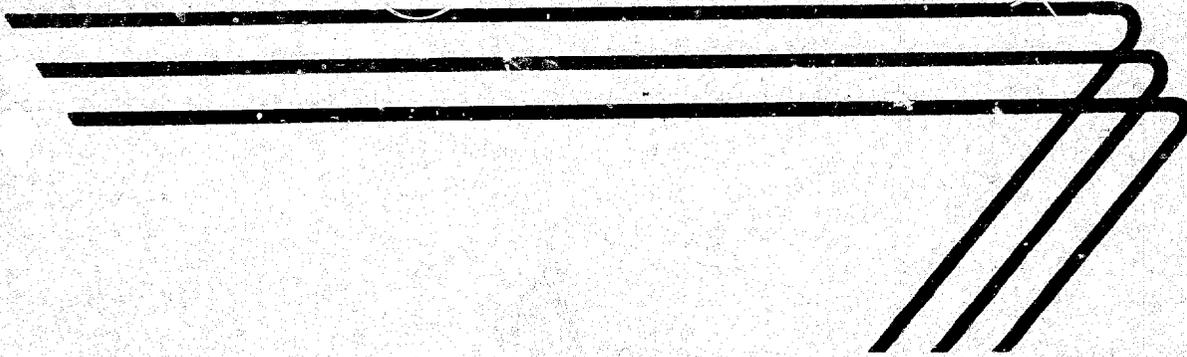


12

# **PLANT REQUIREMENTS FOR MANUFACTURE OF BOXES AND SHOOKS**



**DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
COMMUNICATIONS RESOURCES DIVISION**

Washington 25, D. C.



## 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 factors 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 Agency for International Development, but merely a citation that is typical in its field.

This brochure was prepared in December 1957 by the George H. Andrews Engineering Associates, Inc., 411 Southern Building, Washington 5, D. C., for the industry program through the facilities of the Office of Technical Services, U. S. Department of Commerce.

\* \* \* \* \*

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

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\*Can furnish either new or used equipment.

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## A SMALL BOX AND SHOOK PLANT

### INTRODUCTION

The small box and shook plant described in this brochure is intended to manufacture wooden boxes and shocks where the demand for these products exists and where such a local operation would be practicable.

The machinery and equipment recommended is adequate to manufacture any design or size of wooden box or shook. A shook is a knocked down box. It includes all the wood pieces to make a box, bundled together complete, ready for assembling and nailing. The end pieces in a shook are usually assembled, and nailed, if they consist of more than one piece. Boxes are usually ordered in the form of shocks where they are shipped long distances before being used. Shipment as shocks saves a great deal of shipping space, which, in turn, reduces the cost of freight, and saves warehouse space at the point of use.

### GENERAL ASSUMPTIONS

In order to make realistic estimates, certain assumptions must be made. These are:

1. All costs, such as those for building, equipment, materials and supplies, are based on current prices in the United States.
2. The operating costs, including labor used, are taken from actual operating experience in the United States.
3. Adequate power and water are available at the plant site.
4. Adequate transportation facilities are available at the plant site.
5. All estimates are based on one 8-hour work shift per day, 5 days per week, or 40 hours per week.

6. A few more workers than are shown in the estimate will be required during the training period and peak production is not likely to be attained until the whole organization is thoroughly trained. It is estimated that this training will require from 6 weeks to 3 months.
7. The principal material, which is lumber, is available locally.
8. A market analysis has proved that annual sales of at least 375,000 units are possible.
9. The following items cannot be estimated realistically:
  - A. Land value.
  - B. Freight in and out.
  - C. Distribution and sales cost.
  - D. Taxes, interest, insurance, and other burdens.

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 brochure should be adjusted to conform to local conditions.

### PRODUCT SPECIFICATIONS

The machinery and equipment listed in this brochure is adequate for the production of any design or size of wooden box, or shock, that does not require a sanded surface. If boxes with sanded surfaces are produced, sanding equipment will have to be purchased.

The exact specifications of boxes and shocks will always depend upon the customers' requirements. Most boxes will require such printing as company name, address and product.

For the purpose of providing manufacturing methods and operations, cost estimates and other essential information, for the production of both boxes and shocks, box style 4 1/2 shown on Page 4, has been selected. The size of box and shock selected is 12 inches high, 14 inches wide and 24 inches long, inside dimensions.

Complete information on the manufacturing of a beverage bottle box will also be used for providing additional data.

A picture of this box, together with specifications, is shown on Page 10.

THE NATIONAL WOODEN BOX ASSOCIATION  
has kindly permitted the reproduction of the  
following specifications as a part of this  
brochure:

SPECIFICATION 1-1A

May 1, 1956



Specifications for  
NAILED WOODEN AND LOCK CORNER BOXES  
for  
INDUSTRIAL USE

Issued by: National Wooden Box Association  
402 Barr Building  
Washington 6, D. C.

\* \* \* \* \*  
[" indicates inches]

These specifications cover nailed and lock corner wooden boxes for shipment of industrial products. The general provisions apply to wooden boxes for both domestic and export shipment, and are intended to serve as a guide in the design and construction of serviceable and economical wooden boxes.

Certain exceptional commodities or especially dangerous articles or products may require greater protection than is afforded by a box constructed under these specifications. In every case, the container must conform to the specifications prescribed in the Interstate Commerce Commission regulations governing the transportation of the particular articles being packed.

## 1. CLASSIFICATION

1.1 Boxes shall be furnished in the following styles as specified by the purchaser:

### Nailed Construction

Style 1	Style 3
Style 2	Style 4
Style 2½	Style 4½
	Style 5

### Lock-corner Construction

Style 6

1.2 Boxes shall be classified as to intended use for domestic or for export shipment.

1.3 Boxes shall be designed and constructed for the particular type of load for which they are intended. Loads shall be classified as follows:

**Type 1 -- Easy Loads** Contents have low or moderate density, and are prepacked in one interior container which completely fills and in some instances adds rigidity to the outer shipping box, or contents themselves completely fill, support

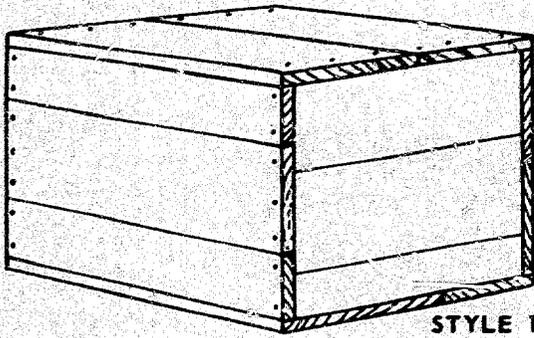
and add rigidity to the shipping box. Easy load items are those not easily damaged by puncture or shock and do not shift or flow within the package.

**Examples:** Clothing, textiles, cans or cartons packed in an inner container completely filling the outer shipping box, items packed in wood or metal chests which in turn are packed in the outer shipping box, one-piece solid materials, chests or kits of tools, wooden or metal cabinets, and boxed sturdy instruments.

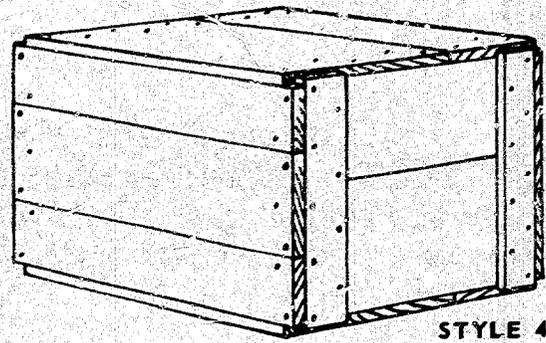
**Type 2 -- Average Load** Contents are moderately concentrated articles, and are packed directly into the outer shipping container, providing support at several points on each face of the outside box, or are subjected to an intermediate form of packing such as wrapping, pads, excelsior, paper wadding, partitions, chipboard boxes or other types of suitable interior packing, and packed into and support all faces of an outer shipping box.

**Examples:** Hardware in cartons, paints and oils in metal cans, cosmetics, pharmaceuticals, chemicals, small electrical appliances, processed food in glass containers individually cushioned, and items such as china, enamel, aluminum and glassware.

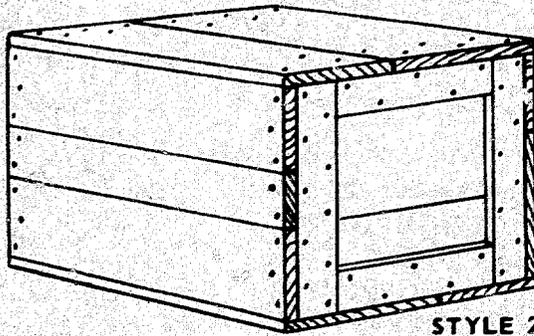
# STANDARD STYLES OF NAILED WOODEN BOXES



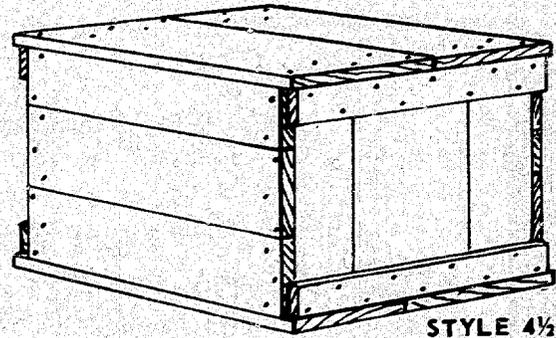
STYLE 1



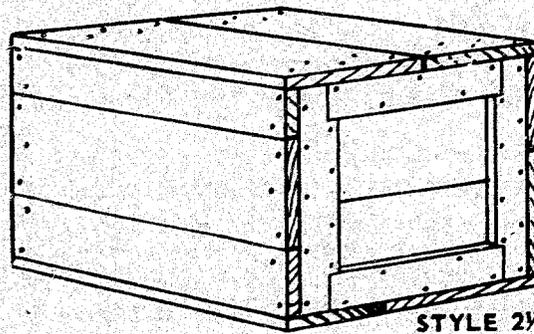
STYLE 4



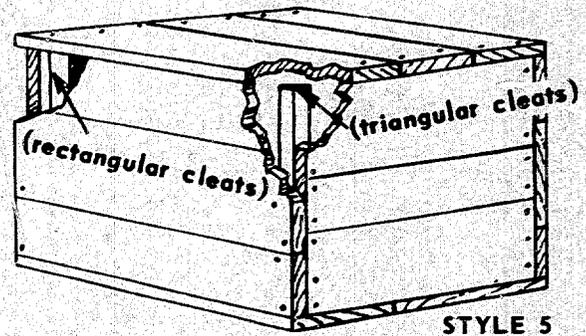
STYLE 2



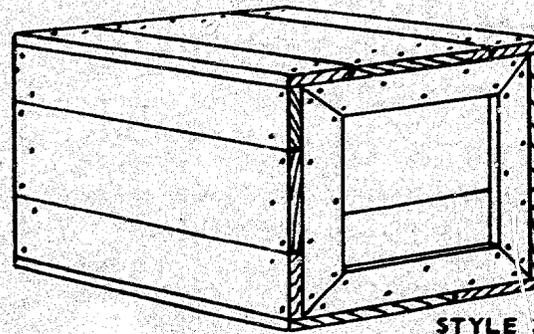
STYLE 4½



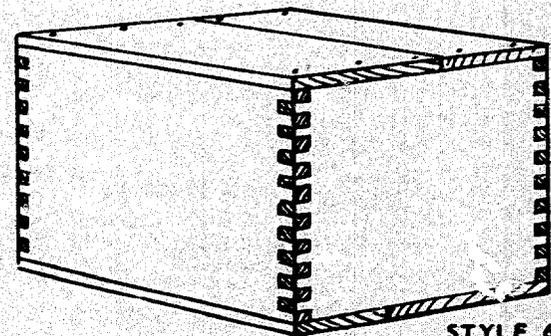
STYLE 2½



STYLE 5



STYLE 3



STYLE 6

**Type 3 -- Difficult Load** Items require a high degree of protection from puncture, shock or distortion of the container, or items do not support the faces of the shipping box.

**Examples:** Hardware in partially filled cartons, porcelain insulators packed in bulk, castings, heavy stampings, forgings, machine parts, coiled metal tubing, adding machines, typewriters, lawn mowers, generators, glass bottles of soda fountain syrup, heavy mirrors, framed and glazed pictures, steel balls, welding rods, large gears, crank shafts, and explosives.

## 2. GLOSSARY OF TERMS

**2.1 Part.** For the purpose of this specification, a part means the cut-to-size component of a shook or box, such as a side, top, bottom, end, or partition. A part may be composed of one or more single solid and/or built-up pieces or combination of both.

**2.2 Piece.** A piece is any separate segment of a box part which is the full length and full thickness, but not necessarily the full width, of the part. A single solid piece is one which is without joints. A built-up piece is one composed of two or more single solid pieces joined together in accordance with paragraphs 4.2.1.1 through 4.2.1.4.

**2.3 One-piece part.** A one-piece-part is one composed of one single solid piece or one built-up piece which forms one solid component of a shook or box.

**2.4 Cleat.** A cleat is a single solid or built-up piece used to reinforce the ends of a shook or box.

**2.5 Batten.** A batten is a single solid or built-up piece used to reinforce the sides, tops, and bottoms of a shook or box and may be placed inside or outside of the box as feasible for a given load or contents.

## 3. MATERIALS

### 3.1 Wood

**3.1.1.** The species of lumber for the construction of boxes are classified, for the purpose of determining nailing schedules and thicknesses of parts, into four groups as follows:

#### Group I

Alder, red	Cypress
Aspen (popple)	Fir (Abies species)
Basswood	Pine, (except Southern yellow)
Buckeye	Redwood
Butternut	Spruce
Cedar	Willow
Chestnut	Yellow poplar
Cottonwood	

#### Group II

Douglas fir	Larch (Tamarack)
Hemlock	Pine, southern yellow

#### Group III

Ash, (cabinet texture)	Gum, red or black
Elm, soft	Magnolia
	Maple, soft
	Sycamore

#### Group IV

Ash, (tough texture)	Hackberry
Beech	Hickory
Birch	Locust
Cherry	Maple, hard
Elm, hard	Oak
	Pecan

**3.1.2.** Seasoning - Moisture content of lumber at time of manufacture of boxes is to be not less than 8% and not more than 18% of the oven-dry weight.

**3.1.3.** At least one surface - to be placed on the outside of the box - shall be sufficiently smooth to permit legible marking, stencilling or printing. The boards shall be free from defects that materially weaken them, expose the contents of the box to damage, or interfere with the prescribed fabrication or nailing.

### 3.2 Nails

**3.2.1.** Unclinched nails shall be cement coated, chemically etched or helical steel nails. Cement coated nails shall be cooler (top and underside of head flat), corker (top of head flat and underside cone-shaped), sinker (top of head flat and underside of head cone-shaped) or smooth standard type (see Table I). Chemically etched nails shall be smooth standard type (see Table I), unless some other type is required for a specific purpose, and shall have the surface roughened by chemical action.

3.2.2. Clinched nails, used for nailing cleats or battens to ends, sides, top, or bottom, may be cement coated, chemically etched or bright (uncoated) smooth standard nails (see Table II).

3.3 Corrugated fasteners.

3.3.1 Corrugated fasteners shall be of steel.

4. FABRICATION

4.1 Thickness of parts.

4.1.1 For Style 1, 2, 2½, 3, 4, 4½ and 5 boxes only, the minimum thickness of ends, sides, top and bottom and the minimum thickness and width of cleats and/or battens, shall be determined from Table III according to the style of box, use, type of load, weight of contents and wood group applicable.

4.1.2 For Style 6 boxes only, the minimum thickness of ends, sides, top and bottom shall be determined from Table IV.

4.1.3 Occasional variations in thickness due to manufacture will be permitted, but no part shall be

TABLE I - SIZE AND WEIGHT OF CEMENT COATED NAILS

SIZE (Penny)	LENGTH (inches)	COOLERS			CORKERS		
		DIA. (inches)	HEAD (inches)	NO/LB.	DIA. (inches)	HEAD (inches)	NO/LB.
4d	1-3/8	.0800	7/32	488	.0860	7/32	392
5d	1-5/8	.0860	15/64	364	—	—	—
6d	1-7/8	.0915	1/4	275	.0990	1/4	232
7d	2-1/8	.0990	17/64	212	—	—	—
8d	2-3/8	.1130	9/32	144	.1205	9/32	129
9d	2-5/8	.1130	9/32	127	.1205	9/32	114
10d	2-7/8	.1205	19/64	104	.1350	5/16	84
12d	3-1/8	—	—	—	.1350	5/16	77
SIZE (Penny)	LENGTH (inches)	SINKERS			STANDARD SMOOTH		
		DIA. (inches)	HEAD (inches)	NO/LB.	DIA. (inches)	HEAD (inches)	NO/LB.
4d	1-3/8	.0800	13/64	488	.0670	13/64	710
5d	1-5/8	.0860	7/32	364	.0720	7/32	536
6d	1-7/8	.0915	15/64	275	.0860	1/4	306
7d	2-1/8	.0990	1/4	212	.0860	1/4	268
8d	2-3/8	.1130	17/64	142	.0990	17/64	186
9d	2-5/8	.1130	17/64	130	.0990	17/64	167
10d	2-7/8	.1205	9/32	104	.1130	19/64	118
12d	3-1/8	.1350	5/16	77	—	—	—

TABLE II - SIZE AND WEIGHT OF BRIGHT (UNCOATED) SMOOTH STANDARD NAILS

SIZE (Penny)	LENGTH (inches)	DIAMETER (inches)	HEAD (inches)	NO/LB.
4d	1-1/2	.0800	7/32	473
5d	1-3/4	.0800	7/32	406
6d	2	.0990	17/64	236
7d	2-1/4	.0990	17/64	210
8d	2-1/2	.1130	19/64	145
9d	2-3/4	.1130	19/64	132
10d	3	.1280	5/16	94
12d	3-1/4	.1280	5/16	88

TABLE III - Determination of minimum thickness of sides, tops, bottoms and ends, and minimum thickness and with of cleats for Styles 1, 2, 2½, 3, 4, 4½, and 5 nailed wood boxes.

DOMESTIC MAXIMUM WEIGHT	TYPE LOAD	EXPORT MAXIMUM WEIGHT	STYLE <sup>a</sup>	GROUP I & II WOODS			GROUP III & IV WOODS		
				S.T.B.	ENDS	CLEATS	S.T.B.	ENDS	CLEATS
50	I-II	---	1 <sup>b</sup>	1/4	1/2	---	3/16	1/2	---
50	I-II	---	4, 4½, 5	1/4	1/2	1/2 x 1-1/2	3/16	1/2	1/2 x 1-1/2
50	III	---	4, 4½, 5	5/16	1/2	1/2 x 1-3/4	7/32	1/2	1/2 x 1-1/2
---	I-II	60	1 <sup>b</sup>	3/8	3/4	---	11/32	3/4	---
---	I-II	60	4, 4½, 5	3/8	5/8	5/8 x 1-3/4	5/16	5/8	5/8 x 1-3/4
85	I-II	---	1 <sup>b</sup>	5/16	1/2	---	7/32	1/2	---
85	I-II	---	4, 4½, 5	5/16	1/2	1/2 x 1-1/2	7/32	1/2	1/2 x 1-1/2
85	I-II	---	2	5/16	5/16	1/2 x 1-1/2	7/32	7/32	1/2 x 1-1/2
85	III	---	4, 4½, 5	3/8	9/16	9/16 x 1-1/2	5/16	1/2	1/2 x 1-1/2
85	III	---	2, 2½	3/8	3/8	5/8 x 1-1/2	5/16	5/16	1/2 x 1-1/2
---	I-II	100	4, 4½, 5	7/16	3/4	3/4 x 2-1/4	3/8	5/8	5/8 x 1-3/4
---	III	100	4, 4½, 5	1/2	3/4	3/4 x 2-1/4	7/16	5/8	5/8 x 1-3/4
---	III	100	2, 2½	1/2	5/8	5/8 x 2-1/4	7/16	5/8	5/8 x 1-3/4
125	I-II	---	1 <sup>b</sup>	3/8	5/8	---	5/16	1/2	---
125	I-II	---	4, 4½, 5	3/8	5/8	5/8 x 1-1/2	5/16	9/16	9/16 x 1-1/2
125	I-II	---	2, 2½	3/8	3/8	5/8 x 1-1/2	5/16	5/16	9/16 x 1-1/2
125	III	---	4, 4½, 5	7/16	5/8	5/8 x 1-3/4	3/8	9/16	9/16 x 1-1/2
125	III	---	2, 2½	7/16	7/16	5/8 x 1-3/4	3/8	3/8	9/16 x 1-1/2
225	I-II	---	4, 4½, 5	3/8	5/8	5/8 x 1-3/4	5/16	9/16	9/16 x 1-3/4
225	I-II	---	2, 2½	3/8	3/8	5/8 x 1-3/4	3/8	3/8	9/16 x 1-3/4
225	III	---	4, 4½, 5	1/2	11/16	11/16 x 1-3/4	7/16	5/8	5/8 x 1-3/4
225	III	---	2, 2½	1/2	1/2	3/4 x 1-3/4	7/16	7/16	9/16 x 1-3/4
---	I-II	250	4, 4½, 5	9/16	3/4	3/4 x 2-1/4	1/2	11/16	11/16 x 2-1/4
---	I-II	250	2, 2½	9/16	5/8	5/8 x 2-1/4	1/2	5/8	5/8 x 1-3/4
---	III	250	4, 4½, 5	5/8	25/32	25/32 x 2-5/8	1/2	3/4	3/4 x 2-1/4
---	III	250	2, 2½	5/8	3/4	3/4 x 2-1/4	1/2	5/8	5/8 x 2-1/4
325	I-II	---	4, 4½, 5	1/2	3/4	3/4 x 1-3/4	7/16	5/8	5/8 x 1-3/4
325	I-II	---	2, 2½	1/2	1/2	5/8 x 1-3/4	7/16	7/16	9/16 x 1-3/4
325	III	---	4, 4½, 5	5/8	3/4	3/4 x 1-3/4	1/2	11/16	11/16 x 1-3/4
325	III	---	2, 2½	5/8	5/8	3/4 x 1-3/4	1/2	1/2	5/8 x 1-3/4
---	I-II	400	4, 4½, 5	11/16	25/32	25/32 x 2-5/8	9/16	3/4	3/4 x 2-1/4
---	I-II	400	2, 2½	11/16	3/4	3/4 x 2-5/8	9/16	11/16	11/16 x 2-1/4
---	III	400	4, 4½, 5	3/4	1-1/16	1-1/16 x 3-1/4	5/8	13/16	13/16 x 2-3/4
---	III	400	2, 2½	3/4	3/4	1-1/16 x 3-1/4	5/8	3/4	3/4 x 2-5/4
425	I-II	---	4, 4½, 5	5/8	3/4	3/4 x 2-5/8	1/2	11/16	11/16 x 1-3/4
425	I-II	---	2, 2½, 3	5/8	5/8	5/8 x 2-5/8	1/2	1/2	5/8 x 1-3/4
425	III	---	4, 4½, 5	3/4	3/4	3/4 x 2-5/8	11/16	3/4	3/4 x 1-3/4
425	III	---	2, 2½, 3	3/4	3/4	3/4 x 2-5/8	11/16	11/16	11/16 x 1-3/4
600	I-II	---	2, 2½, 3	3/4	3/4	3/4 x 2-5/8	11/16	11/16	11/16 x 1-3/4
600	III	---	2, 2½, 3	3/4	3/4	1-1/16 x 3-1/4	11/16	11/16	13/16 x 2-1/4
---	I-II	600	2, 2½, 3	25/32	25/32	25/32 x 2-5/8	5/8	3/4	3/4 x 2-1/4
---	III	600	2, 2½, 3	25/32	25/32	1-1/16 x 3-1/4	11/16	13/16	13/16 x 2-3/4
800	I-II	800	2, 2½, 3	13/16	1-1/16	1-1/16 x 3-1/4	3/4	13/16	13/16 x 2-3/4
1000	III	1000	2, 2½, 3	1-1/16	1-5/16	1-5/16 x 4-1/8	7/8	1-1/16	1-1/16 x 3-5/8

NOTES: <sup>a</sup>When the inside depth of a box is 5" or less, end cleats shall not be used. However, each side and each end shall be a one piece part, except when the end is approximately square, it shall be composed of two thicknesses with grain running at right angles to each other, with both pieces being of approximately equal thickness. Thickness of the end shall be not less than the combined thickness of the end and cleat as specified for style 4 boxes.

<sup>b</sup>Style 1 boxes shall be limited to 12" in height and the total dimensions (length, width and height added together) shall not exceed 50". Style 1 boxes may be used to carry a net weight exceeding 85 pounds and net exceeding 125 pounds if the boxes have single solid or built-up ends and sides.

less than 7/8 of the required thickness and the average thickness shall be not less than the specified thickness. If pieces 3/8" or more in thickness are surfaced on both sides to protect the contents, the thickness may be 1/32" less than the thickness as determined from Table III or Table IV.

4.2 The sides, top, bottom, or ends of a box may be composed of one or more pieces as defined in Paragraphs 2.1 and 2.2 except that for Style 6 boxes, all sides and ends shall be composed of one single solid piece or one built-up piece which is either Lindermanized or tongued and grooved and fastened with corrugated fasteners.

4.2.1 The individual pieces making up a side, top, bottom or end may be either single solid pieces or built-up pieces as defined in Paragraph 2.2. In either case, the width of each piece shall be not less than 2 1/2", measured across the face.

4.2.1.1 Two or more pieces that are Linderman-jointed and glued shall be considered a built-up piece.

4.2.1.2 Two or more pieces butt jointed and glued, or tongued and grooved and glued, provided the

joined surfaces are jointed so as to insure full contact and held under pressure until glue is set and provided the joint does not fail when, after 24 hours immersion in water at 70 deg.F., the part is broken parallel to the joint, shall be considered a built-up piece.

4.2.1.3 Two or more pieces 3/8" or more in thickness, and not less than 1-1/2" in width at either end, which are butt jointed or tongued and grooved and which are fastened with two or more corrugated fasteners in accordance with paragraph 4.2.1.3.1 shall be considered a built-up piece.

4.2.1.3.1 When corrugated fasteners are required, at least two fasteners shall be used in each joint. In jointing sides, tops and bottoms, corrugated fasteners shall be placed within 6" of each end of the piece with spacing between corrugated fasteners to be in accordance with Table V. On the ends of Style 1 boxes, corrugated fasteners shall be driven not more than 3" from each end. If three or more corrugated fasteners are required in a joint, they shall be driven alternately from opposite sides of the piece, unless the joint is tongued and grooved and glued, in which case fasteners may be driven from one side. Corrugated fasteners shall be overdriven not less than 1/32" and not more than 1/16". See Table VI for sizes.

TABLE IV

Determination of minimum thickness of sides, tops, bottoms and ends for Style 6 (lock corner) boxes for domestic or export shipments.

Maximum Weight of Contents (In pounds)	MINIMUM THICKNESS OF PARTS					
	DOMESTIC USE			EXPORT USE		
	Sides	Ends	Top & Bottom	Sides	Ends	Top & Bottom
10	1/4"	3/8"	1/4"	3/8"	3/8"	1/4"
20	1/4"	3/8"	1/4"	3/8"	3/8"	5/16"
40	5/16"	7/16"	5/16"	7/16"	7/16"	5/16"
70	7/16"	7/16"	5/16"	1/2"	1/2"	3/8"
100	1/2"	1/2"	3/8"	9/16"	9/16"	7/16"
150	9/16"	9/16"	7/16"	5/8"	5/8"	5/8"

Note: For EXPORT shipments, the following additional requirements shall apply:

- Only waterproof or moisture-resistant glues shall be used.
- All corners shall be pinned before tops and bottoms are attached.
- Top and bottom shall be nailed to sides only when the thickness of the sides is 5/8" or greater.
- All boxes shall be strapped in accordance with standard commercial practice.

TABLE V

MAXIMUM SPACING BETWEEN CORRUGATED FASTENERS FOR SIDES, TOPS, BOTTOMS AND ENDS

Type of Joint	Domestic Use	Export Use
Tongued and Grooved	9"	8"
Butt joint	8"	6"

TABLE VI

SIZE OF CORRUGATED FASTENERS FOR BUILT-UP PIECES

Thickness of box parts inches.	Size of Corrugated Fasteners inches
11/32 to 27/64, incl.	1/4 x 1
7/16 to 31/64, incl.	5/16 x 1
1/2 to 39/64, incl.	3/8 x 1
5/8 to 51/64, incl.	1/2 x 1
13/16 to 55/64, incl.	5/8 x 1
7/8 and up	3/4 x 1

**4.2.1.4** For domestic use only, two or more pieces 3/8" or more in thickness which are tongued and grooved and glued shall be considered a built-up piece.

**4.3** Cleats less than 2-5/8" in width shall be single solid pieces. Cleats 2-5/8" and more in width may be Linderman-jointed and glued.

**4.4** Details of construction of ends.

**4.4.1 Style 1** - End shall be one single solid or built-up piece without cleats, grain to run long way.

**4.4.2 Styles 2 and 2½.** The ends of the cleats which are positioned across the grain of the end shall be from 1/8" to 1/16" from the inside surface of the sides or the top and bottom. Standard construction of these styles shall be with the grain of the end running horizontally and with the long end cleats running vertically. However, in the case of a box in which the width is much greater than the depth, this may be reversed, with the end grain running vertically and the long end cleats running horizontally (to be designated as Style 2 Reversed and Style 2½ Reversed). In either case, the sides, top and bottom shall extend over the cleats.

**4.4.3 Style 3.** The ends of the cleats shall be mitered. Cleats shall be flush with the edges of the end panel. The sides, top and bottom shall extend over the cleats.

**4.4.4 Style 4.** The cleats shall be positioned across the grain of the end boards. The grain of the ends shall run horizontally and the cleats, running vertically, shall extend within 1/8" of the outside surface of the top and bottom. Only the sides shall extend over the cleats.

**4.4.5 Style 4½.** The cleats shall be positioned across the grain of the end boards. The grain of the ends shall run vertically and the cleats, running horizontally, shall extend within 1/8" of the outside surface of the sides. Only the top and bottom shall extend over the cleats.

**4.4.6 Style 5.** The cleats may have either a triangular or rectangular cross-section. Triangular cleats shall have not less than the same cross-sectional area required for corresponding rectangular cleats. The cleats shall be positioned across the grain of the end boards and shall extend within 1/8" of the inside surface of the top and bottom. The sides shall extend over the ends and be flush with the outside face of the ends.

**4.4.7 Style 6.** The end must be a single solid piece, or must be either Lindermanized or tongued and grooved and fastened with corrugated fasteners.

#### 4.5 Nailing

**4.5.1** The size of nails for fastening sides, top and bottom to ends and cleats, as determined by the species of wood and the thickness of the parts fastened together, shall conform to the requirements shown in Table VII.

**4.5.1.1** If the desired nail is not available, one size smaller shall be used and the nails spaced 1/4" closer than is required for the size of nail for which the substitution is made.

**TABLE VII**  
**NAIL SIZES FOR ATTACHING SIDES, TOPS,**  
**AND BOTTOMS TO ENDS AND CLEATS**

<i>Thickness of End or Cleat (Whichever Thicker)</i>		<i>Size of Nail Required</i>	
		<i>GROUP I &amp; II WOODS</i>	<i>GROUP III &amp; IV WOODS</i>
<i>OVER</i>	<i>TO</i>		
0	1/2"	4d	3d
1/2"	5/8"	5d	4d
5/8"	11/16"	6d	5d
11/16"	13/16"	7d	5d
13/16"	7/8"	7d	6d
7/8"	1"	8d	7d
1"	1-1/4"	9d	8d
1-1/4"	and over	12d	9d

**TABLE VIII**  
**NAIL SPACING FOR ASSEMBLING BOXES**

<i>Size of Nails</i>	<i>Spacing when driven into side grain (Inches)</i>	<i>Spacing when driven into end grain (Inches)</i>
	Sixpenny or smaller	2
Sevenpenny	2-1/4	2
Eightpenny	2-1/2	2-1/4
Ninepenny	2-3/4	2-1/2
Tenpenny	3	2-3/4
Twelvepenny	3-1/2	3
Sixteenpenny	4	3-1/2
Twentypenny	4-1/2	4

4.5.2 The size of nails for fastening cleats to ends or battens to sides, top, bottom or ends, shall be such that the nail shall pass through both parts and be clinched not less than 1/8 inch nor, when 2 penny nails or smaller are used, more than 3/8 inch.

4.5.3 In attaching cleats or battens to ends, sides, top or bottom, nails shall be driven in two parallel rows spaced alternately as in Table VIII so that the end nails shall be not less than 3/4 inch from the end of the cleat or batten, except that when a cleat or batten is placed at right angles to the direction of the grain of any box part, each piece of that part shall be attached to that cleat or batten with at least two nails. Nails shall be driven approximately 3/8 inch from the edge when the cleat or batten is 2 inches or less in width and 1/2 inch from the edge when the cleat or batten is more than 2 inches in width.

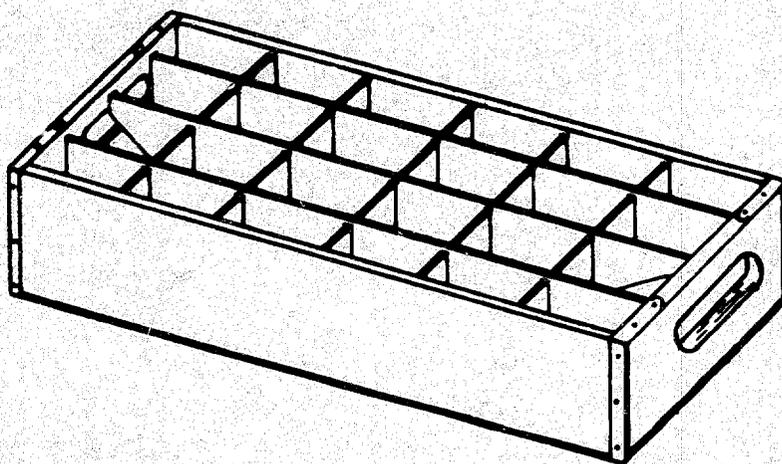
4.5.4 The average spacing of nails holding the sides, top or bottom to the ends shall be no greater than the values given in Table VIII. The distance between any two adjacent nails shall not exceed one and one-half times the spacing given in Table VIII. However, each piece in a side, top or bottom shall have at least two nails at each nailing end.

4.5.5 Each piece in a side, top or bottom shall have at least two nails at each nailing end. When a side, top or bottom extends over the end and cleat, approximately half of these nails shall be driven into the ends and the remainder into the cleats.

4.5.6 Nails shall be driven so as not to project above the surface of the wood. Occasional over-driving of nails will be permitted. No nail shall be over-driven more than one-eighth the thickness of the piece, except that nails driven through parts 1/2" or less in thickness may be over-driven a maximum of 1/16".

The following information is in addition to that furnished by the National Box and Shook Association.

### BOTTLE BOX STYLE 7



Inside Dimensions - 16 7/8 inches by 11 1/8 inches by 3 7/8 inches

	Size in inches		
	Length	Width	Thickness
2 end pieces	11 1/8	3 7/8	13/16
2 side pieces	18 1/2	3 3/4	3/8
3 bottom pieces	18 1/2	3 1/2	3/8
3 partition pieces	17 3/8	2	5/16
5 partition pieces	11 5/8	3 3/8	5/16

## MANUFACTURING OPERATIONS

Lumber is unloaded from railroad cars or trucks and stacked in the lumber yard for air drying.

Lumber is air dried to not less than 8 percent, or more than 18 percent, of moisture content by weight. The exact degree of dryness will depend upon the customers' requirements and specifications.

The lumber is delivered from railroad cars or trucks to the lumber yard, and from the lumber yard to the plant, with a fork lift truck.

The boards are sorted and stacked by widths in the lumber yard. The width of boards that can be processed with the least amount of waste, based on the widths of the pieces contained in the box or shook, are delivered to the plant as requested.

### BOXES AND SHOOKS

The first operation in the plant is resawing to required thickness, on a band resaw machine. However, lumber that does not require resawing, goes directly to the double head planer.

The second operation on resawed lumber, or the first operation on lumber that is not resawed, is surfacing, either one or two sides, as specified, on a double head planer. If the specifications call for surfacing one side only, the bottom head on the planer is lowered accordingly.

The next operation is done on a combination cutoff and gang rip machine. The cutoff saw is equipped with a foot pedal control, for either intermittent or automatic operation and an automatic feed which passes the pieces that are cut off, through the gang rip saw and out onto an off-feed table. This is a continuous automatic operation, except when the operator stops the feed at the cutoff saw to cut out and eliminate a defective piece in the board.

If the ends contain more than one piece, they are always assembled and fastened together, with either nails or corrugated fasteners, depending upon the design of the box or shook. If nails are used, the operation is done on the nailing machine with the clincher.

If a part of the box containing more than one piece is to be printed, the pieces are assembled and fastened together with corrugated fasteners on the corrugated fastener machine.

All pieces of a box or shook that require printing are machined first so that they can be printed while the other parts, or pieces, are being machined.

The pieces that are to be printed are passed through the printing machine and printed, as specified in the purchase order.

At this point, all operations, except packaging and shipping, are completed, if the product is to be shipped as a shook.

The packaging of shoeks is done at a bench where forms are used to keep the parts lined up while they are being fastened in bundles. Each part, such as the ends, sides, tops and bottoms, are bundled separately. The bundles may be fastened with wire, metal strapping or twine, whichever is most appropriate, or costs the least.

When the product is to be shipped as completed boxes, the bundling operations are eliminated and the following additional operations are performed:

The box ends are nailed to the end cleats on a nailing machine that has a clinching attachment.

The sides are nailed to the ends in a nailing machine.

The bottom is nailed to the sides and ends in a nailing machine and the top, in most cases, is lightly nailed in place, or sometimes left loose.

The superintendent and machine setters, who also act as foremen, inspect the work in process and the completed boxes and shoeks frequently.

#### **BOTTLE BOXES FOR BEVERAGES**

Bottle boxes are produced in 4 general types, as follows:

- A. High boxes that are slightly higher than the bottle.
- B. Sanitary high boxes that have an open space of about 1 1/2 inches on both sides at the bottom, so that the boxes may be easily washed and kept sanitary.
- C. A low box just high enough to keep the bottles from falling out and partitioned to hold 4 packages of 6 bottles each.
- D. A low box, just high enough to keep the bottles from falling out and partitioned to hold 24 bottles in separate partitions.

All bottle boxes have a hand hold out in each end.

The following manufacturing operations are based on the low box, specified above as "D". Specifications and a picture of this box are shown on Page 10.

#### BOTTLE BOX OPERATIONS

The first operation in the plant is resawing to required thickness, on a band resaw machine. However, lumber that does not require resawing, goes directly to the double head planer.

The second operation on resawed lumber, or the first operation on lumber that is not resawed, is surfacing, either one or two sides, as specified, on a double head planer. If the specifications call for surfacing one side only, the bottom head on the planer is lowered accordingly.

Since the sides on this type of bottle box are always printed, they are always machined first, to allow extra time for printing them, so that they will reach the nailers at the same time as the other parts.

All pieces of the box are passed through a combination cutoff and gang rip machine, as explained in the box and shock operations.

#### SIDES

The sides are passed through a hopper feed automatic machine, which trims both ends and cuts a recess in both ends for the metal strapping, machines the grooves for the partitions and machines flutes, if required.

The sides are then passed through a box board notcher to round, or otherwise finish, the edges.

The sides are then sent to the printing machine and printed, as specified.

After printing, the sides are sent to the nailing machines.

#### BOTTOMS

The bottoms are passed through a hopper feed automatic machine, which trims both ends and cuts a recess in both ends for the metal strapping.

The bottoms are then sent to the nailing machines.

## ENDS

The ends are not resawed, since they finish 12/16 inches thick and are made from one inch lumber.

The first operation is surfacing two sides on the double head planer.

The next operation is done on a combination cutoff and gang rip machine, as shown on previous cutoff and rip operations.

The ends are then hopper fed through an automatic machine that trims the ends to length; dados for partitions and cuts the hand holes.

The ends are then sent to the nailing machines.

## PARTITIONS

The partitions are passed through the resaw, planer, cutoff and gang rip saw, as shown on other thin box parts.

If grooving and fluting of the partitions is specified, they are passed through the grooving machine for this operation.

The partitions are then hopper fed into the automatic notcher, which notches the edges for meshing.

The long center partition is then trimmed on a bevel at both ends for hand hole clearance.

The partitions are then sent to the nailing machines.

The boxes are then assembled for nailing and nailed on the nailing machines.

The final operations are strapping and nailing the strap in place.

The first nailing machine stretches the metal strapping on both ends of the box. The operators on this machine drive one nail at each end of the straps.

The boxes are then passed on to another nailing machine, which nails the strapping securely in place.

In some styles of boxes, such as high bottle boxes, the ends are fastened together with corrugated fasteners to facilitate the printing and the nailing operations which follow. The corrugated fasteners for this operation come in rolls and are automatically cut off and driven by the corrugated fastener driver.

## PRODUCTION CAPACITY

Based on large orders of various styles of boxes that would make it possible to operate all the machines simultaneously, thus greatly reducing the number of machine setups, a production of 3,000 boxes per each 8 hour working day could be attained.

However, the orders may not be large, thus resulting in frequent machine setups. Moreover, it is not likely that the orders will be so diversified as to permit the use of all the equipment simultaneously.

Therefore, in order to provide for the probability that the orders will not be large and that all the equipment will not be used to capacity, all manufacturing operations and cost estimates herein are based on a production of 1,500 boxes per day, of the following 3 box styles:

<u>BOX OR SHOOK STYLE</u>		<u>AMOUNT PER DAY</u>
4 1/2	Shook	500
4 1/2	Box	500
7	Bottle Box	<u>500</u>
TOTAL PRODUCTION PER DAY		1,500

Production could be increased by working more hours per shift, or by working extra shifts per day, as shown below:

<u>SHIFTS PER DAY</u>	<u>HOURS PER SHIFT</u>	<u>UNITS PER DAY</u>
1	8	1,500
1	10	1,875
2	8	3,000
2	10	3,750
3	8	4,500

Some additional working capital would be required if production is substantially increased. No additional equipment or increase in capital investment is required for a production of 4,500 per day, if the plant is operated in accordance with the above hours per shift and shifts per day.

## PLANT SITE

A site of level, well drained land of about 5 acres will be desirable, to provide ample space for a lumber yard. The site should be as advantageously located as practicable with respect to transportation facilities, power, water, fuel, sources of lumber, labor and markets. The cost of the site is estimated at \$2,000.

## BUILDING

One building 150 feet by 80 feet, or 12,000 square feet, will provide enough space for an office, storage, production, shipping, and some expansion. The building may be constructed of any substantial materials. It should be a one story building, well lighted, heated and ventilated. The estimated cost of this building, including the steam boiler for heating is \$50,000.

## POWER

The connected load of all motors used will not exceed 172 horsepower. Since all these motors will not be operated to full capacity at the same time, the peak demand will probably be 140 horsepower. The estimated annual cost of electricity is \$1,400.

## FUEL

The waste and sawdust resulting from the manufacturing operations will provide all the fuel required to operate the boiler, which is used only for heating the building. Therefore, no fuel will be purchased.

## WATER

The only water required will be for the boiler, sanitary facilities, drinking purposes and fire protection. The estimated annual cost of water is \$100.

## TRUCK

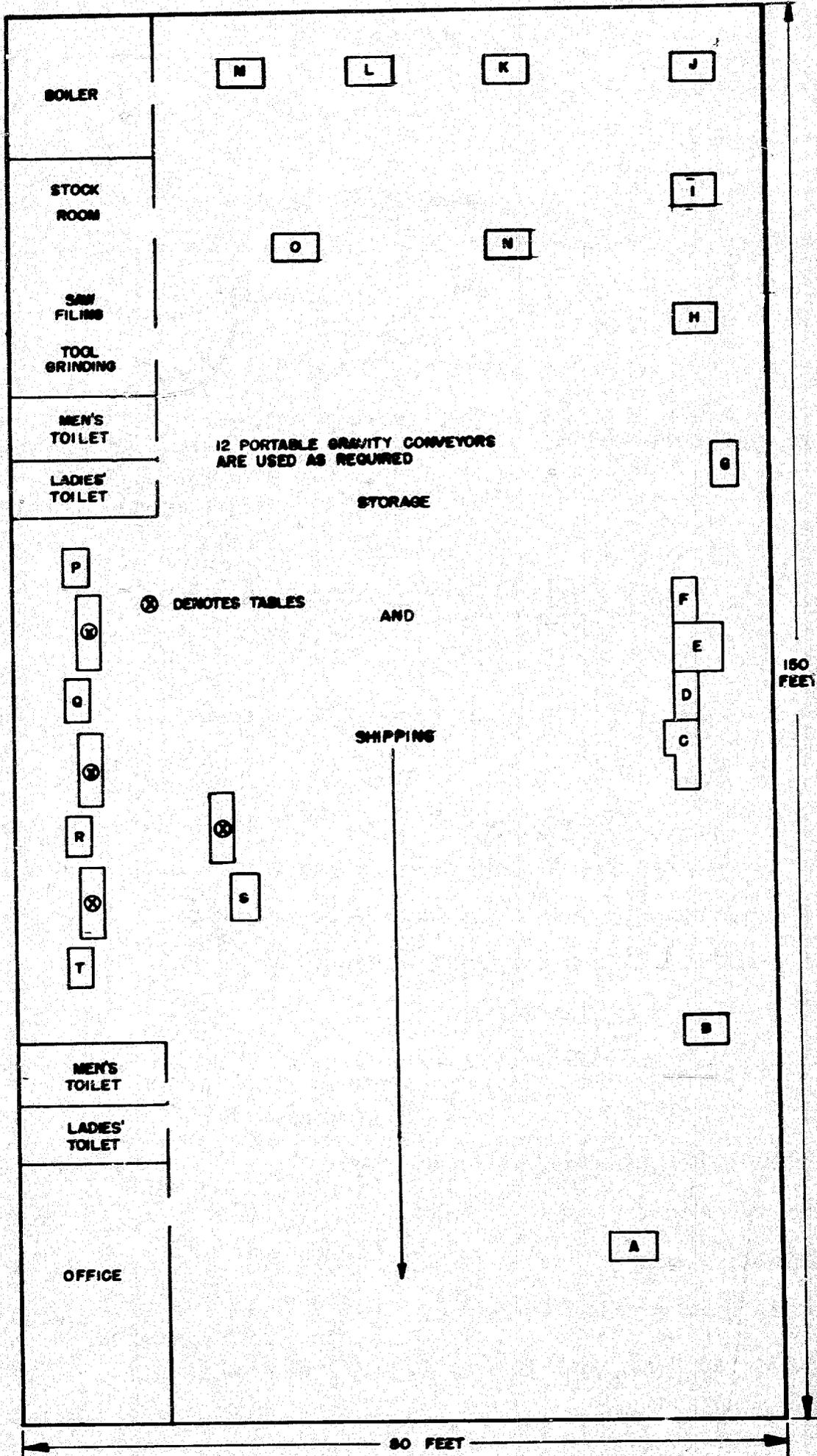
A one ton cab truck with a stake body for local deliveries and for pick-up purposes will be required. Long distance deliveries should be made by railroad and by established trucking companies.

The cost of the truck is included in the list of machinery and equipment. The maintenance and operating cost is included in supplies.

MACHINERY JD EQUIPMENT REQUIREMENTS

	<u>Price</u>
A. 54-inch Resaw (single band)	\$ 9,000
B. Double Surface Planer	13,650
C. Automatic Cutoff Saw	2,300
D. 72-inch Transfer Hopper Feed	2,400
E. 12-inch Gang Rip Saw, with Center roll and 3 saw sleeves	5,850
F. Saw Outfeed and Sorting Table driven from Rip Saw Note: Items C, D, E and F comprise one unit.	1,055
G. 2-Head Corrugated Fastener Driver, Foot Controlled	2,500
H. Hand Hole Machine with Equalizer, Jump Dado and Sanitary Attachments	9,500
I. Groover with Fluting Attachment	7,870
J. Notcher	2,660
K. Matcher with Glue Spreader for Tongue and Groove Joints, or other Finished Edges	4,465
L. 32-inch by 48-inch Squeezer	4,280
M. 2-Color Chain Feed Printer	8,500
N. 10-Track Open Back Cleater with Clincher, Foot Controlled	5,500
O. 8-Track Closed Back Cleater with Clincher, Foot Controlled	4,200
P. 6-Track Closed Back Nailer, Foot Controlled	3,800
Q. 8-Track Closed Back Nailer, Foot Controlled	4,000
R. 10-Track Closed Back Nailer, Foot Controlled	4,200
S. Bottle Box Strapping Machine, Foot Controlled	3,000
T. 10-Track Closed Back Intermittant Nailer	4,500
U. 50 Factory Trucks	2,000
V. 10-Ten Foot Portable Gravity Conveyors	770
W. Fork Lift Truck	6,000
X. Delivery Truck - 1 ton	2,400
Y. Office Furniture and Fixtures	<u>1,500</u>
<b>TOTAL ESTIMATED COST OF MACHINERY AND EQUIPMENT</b>	<b>\$115,900</b>

PLANT LAYOUT



## FLOW SHEET

All lumber goes either to machine A, or machine B.

If a board does not have to be resawed, it goes directly to the planer. For example, the end pieces of a bottle box finish  $13/16$  inches thick. On this piece, one inch lumber is used and no resawing is required.

Resawing is done where the specified dimension of the finish piece will permit making 2 or more boards from one board, thus saving material.

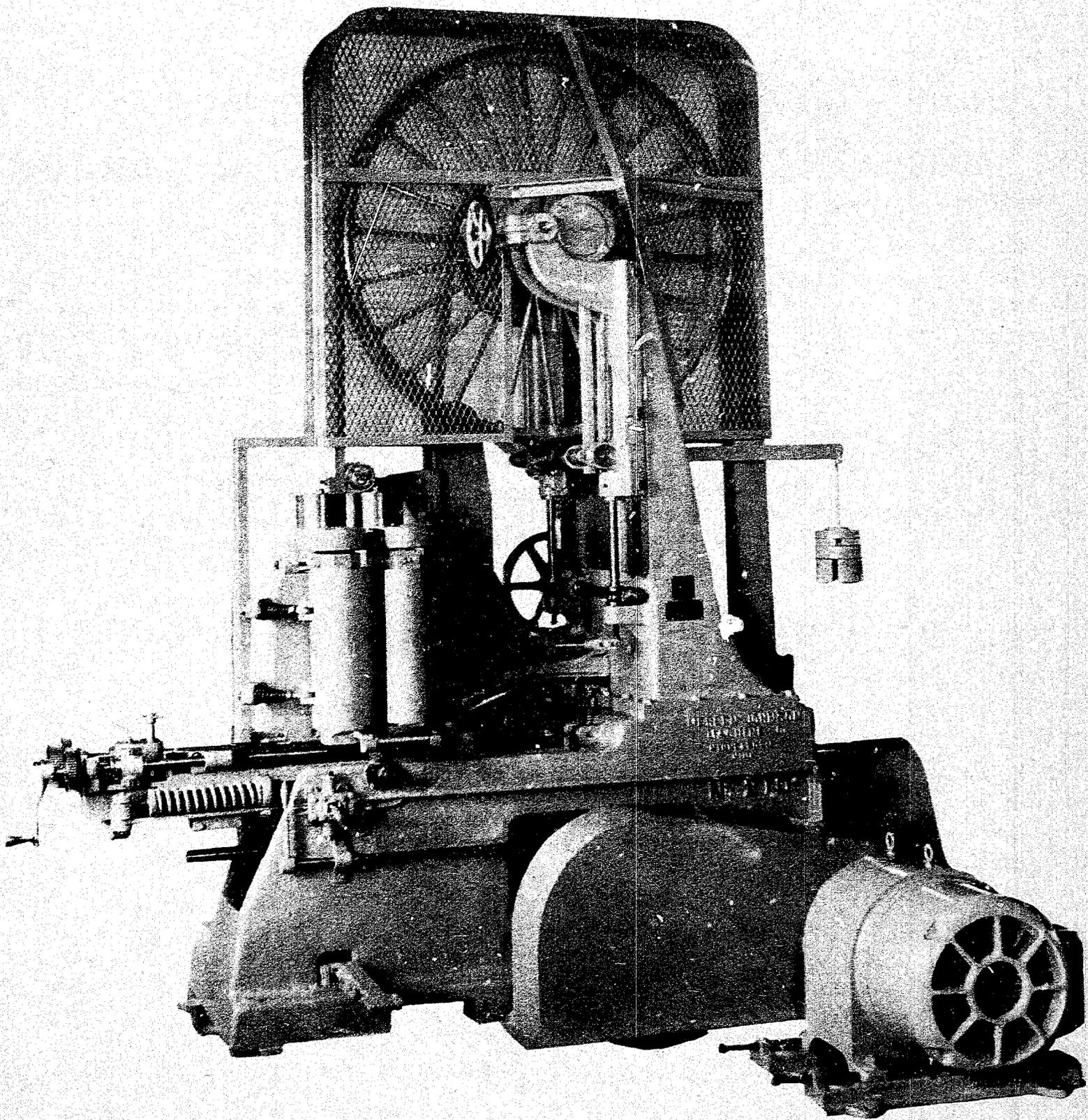
C, D, E and F are units that have been grouped into an automatic cutoff and rip unit. Every wooden part that goes into a box or shock, passes through this unit after it leaves the resaw, the planer, or both.

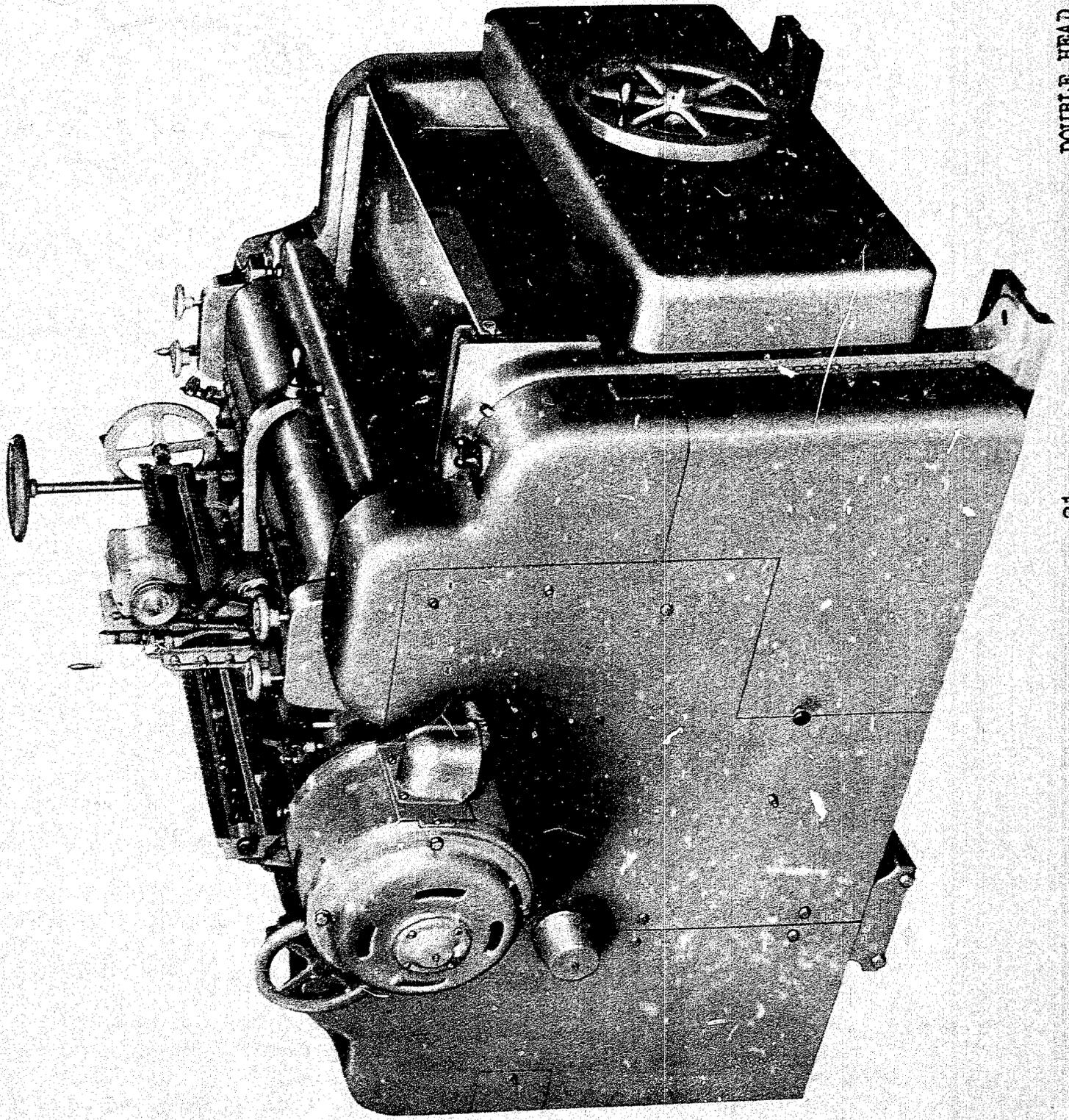
After the cutoff and rip operation, the pieces may take just one or several operations on the following machines: G, H, I, J, K and L. The number and kinds of operations will depend upon the specifications of the box being machined. Regardless of the number and kind of operations, the machinery is located so that there will not be any backtracking.

Not all pieces of a box or shock are printed. The pieces that are printed stop at machine M for this operation.

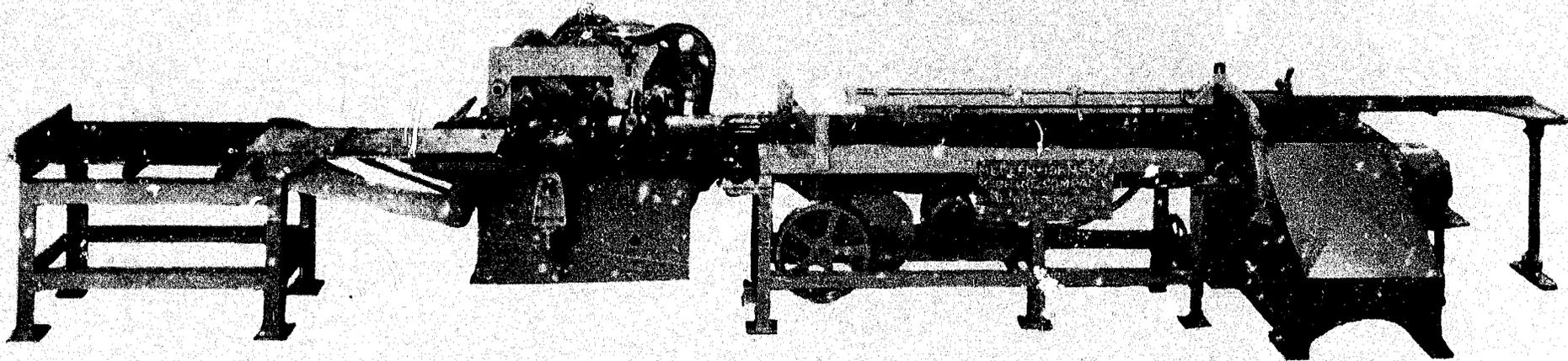
Machines N to T, inclusive, are nailing machines. Here again, while the exact sequence of operations will depend on the design and specifications of the box or shock, there will be no backtracking.

Bundling of shocks will be done by nailing machine operators.



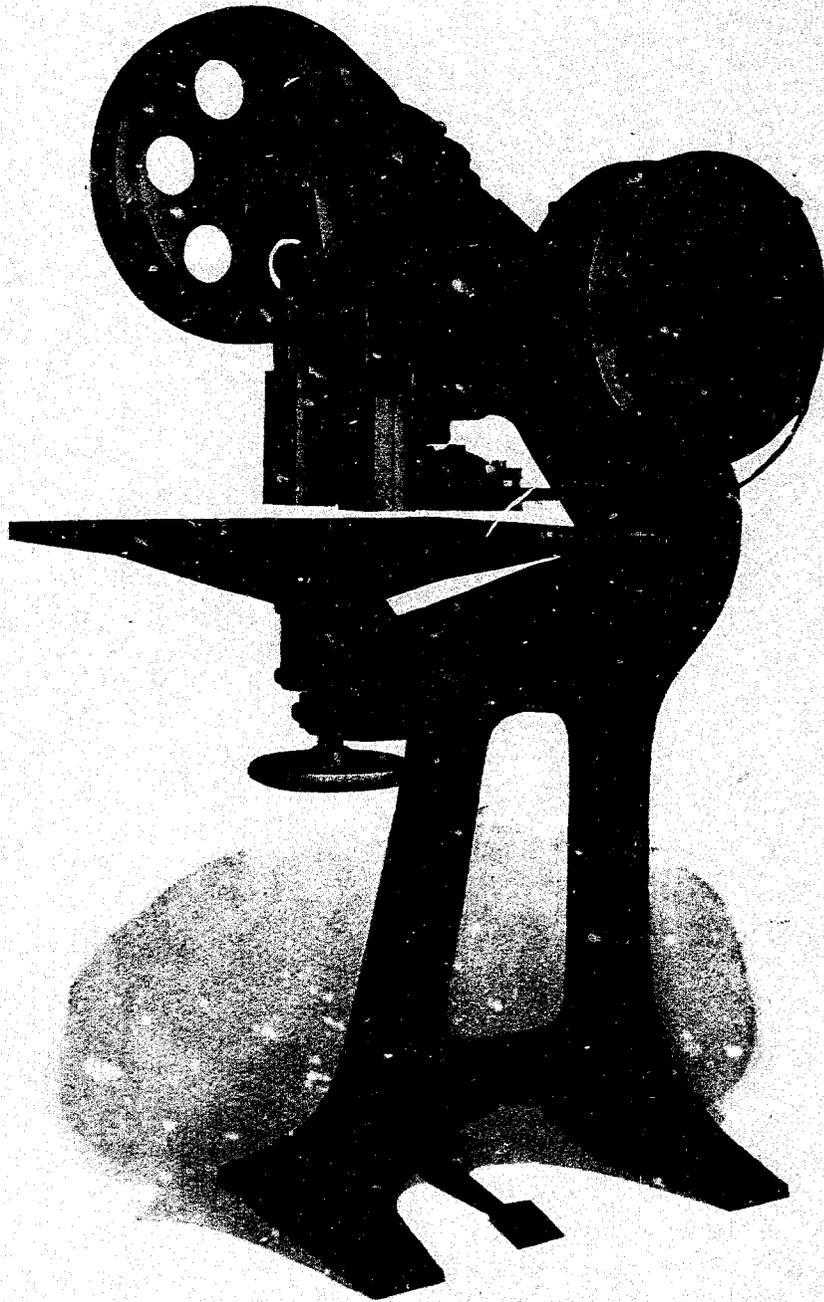


DOUBLE HEAD PLANER

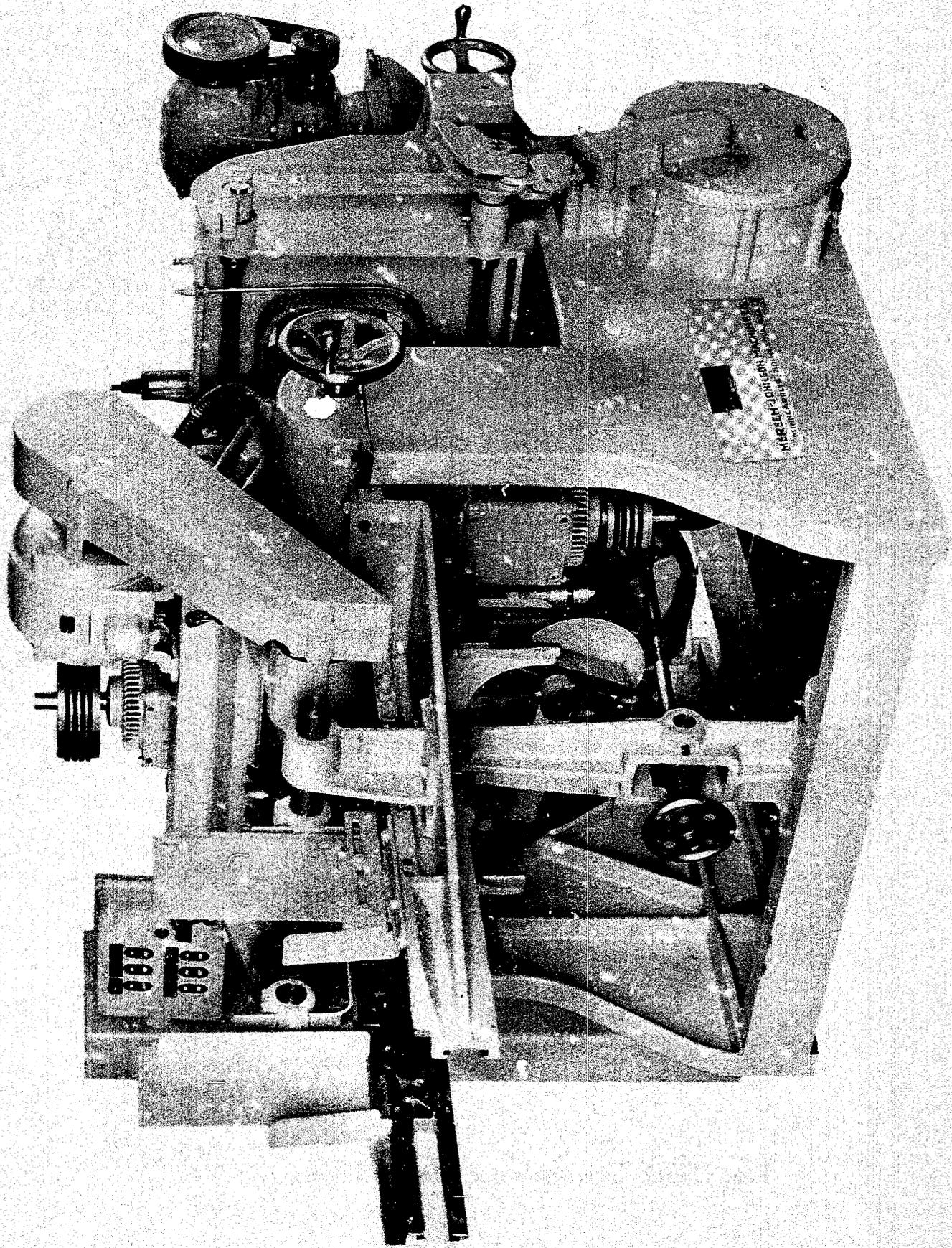


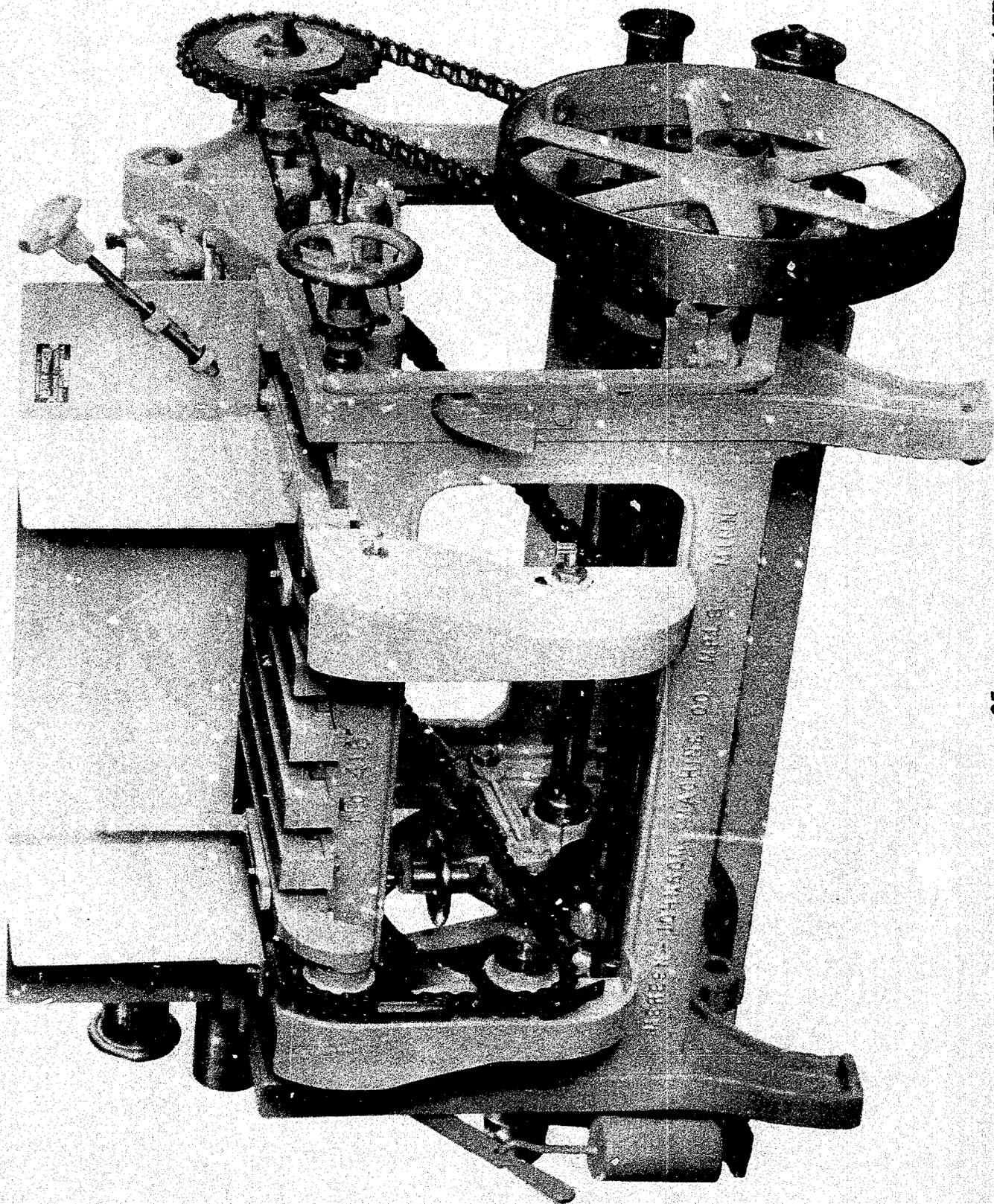
#### CUT-OFF AND RIP UNIT

Overall view of complete Unit consisting of an Automatic Cut-Off Saw, Intermediate Chain Feed Transfer Hopper, Gang Rip Saw and Outfeed Conveyor with Sorting Table.

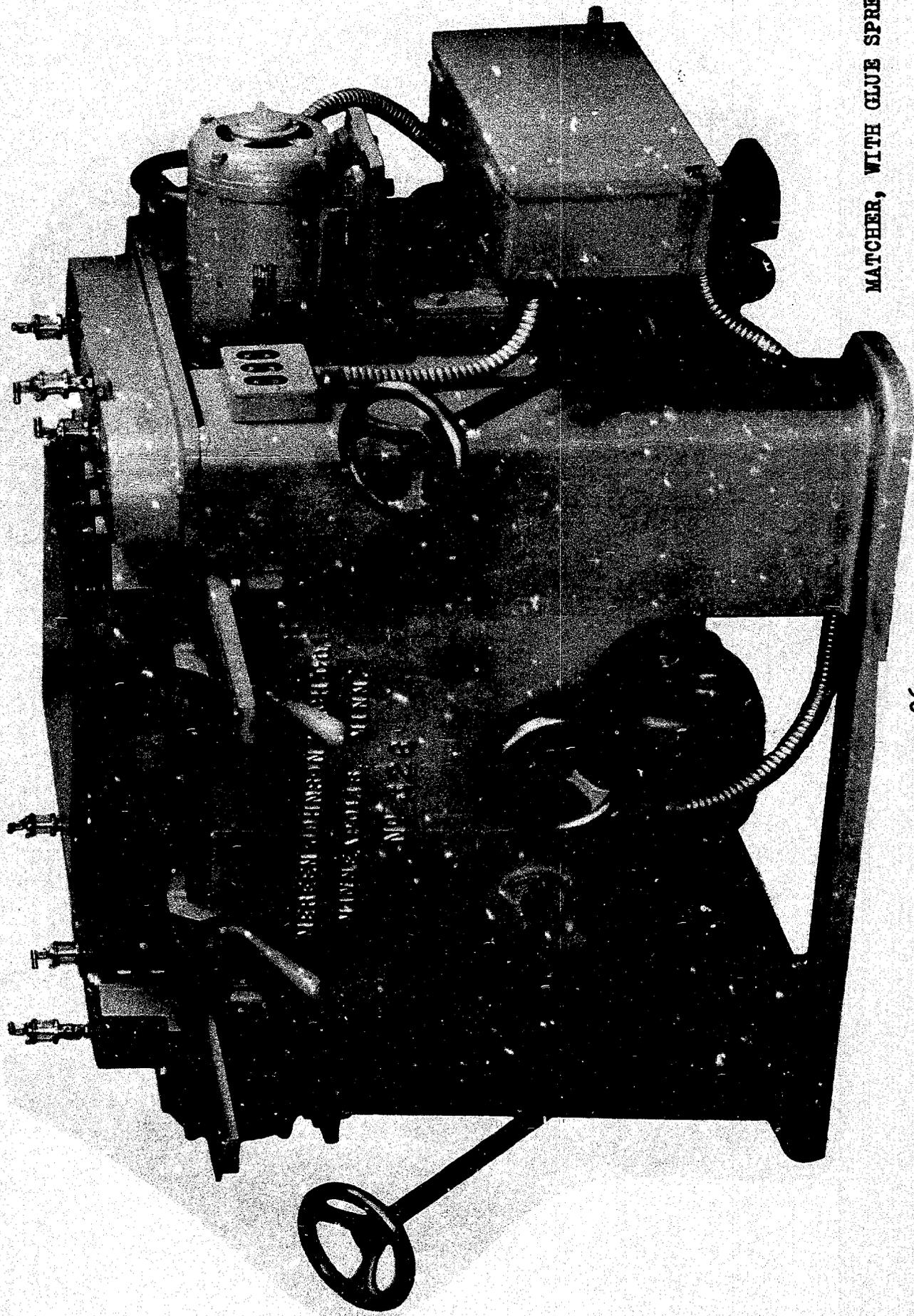


**Two Chuck Corrugated Fastener Driving Machine**

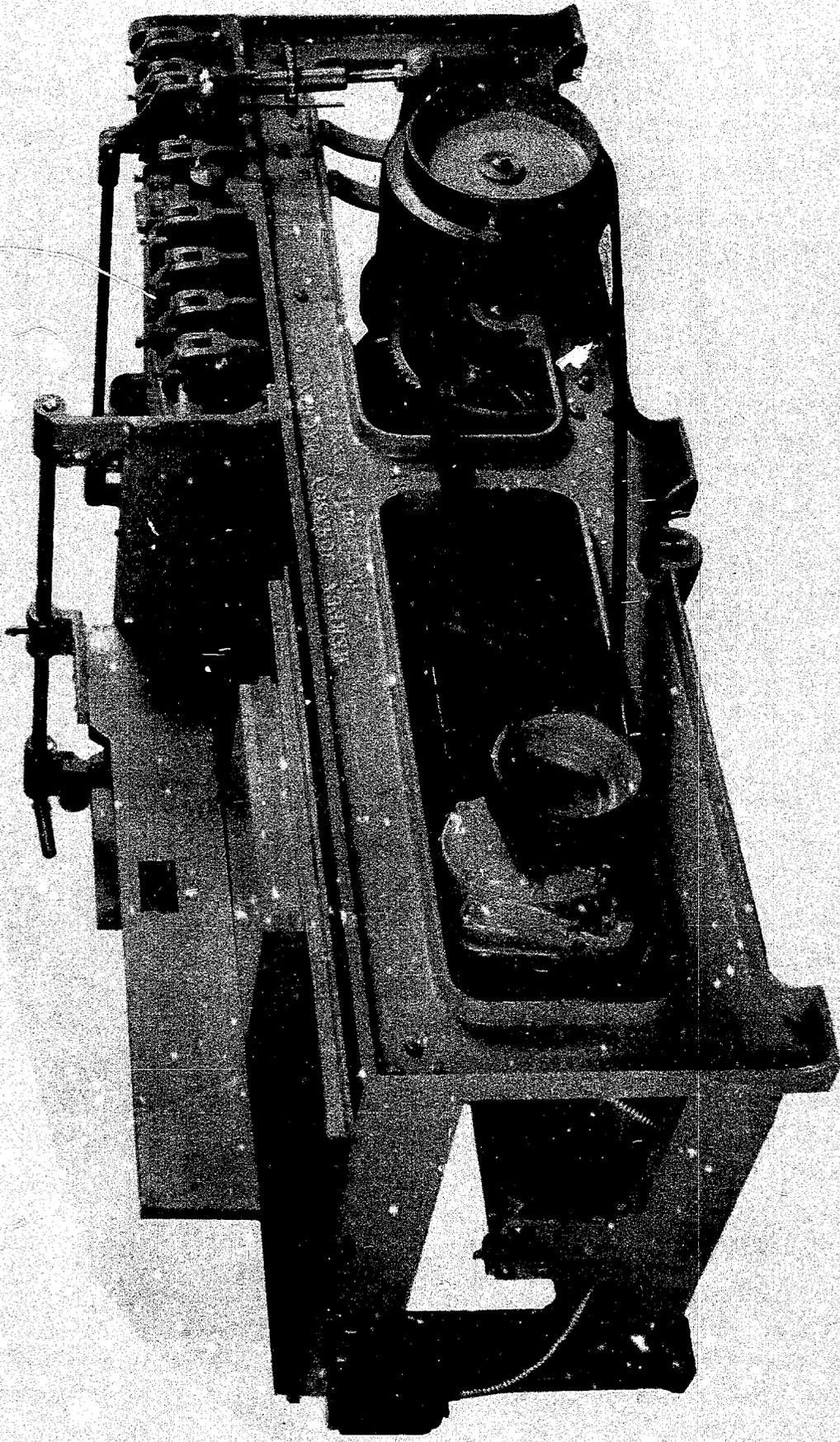




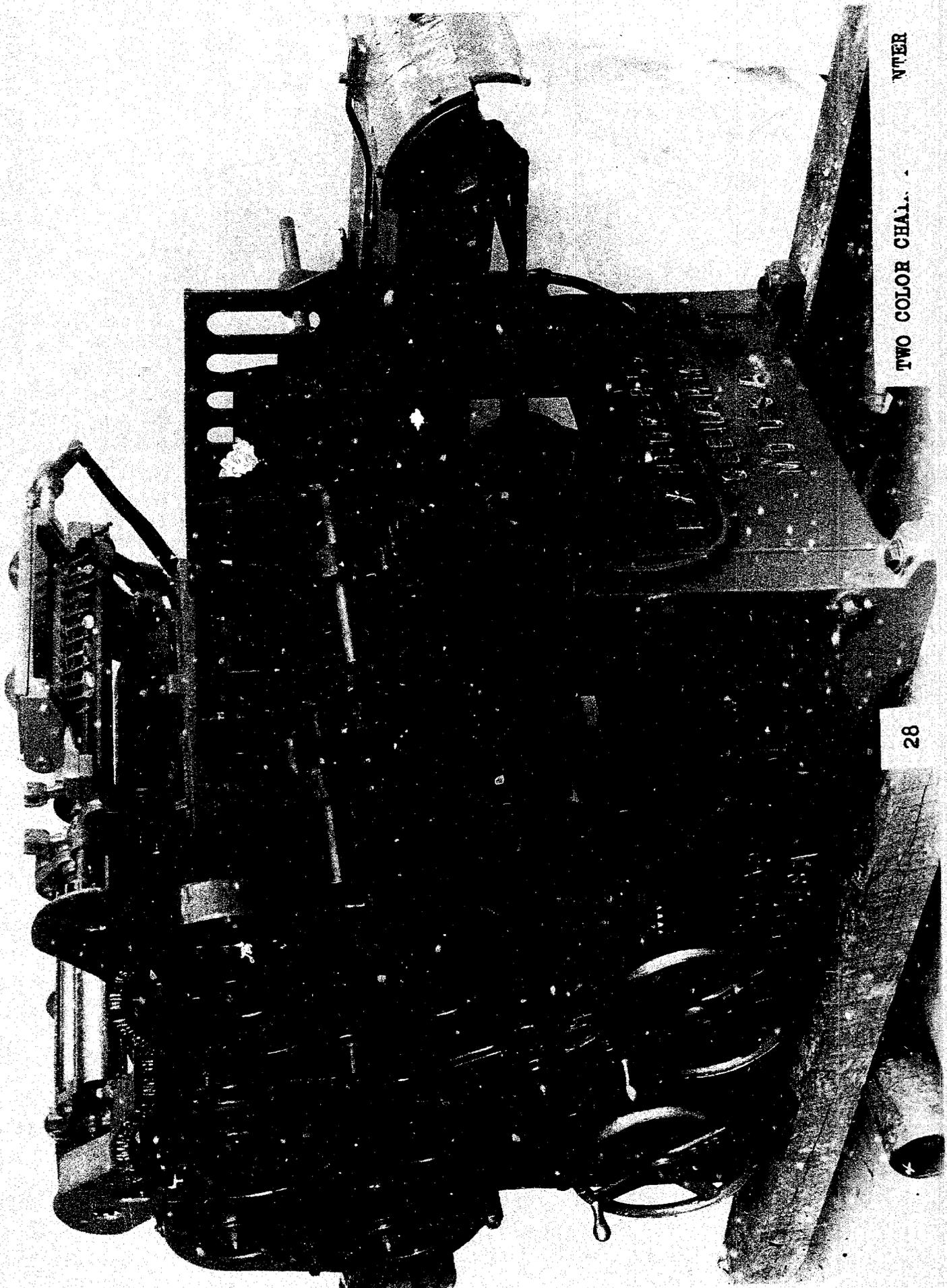
GROOVER WITH FLUTING ATTACHMENT



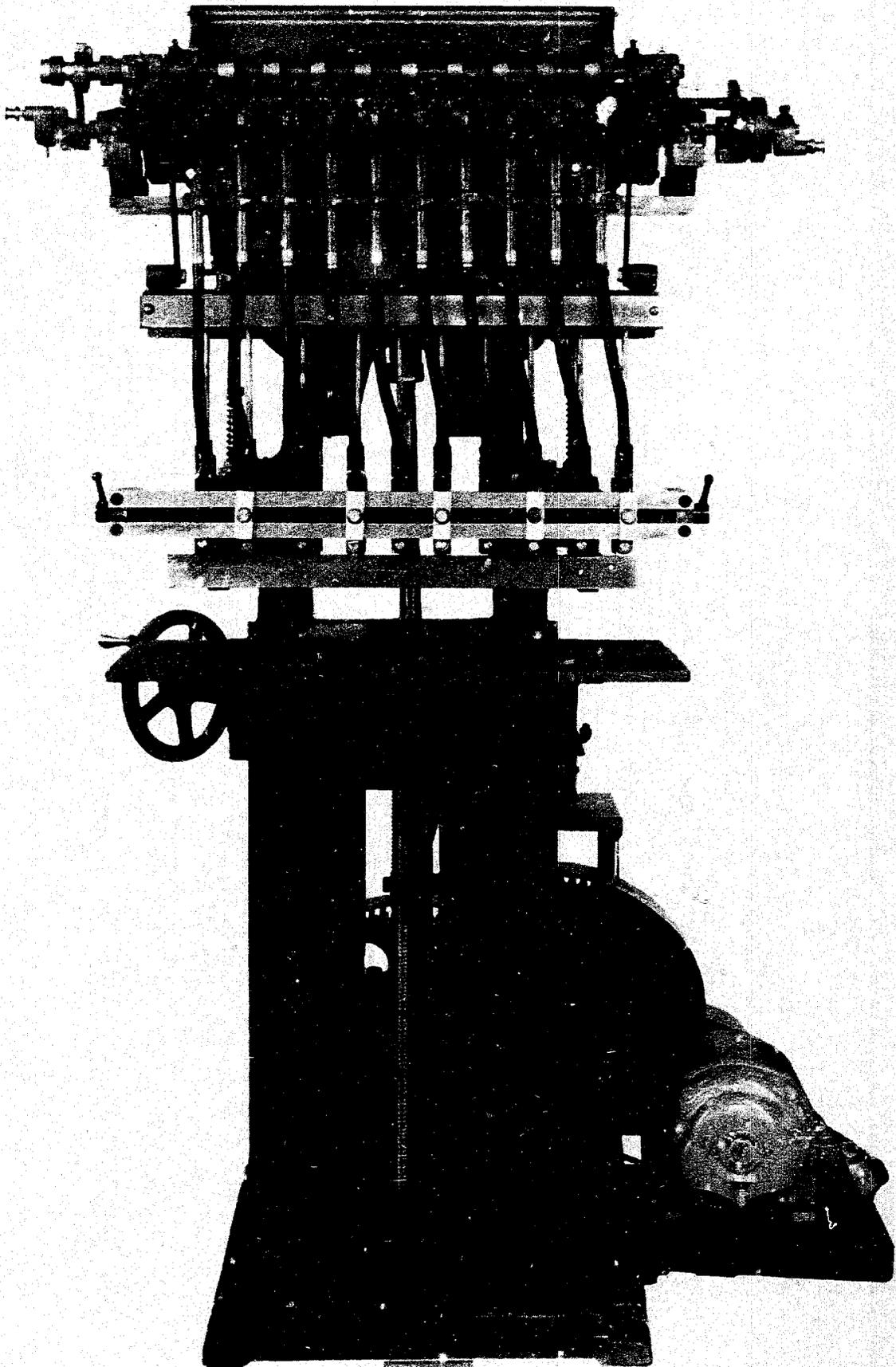
MATCHER, WITH GLUE SPREADER

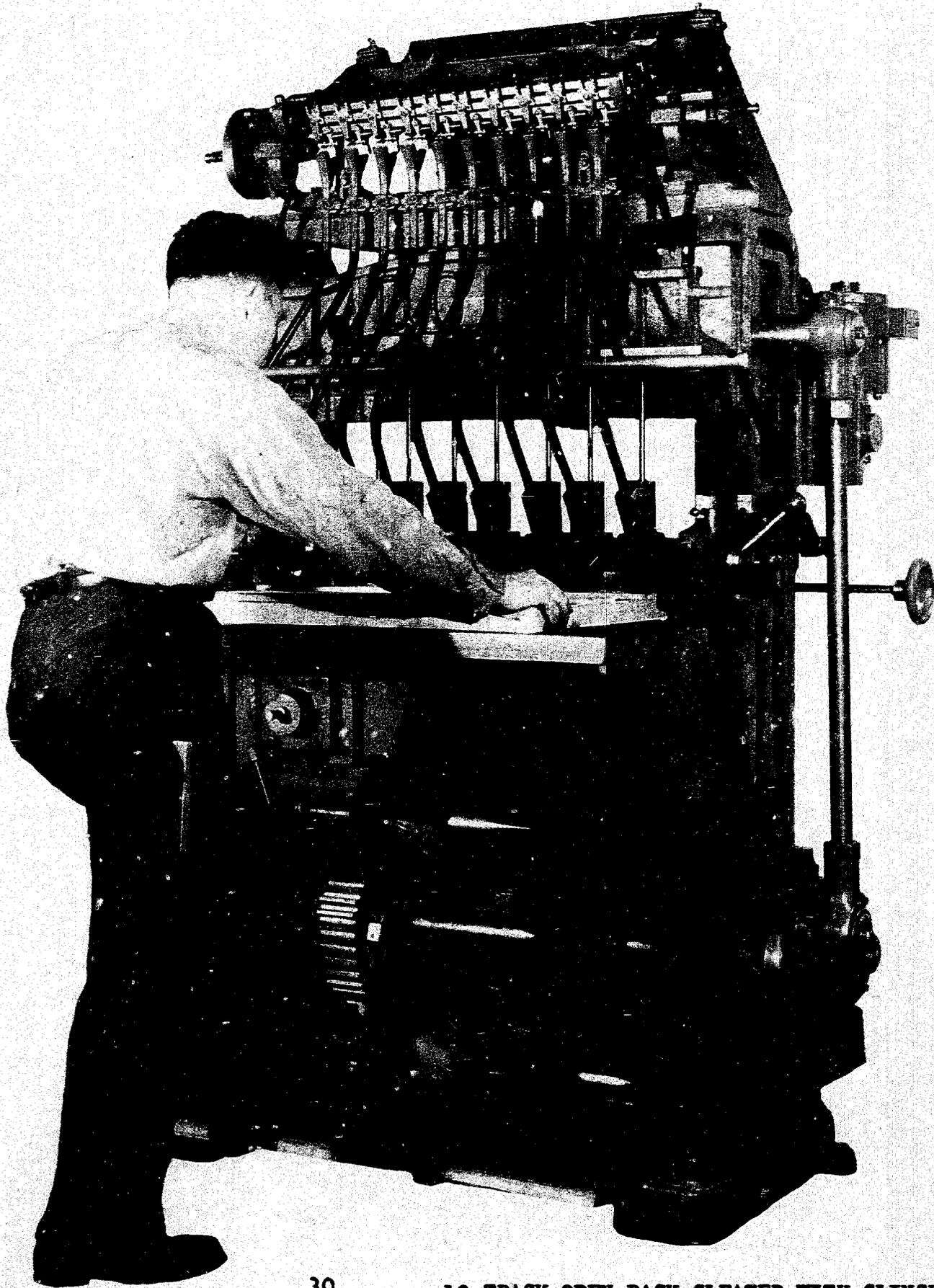


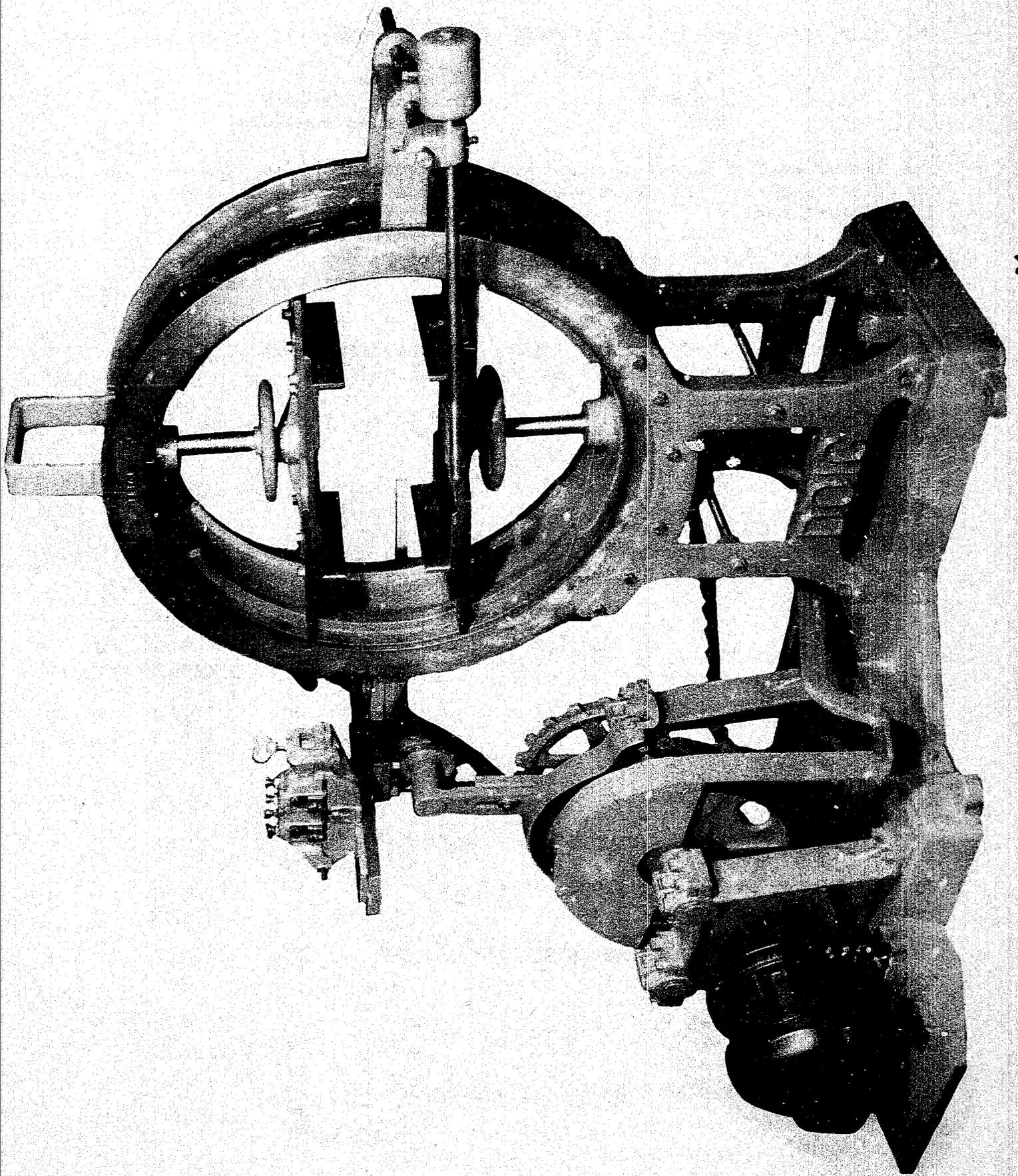
MOTOR DRIVEN STANDARD SQUEEZER



TWO COLOR CHAL... NTER







BOTTLE BOX STRAPPING MACHINE

DIRECT MATERIALS

The principal direct materials used in wooden boxes and shooks are:

Lumber	Strapping
Nails	Printing ink
Glue	Corrugated Fasteners

The lumber used in boxes described in this brochure is cotton-wood, or yellow poplar. The estimated cost of this lumber is \$85 per 1,000 board feet.

The estimated cost of nails for the 4 1/2 style box is 4.7 cents per box. The estimated cost of nails for the 4 1/2 style shook is 2.7 cents per shook.

Where glue is used on dovetail boxes, the estimated cost of glue for the average size box is 2 1/2 cents per box.

The estimated cost of strapping for bottle boxes, style 7, is 8 cents per box.

**BOX AND SHOOK**

The cost of lumber for the 4 1/2 style box and shook, is shown below. The size of this box is 12 inches by 14 inches by 24 inches, inside dimensions.

	Size in inches:			Board feet, including 25 percent waste
	<u>Length</u>	<u>Width</u>	<u>Thickness</u>	
4 end cleats	15	1 1/2	1/2	.489
2 ends	12	14	1/2	1.823
2 sides	25	12	1/4	2.170
1 top	26	14 1/2	1/4	1.363
1 bottom	26	14 1/2	1/4	<u>1.363</u>
<b>TOTAL BOARD FEET, INCLUDING 25 PERCENT WASTE</b>				<b>7.208</b>
Cost of lumber at \$85 per 1,000 board feet				\$ .613
Cost of nails per box				<u>.047</u>
<b>TOTAL COST OF DIRECT MATERIALS FOR BOX STYLE 4 1/2</b>				<b>\$ .66</b>
Cost of lumber for shook				\$ .613
Cost of nails for shook				<u>.027</u>
<b>TOTAL COST OF DIRECT MATERIALS FOR SHOOK STYLE 4 1/2</b>				<b>\$ .64</b>

## BOTTLE BOX

The cost of lumber for the bottle box, style 7, is shown below. The size of this box is 16 7/8 inches by 11 1/8 inches by 3 7/8 inches, inside dimensions.

	Size in inches:			Board feet, including 25 percent waste
	<u>Length</u>	<u>Width</u>	<u>Thickness</u>	
2 ends	11 1/8	3 7/8	13/16	.748
2 sides	18 1/2	3 3/4	3/8	.502
3 bottom pieces	18 1/2	3 1/2	3/8	.734
3 long partitions	17 3/8	2	5/16	.377
5 short partitions	11 5/8	3 3/8	5/16	<u>.678</u>
<b>TOTAL BOARD FEET, INCLUDING WASTE</b>				<b>3.039</b>
Total cost of lumber at \$85 per 1,000 board feet				\$ .259
Cost of strapping				.08
Cost of nails				<u>.031</u>
<b>TOTAL COST OF DIRECT MATERIALS FOR BOTTLE BOX, STYLE 7</b>				<b>\$ .37</b>

## SUPPLIES

Saws, knives and other cutting tools	\$ 800
Grinding wheels and files	250
Grease and oil	100
Printing plates	1,000
Balting	250
Hand tools	250
Repairs to building, machinery and equipment	2,850
Office supplies	500
Gas, oil and repairs for fork lift truck and pick-up truck	<u>1,000</u>
<b>ESTIMATED TOTAL ANNUAL SUPPLIES</b>	<b>\$ 7,000</b>

DIRECT LABOR

	<u>Hourly Rate</u>	<u>Estimated Annual Cost</u>	<u>Actual Cost</u>
1 Superintendent	\$	\$ 8,000	\$ _____
2 Yard men	1.50	6,000	_____
1 Fork lift truck operator	1.50	3,000	_____
1 Resaw operator	2.00	4,000	_____
1 Resaw helper	1.50	3,000	_____
1 Planer operator	2.00	4,000	_____
1 Planer helper	1.50	3,000	_____
1 Cutoff and rip operator	2.00	4,000	_____
1 Cutoff and rip helper	1.50	3,000	_____
1 Machine setter and foreman	2.50	5,000	_____
1 Hand hole machine feeder	1.50	3,000	_____
1 Hand hole machine off bearer	1.50	3,000	_____
1 Notching machine feeder	1.50	3,000	_____
1 Notching machine off bearer	1.50	3,000	_____
1 Grooving machine feeder	1.50	3,000	_____
1 Grooving machine off bearer	1.50	3,000	_____
1 Matching feeder	1.50	3,000	_____
1 Matching off bearer	1.50	3,000	_____
1 Machine setter and foreman	2.00	4,000	_____
1 Printing feeder	1.50	3,000	_____
1 Printing off bearer	1.50	3,000	_____
4 Nailing machine operators for nailing and corrugating machine	1.50	12,000	_____
1 Factory trucker	1.50	3,000	_____
<u>2</u> Utility men	1.50	<u>6,000</u>	_____
29 TOTAL ESTIMATED ANNUAL DIRECT PAYROLL		\$ 98,000	\$ _____

KEY MEN

The superintendent and the two set-up men, who also act as foremen, are the key men in a box and shook plant.

It is seldom that all machines in the plant are operating at one time. For this reason, most of the machine operators and helpers are trained in the operation of more than one machine.

**Note:** When shocks are being run, the nailing machine operators do the banding.

## INDIRECT LABOR

	<u>Estimated Annual Cost</u>	<u>Actual Annual Cost</u>
1 Manager	\$ 10,000	\$ _____
1 Secretary	4,000	_____
1 Bookkeeper	5,000	_____
1 Truck driver	3,000	_____
1 Maintenance man	4,000	_____
<u>1 Night watchman</u>	<u>3,000</u>	<u>_____</u>
 6 TOTAL ESTIMATED ANNUAL INDIRECT LABOR	 \$ 29,000	 \$ _____

## SAFETY

There is always danger of injuries from flying pieces of wood, from wood splinters and from the saws and knives of machines in operation.

The manager should take specific action through the superintendent and the machine setter to bring to the attention of each employee the importance of safety precautions and intelligent first aid. Practically all of the 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 the machine setter, as well as the superintendent, should have a kit available. These men should be familiar with first aid services.

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.

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.

**ANNUAL DIRECT OPERATING COST**

125,000 Style 4 1/2 boxes at \$ .66 =	\$ 82,500
125,000 Style 4 1/2 shooks at \$ .64 =	80,000
125,000 Style 7 bottle boxes at \$ .37 =	46,250
Corrugated fasteners	1,500
Bundling material	2,500
Direct labor	<u>98,000</u>
<b>TOTAL ESTIMATED ANNUAL DIRECT OPERATING COST</b>	<b>\$310,750</b>

**ANNUAL INDIRECT OPERATING COST**

Supplies	\$ 6,000
Indirect labor	29,000
Fork lift truck and pick-up truck expense	1,000
Power	1,400
Water	<u>100</u>
<b>TOTAL ESTIMATED ANNUAL INDIRECT OPERATING COST</b>	<b>\$ 37,500</b>

It is assumed that the lumber will be procured locally. The glue, nails, metal strapping and part of the supplies may have to be imported. Allowing 30 days for sales collections, it is estimated that about 2 1/2 months' working capital will be sufficient. Working capital for 2 1/2 months will amount to \$69,000.

**CAPITAL REQUIREMENTS**

<b>FIXED ASSETS</b>	<b>\$167,900</b>
<b>WORKING CAPITAL</b>	<b><u>69,000</u></b>
<b>TOTAL CAPITAL REQUIREMENTS</b>	<b>\$236,900</b>

**DEPRECIATION ON FIXED ASSETS**

	<u>Estimated Cost</u>	<u>Life Years</u>	<u>Annual Depreciation</u>
Buildings	\$ 50,000	20	\$ 2,500
Equipment	106,000	15	7,067
Furniture and Fixtures	1,500	10	150
Trucks, fork and delivery	8,400	4	<u>2,100</u>
<b>TOTAL ANNUAL DEPRECIATION</b>			<b>\$11,817</b>

## DESIGN OF BOX

The design of the box will depend upon the customers' specifications, which, in turn, will depend upon the use for which the box is intended, and whether it is for one time or multiple use.

Such factors as the physical characteristics of the product, including its weight, size and shape, will also effect the design of the box.

## SALES METHODS

Since there are many kinds of containers on the market, the sales methods should include frequent contact with potential box and shock customers. It will obviously be necessary to convince each customer that wood boxes are the most advantage-out containers in which to package his products.

In many foreign countries the ultimate customer will prefer a wooden box because of the many ways in which he can use it. Competitive cost, appearance of packages, protective features, the advantage of quick delivery resulting in reduced box inventories and quick service in changes of design as required, are a few of the features that will influence sales.

Because of the necessity for this type of sales work with potential customers, a full time salesman should be employed, preferably on the basis of a guaranteed minimum salary and expenses, with a specified commission on all sales over a certain predetermined volume.

The salesman should devote the most of his time to calling on regular and potential customers and keeping himself and the manager of the company well advised on all factors that affect sales. He should not be burdened with the routine office details of sales, in order that he can devote the most of his time to work in the field.

It is estimated that the selling cost, including salary, commission, travel expense, returns and allowances, bad debts, telephone and other sales expense will amount to about \$55,000.

ANNUAL SALES

125,000 Style 4 1/2 box at \$1.65 each =	\$206,250
125,000 Style 7 bottle box at \$1.02 each =	127,500
125,000 Style 4 1/2 shock at \$1.57 each =	<u>196,250</u>
<b>TOTAL ESTIMATED ANNUAL SALES</b>	<b>\$530,000</b>

RECAPITULATION OF COSTS, SALES AND PROFIT

Annual direct operating cost	\$310,750	
Annual indirect operating cost	<u>37,500</u>	
<b>ESTIMATED ANNUAL OPERATING COST</b>		<b>\$348,250</b>
Depreciation of equipment	\$ 11,817	
Freight in and out	10,000	
Insurance	1,000	
Legal and auditing	4,000	
Interest on loans	5,000	
Unforeseen expense	<u>14,933</u>	
<b>ESTIMATED ANNUAL BURDEN COST</b>		<b>\$ 46,750</b>
<b>SALES COST</b>		<b>55,000</b>
<b>PROFIT BEFORE TAX</b>		<b><u>80,000</u></b>
<b>ESTIMATED TOTAL ANNUAL SALES</b>		<b>\$530,000</b>

## BUDGET CONTROL

A requisition form, page 40, is designed to provide accurate records and control of costs, both direct and indirect, with the least amount of time and effort.

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, water, fuel, are usually under contract and are easily checked by reference to monthly bills. For simplification, such items (marked with an asterisk on the attached list) are omitted from the purchase requisition. Variations in the labor costs are easily reviewed by examination of the payroll. The simplified type of control thus provided makes certain that the manager can control expenditures promptly.

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 breakdown of all expenditures relative to the budgeted accounts exceeded. All these supporting data can be secured by reference to the purchase requisitions. 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 Expenditures</u>	<u>Monthly Budget</u>	<u>Annual Budget</u>
10	Administrative	\$ _____	\$ 833	\$ 10,000
20	Sales	_____	4,583	55,000
30	Production Materials	_____	17,729	212,750
40	Supplies	_____	583	7,000
*50	Power and water	_____	125	1,500
60	Unforeseen expense	_____	1,244	14,933
*70	Direct labor	_____	8,166	98,000
*80	Indirect labor	_____	2,416	29,000
90	Freight in and out	_____	833	10,000
100	Special projects	_____		

Note: Number 10 includes legal, insurance, interest and depreciation.



## ENGINEERS

The services of professional engineers are desirable in the design of a box and shooK 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, 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 industrial project.

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

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## PERIODICALS

Industrial Packaging,  
Haywood Publishing Company,  
22 East Huron Street,  
Chicago 11, Illinois.

Packaging Parade,  
Haywood Publishing Company,  
22 East Huron Street,  
Chicago 11, Illinois.

Boxboard Containers,  
Haywood Publishing Company,  
22 East Huron Street,  
Chicago 11, Illinois.

## SUMMARY

A small box and shook plant built and operated to make wooden boxes and shooks aggregating an annual sales volume of \$530,000, according to the assumptions made in this brochure, would be a profitable undertaking.

There are some determinations, however, that should be made before a decision is reached to build and operate such a box and shook plant. Among the necessary determinations to be made are those with respect to the following items:

### **SALES**

Will the potential annual sales of the kinds of boxes and shooks produced by the plant amount to at least \$530,000?

### **MATERIALS**

Is there a satisfactory local source of lumber at reasonable prices?

### **COSTS**

After revising the estimates of costs and earnings shown in the brochure so they conform to actual local costs, where it is proposed to build the plant, will a profitable operation be indicated?

### **COMPETITION**

Is there potential competition which will reduce the revenues below a profitable level, either by lowering the prices, or by reducing the volume of sales?

### **ORGANIZATION**

Is there reasonable assurance that experienced men will be available for management, and for other key posts, to initiate operations?

Will suitable trainees be available for the permanent organization?

The men in the key posts should be trained in advance of the initial operations of the plant.

A small box and shook plant, such as described in this brochure, when installed and operating, will serve as a good nucleus for a much larger industry when a larger plant is justified. The transition can be made by gradual growth.