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TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
General Assumptions	1
Product Specifications	2
Production Capacity	3
Manufacturing Unit	3
Manufacturing Operations	3
Direct Materials	6
Supplies	6
Plant Layout	7
Plant Site	7
Building	7
Power	7
Water	8
Fuel	8
Production Tools and Equipment	9
Other Tools and Equipment	10
Furniture and Fixtures	10
Direct Labor	11
Indirect Labor	11
Depreciation	12
Manufacturing Overhead	12
Manufacturing Costs	13
Fixed Assets	13
Working Capital	14

	<u>Page</u>
Capital Requirements	14
Sales Revenue	15
Pecapitulation of Costs, Sales and Profits	15
Budget Control	16
Budget Control Accounts	16
Purchase Requisition	17
Voucher Check	18
Engineers	19
Training	20
Safety	21
Other Considerations	22
Materials and Supplies	22
Market Factors	22
Export Markets	23
Marketing Problems	23
Economic Factors	24
Personnel	24
Laws and Regulations	24
Financial Factors	25
Financial Requirements of the Project	25
Short Term Bank Credits	25
Financial Plan	25
Bibliography	26
Full-Fashion Knitting Machine	27
Dye Machine	28
Plant Layout	29

NYLON HOSIERY

INTRODUCTION

The purpose of this report is to present basic information for establishing a plant in a foreign country to produce women's full fashioned nylon hose from purchased nylon yarn.

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 three eight-hour shifts per day, five days per week, 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

All information and figures contained in this report are based on the production of women's full fashioned hose made from purchased 15 denier (body) and 40 denier (welt) nylon yarn. The sizes will range as follows:

Sizes - $8\frac{1}{2}$ to 11, inclusive (by $1/2$ sizes)

Length - Short ($8\frac{1}{2}$ to 10, inclusive)
 Medium ($8\frac{1}{2}$ to 11, inclusive)
 Long ($9\frac{1}{2}$ to 11, inclusive)

The range of colors would be limited to six or eight in gauges from 51 to 60.

PRODUCTION CAPACITY

The normal production capacity of this plant is 120 dozen pairs of stockings per day of three eight-hour shifts or 30,000 dozen pairs per year of two hundred and fifty days.

MANUFACTURING UNIT

The manufacturing unit of this plant is one dozen stockings.

MANUFACTURING OPERATIONS

Full Fashion Knitting Machine

Each machine is composed of approximately 20 heads. Each head knits a separate stocking in a flat piece with a selvage on each side. It is shaped during the knitting process by removing a number of loops from the needles that produced them. About 420 needles are used at the top or welt, and at the ankle 45 to 60 needles are in use depending on the gauge. The machines are equipped to produce hosiery by the single unit method which knits a loopless toe thereby eliminating the looping machine.

Seaming

This process consists of joining the stocking together at the back by means of a seam running the entire length from the toe to the welt.

Inspecting

Inspecting consists of placing the stocking on forms whereby they may be inspected for flaws and imperfections.

Bagging

Prior to dyeing, the knit hosiery is packed in mesh or open weave bags in predetermined quantities.

Dyeing

Bags of hosiery are placed in dye machines and dyed the specified shade. Dye machines are of a cylindrical or drum type containing an inner metal basket which holds the bags of knit hosiery. In the most commonly used methods the baskets rotate slowly in the dye liquor permitting uniform dyeing of all hosiery in a color batch. Vacuum dyeing is used to some extent but because it does not lend itself to small lots and quick changes, it is not common in the industry.

Extracting

Upon completion of the dyeing process, the bags are placed in a cylindrical metal basket and by rotating, the resulting centrifugal force draws the majority of the water from the hosiery.

Boarding

This machine consists of a group of hollow metal forms shaped similar to the stocking. Stockings are slipped onto the line of forms which passes through a heat chamber thus accomplishing a drying and pressing effect on stockings. Upon completion of drying and pressing, the stockings are generally mechanically removed from the forms and stacked in piles of one dozen each.

Matching

To insure each pair of stockings being the same length, several stockings are laid out on a table by hand and as a succeeding stocking is found to be of the same length, the two stockings are grouped as a matched pair and remain together from this point until boxed. Color matching is combined with this operation.

Folding

Each pair is folded around a piece of card stock to insure its being received by the consumer in good condition. This is generally done by hand.

Stencilling

The welt or top of each stocking is subjected to a stencil or printing which indicates the size and trade name, following matching and inspection.

Boxing

This operation generally consists of placing three pairs of hosiery in a box ready for storage and shipping.

DIRECT MATERIALS

<u>Item</u>	<u>Number Required</u>	<u>Unit Cost</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
15 denier nylon (body)	7,854 lbs.	\$ 5.25	\$ 41,200	_____
40 denier nylon (welt)	7,854 lbs.	4.00	31,600	_____
Boxes and cartons			<u>3,200</u>	_____
TOTAL			\$ 76,000	_____

SUPPLIES

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Maintenance and repair parts	\$ 700	_____
Lubricants and hand tools	100	_____
Office supplies	<u>200</u>	_____
TOTAL	\$ 1,000	_____

PLANT LAYOUT

A plant layout and work flow diagram showing the location of equipment and the sequence of operations is shown on the last page of this report.

PLANT SITE

In order to provide for future expansion a plant site of about 8,000 square feet will be required. The plant site should be as advantageously located as possible with respect to transportation, power, water, fuel, sources of labor, and markets.

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

BUILDING

A one-story building 40 feet by 80 feet or about 3,200 square feet will be required for the manufacture of nylon hose. Modern textile buildings are usually one-story with good lighting and humidity control.

The cost of this building is estimated at \$5.00 per square foot or about \$16,000.

POWER

The connected load requirements amount to about 40 horsepower. The

annual cost of power is estimated at \$900.

WATER

Water is used for production as well as for sanitary and fire preventive purposes.

The cost of water is estimated at \$200 per year.

FUEL

A small boiler is used in the production of nylon hosiery. The boiler purchased should be adaptable to the use of locally available fuel.

The cost of fuel is estimated at \$500.

* * * * *

PRODUCTION TOOLS AND EQUIPMENT

<u>Description</u>	<u>Number Required</u>	<u>Unit Cost</u>	<u>Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Full fashion knitting machines - 20 heads	4	\$ 30,000	\$ 120,000	_____
Seaming machine	3	830	2,500	_____
Automatic inspection machine	1		3,500	_____
Dye machines 25 pound capacity	2	2,500	5,000	_____
Dye machine - samples	1		800	_____
Extractor	1		2,500	_____
Presetting cabinet	1		3,000	_____
Preboarding machine	1		4,500	_____
Welt printer	1		2,000	_____
Box printer	1		1,500	_____
Boiler	1		2,000	_____
Installation			<u>6,700</u>	_____
TOTAL			\$ 154,000	

OTHER TOOLS AND EQUIPMENT

<u>Description</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Tables and chairs	\$ 100	_____
Bins, racks and trucks	500	_____
Printing dies and hand tools	<u>400</u>	_____
TOTAL	\$ 1,000	_____

FURNITURE AND FIXTURES

<u>Item</u>	<u>Number Required</u>	<u>Unit Cost</u>	Cost	
			<u>Estimated</u>	<u>Actual</u>
Desks and chairs	2	\$150	\$ 300	_____
File cabinets	2	50	100	_____
Typewriter	1	150	150	_____
Adding machine	1	150	<u>150</u>	_____
TOTAL			\$ 700	_____

DIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Hourly Rate</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Knitters	6	\$ 2.00	\$ 24,000	_____
Seamers	3	1.80	10,800	_____
Preboarders	2	1.75	7,000	_____
Pairers	2	1.50	6,000	_____
Finishers, packers and shippers	4	1.55	12,400	_____
Inspector	<u>1</u>	1.60	<u>3,200</u>	_____
TOTAL	18		\$ 63,400	_____

INDIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Annual Cost</u>	
		<u>Estimated</u>	<u>Actual</u>
Plant manager	1	\$ 10,000	_____
Plant supervisors	2	10,000	_____
Office staff	<u>2</u>	<u>7,000</u>	_____
TOTAL	5	\$ 27,000	_____

DEPRECIATION

<u>Description</u>	<u>Estimated Cost</u>	<u>Years Life</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Building	\$ 16,000	20	\$ 800	_____
Production tools and equipment	154,000	10	15,400	_____
Other tools and equipment	1,000	10	100	_____
Furniture and fixtures	700	10	<u>70</u>	_____
TOTAL			\$ 16,370	_____

MANUFACTURING OVERHEAD

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Depreciation	\$ 16,370	_____
Indirect labor	27,000	_____
Power	900	_____
Water	200	_____
Fuel	500	_____
Supplies	<u>1,000</u>	_____
TOTAL	\$ 45,970	_____

MANUFACTURING COSTS

<u>Item</u>	Annual Cost	
	<u>Estimated</u>	<u>Actual</u>
Direct materials	\$ 76,000	_____
Direct labor	63,400	_____
Manufacturing overhead	<u>45,970</u>	_____
TOTAL	\$ 185,370	_____

FIXED ASSETS

<u>Item</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Land	\$ 500	_____
Building	16,000	_____
Production tools and equipment	154,000	_____
Other tools and equipment	1,000	_____
Furniture and fixtures	<u>700</u>	_____
TOTAL	\$ 172,200	_____

WORKING CAPITAL

<u>Item</u>		Cost	
		<u>Estimated</u>	<u>Actual</u>
Direct materials	30 days	\$ 6,330	_____
Direct labor	30 days	5,280	_____
Manufacturing overhead	30 days	3,830	_____
Reserve for sales collections	30 days	<u>22,400</u>	_____
TOTAL		\$ 37,840	_____

CAPITAL REQUIREMENTS

<u>Item</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Fixed assets	\$ 172,200	_____
Working capital	<u>37,840</u>	_____
TOTAL	\$ 210,040	_____

SALES REVENUE

The average price for nylon hosiery of the type produced in this plant is \$8.95 per dozen pairs. The production capacity of this plant is 30,000 dozen pairs of stockings per year. Therefore, based on these figures the annual gross sales revenue of this plant is \$268,500.

RECAPITULATION OF COSTS, SALES AND PROFITS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct materials	\$ 76,000	_____
Direct labor	63,400	_____
Manufacturing overhead	<u>45,970</u>	_____
Total manufacturing cost		\$135,370
Interest on loans	6,300	_____
Insurance	600	_____
Legal	300	_____
Auditing	600	_____
Unforeseen expense	<u>3,230</u>	_____
Total administrative costs		11,030
Sales commissions		6,000
Travel, bad debts, discounts and allowances, freight-out		4,000
Profit before taxes		<u>62,100</u>
Total annual gross sales		\$268,500

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:

<u>Account Number</u>	<u>Monthly Expense</u>	<u>Monthly Budget</u>	<u>Annual Budget</u>	<u>Actual</u>
10 Administrative	\$ _____	\$ 650	\$ 7,800	\$ _____
20 Sales	_____	833	10,000	_____
30 Direct Materials	_____	6,333	76,000	_____
40 Supplies	_____	83	1,000	_____
51 Power*	_____	75	900	_____
52 Water*	_____	16	200	_____
53 Fuel	_____	41	500	_____
60 Unforeseen Expense (Reserve Account)	_____	269	3,230	_____
71 Direct Labor*	_____	5,280	63,400	_____
72 Indirect Labor*	_____	2,250	27,000	_____
80 Depreciation (Reserve Account)	_____	1,364	16,370	_____

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 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?

BIBLIOGRAPHY

Textbooks -

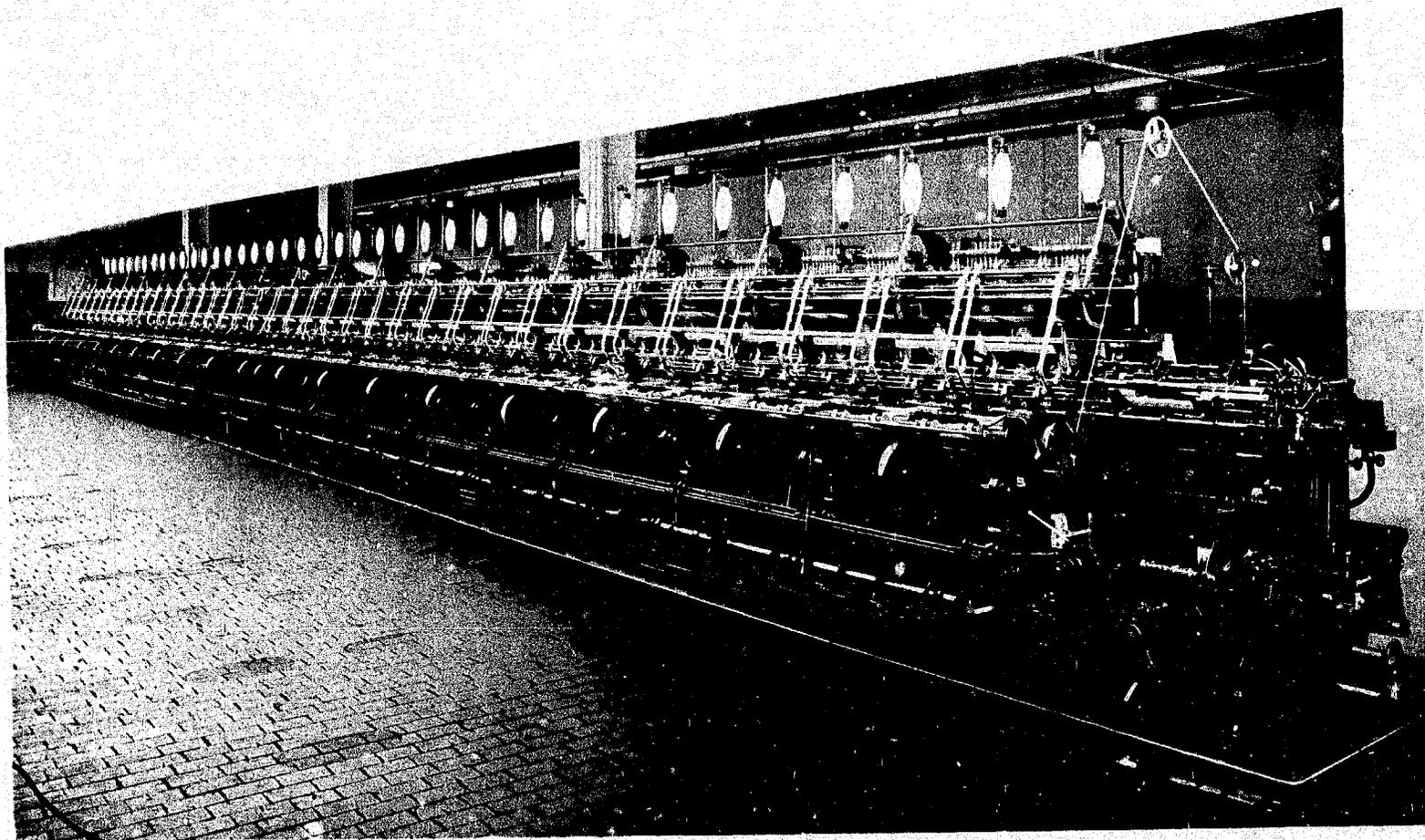
"Nylon Technology"
Karl H. Inderfurth. 1953. 335 pp. illus. \$6.50.
McGraw-Hill Book Company, Inc.
330 West 42nd Street
New York 36, N. Y.

Complete coverage of the use of nylon in the textile industry. Methods of quilling, dyeing, weaving, knitting, printing, and finishing nylon are thoroughly considered.

Periodicals -

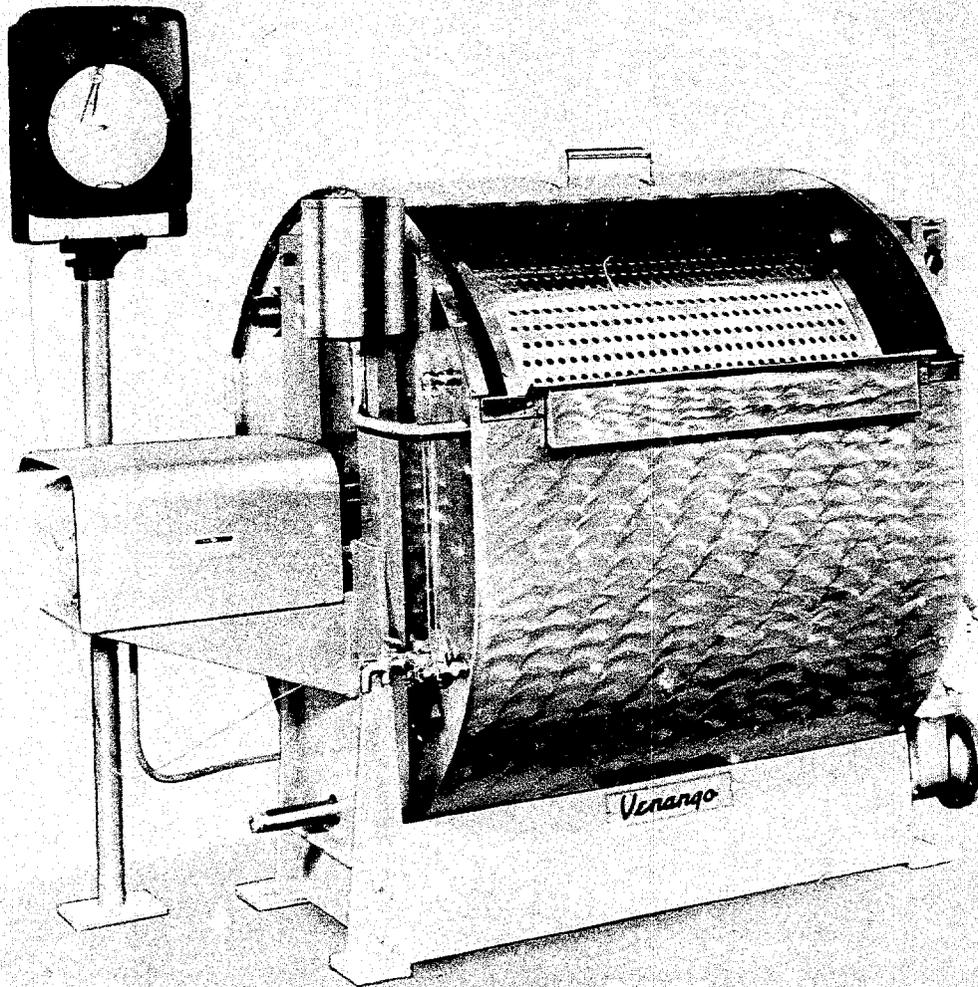
Hosiery and Underwear Review. Monthly.
\$2.00/year (U.S.A.). \$3.00 to \$10.00 (Foreign).
The Knit Goods Publishing Company
307 Fifth Avenue
New York 16, N. Y.

Women's Wear Daily
Daily. \$12.00/year (U.S.A.). \$21.00/year (Foreign).
Fairchild Publications, Inc.
7 East 12th Street
New York 3, N. Y.



Courtesy
Textile Machine Works
Reading, Pennsylvania

FULL-FASHION
KNITTING MACHINE



DYE MACHINE

Courtesy:
Venango Engineering Company
Philadelphia 36, Pennsylvania

PLANT LAYOUT

ARROWS INDICATE WORK FLOW

