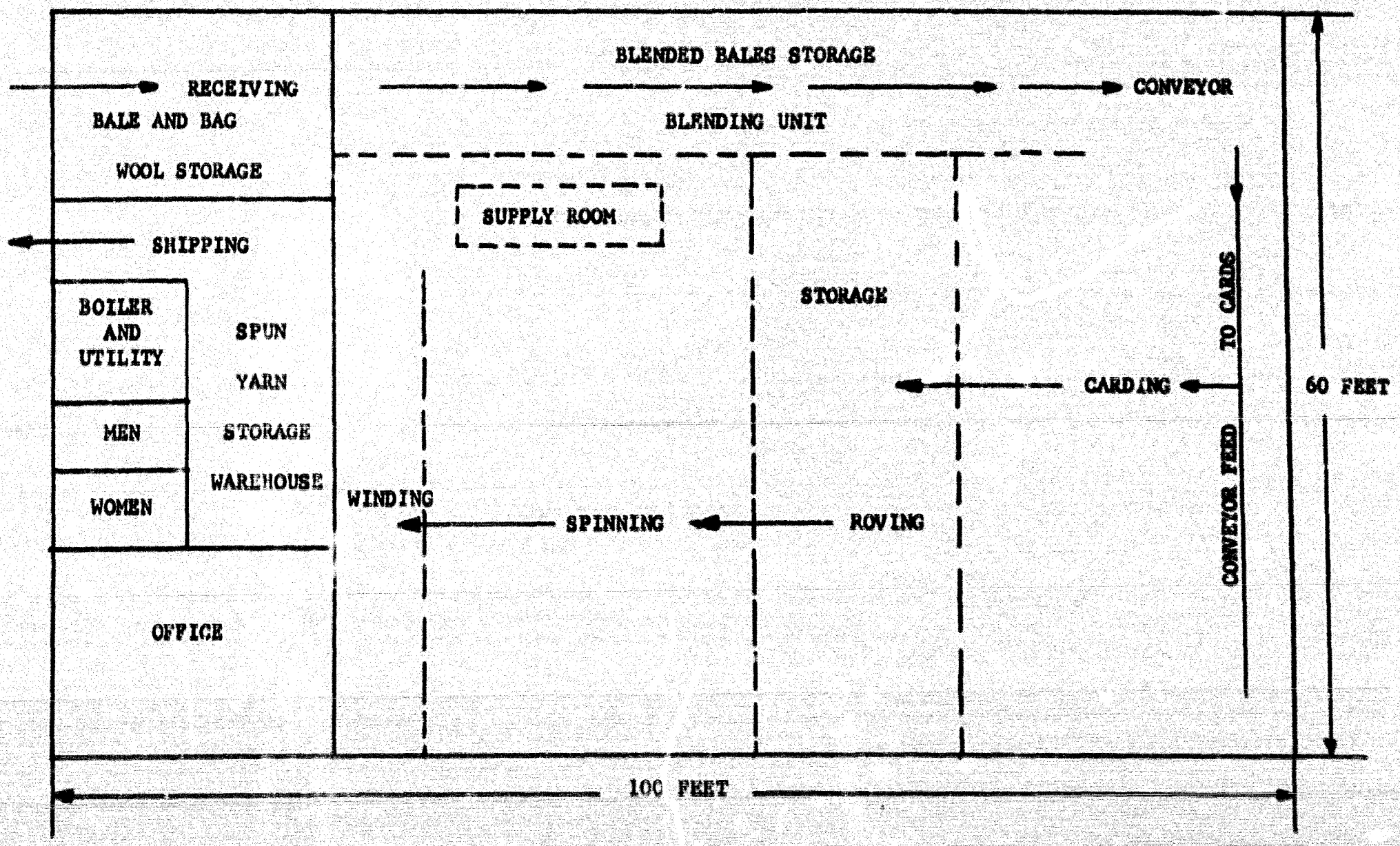
World Wool Guide, Inc.
138 West 7th Street
Philadelphia 6, Pennsylvania

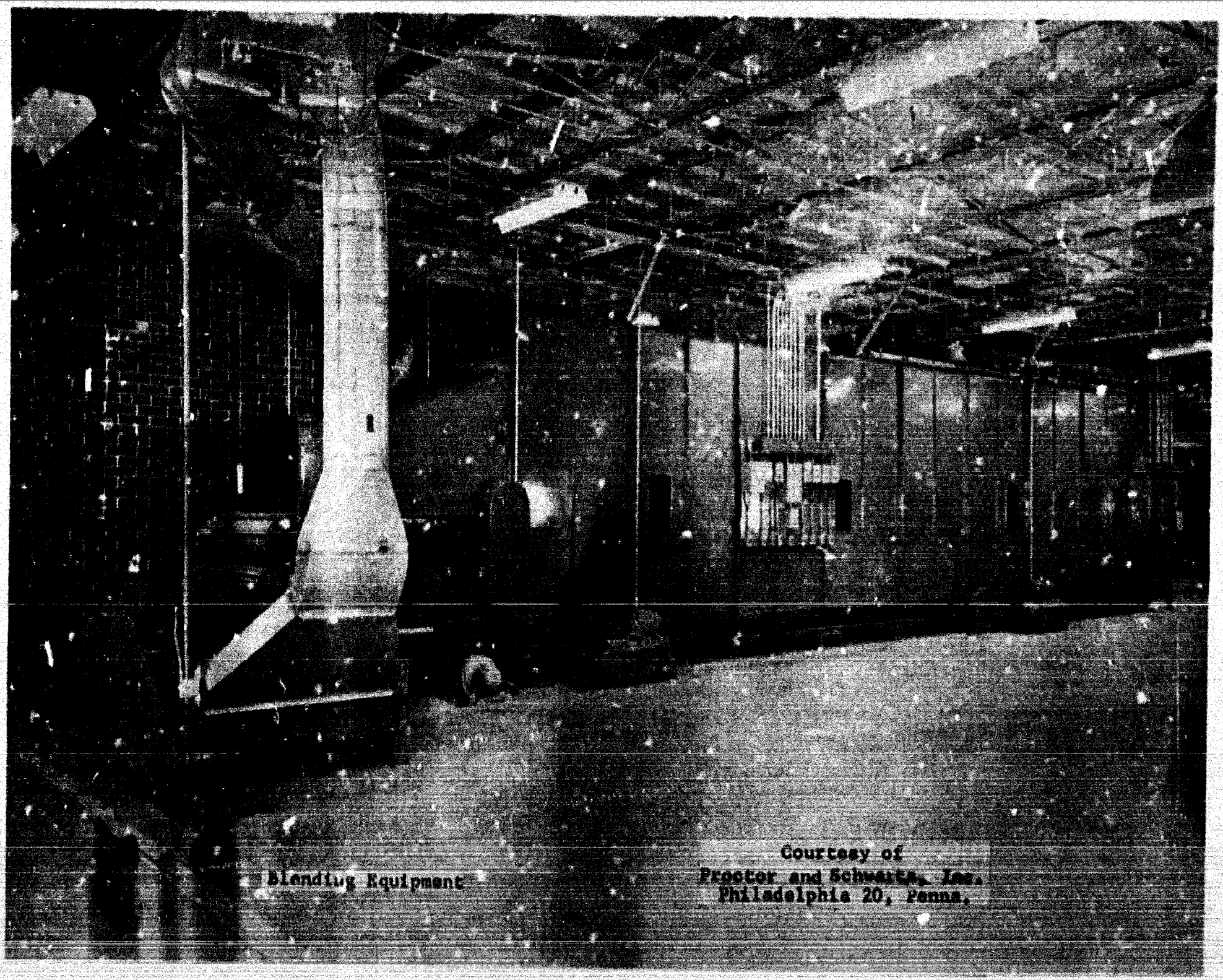
B. "America's Textile Reporter," Weekly $4.00

Frank P. Bennett and Co., Inc.
286 Congress Street
Boston 10, Massachusetts

PLANT LAYOUT

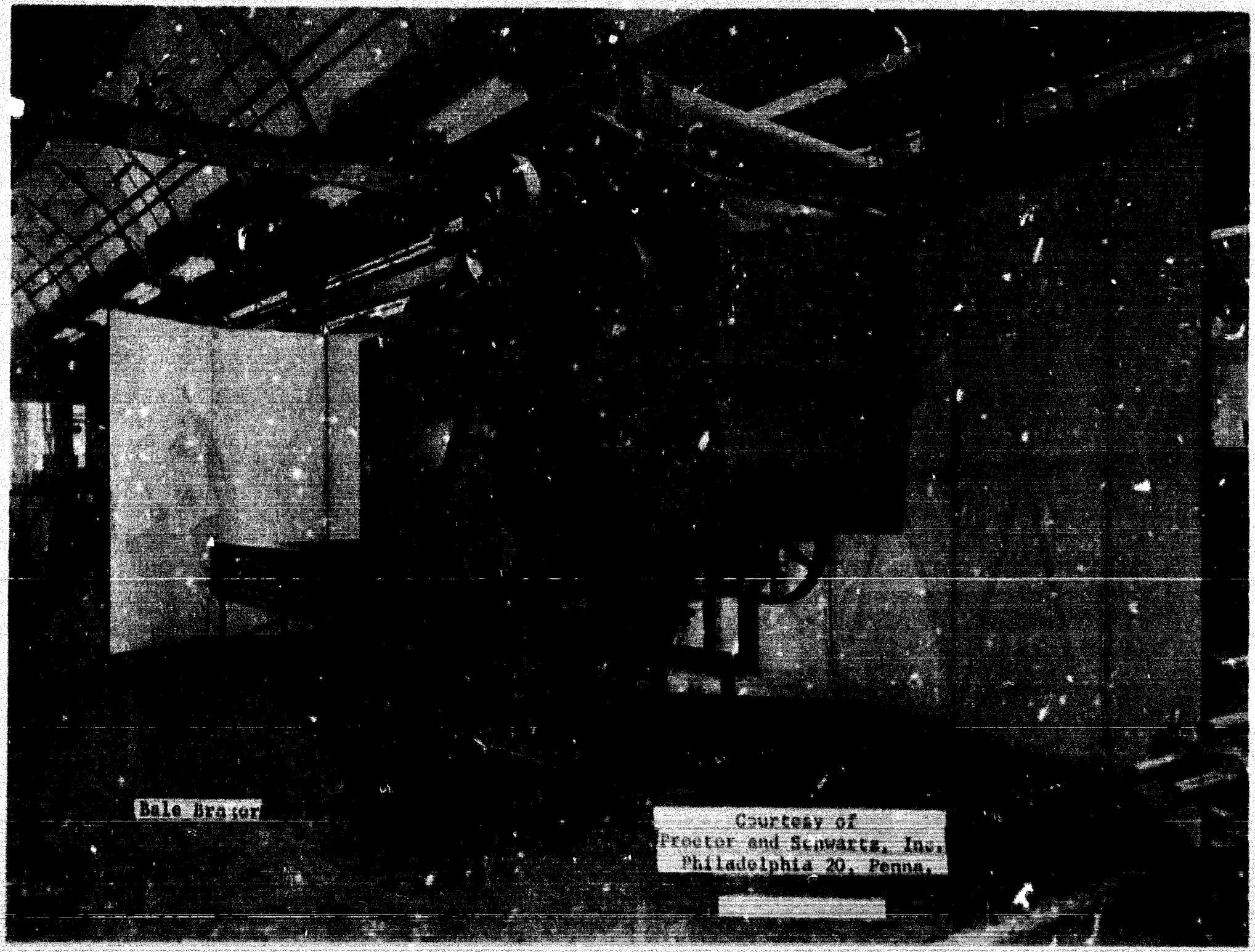
ARROWS INDICATE WORK FLOW





Blending Equipment

Courtesy of
Proctor and Schwartz, Inc.
Philadelphia 20, Penna.


Bale Breaker
Courtesy of
Proctor and Schwartz, Inc.
Philadelphia 20, Penna.