PLANT REQUIREMENTS FOR MANUFACTURE OF RUBBER FABRIC CANVAS SHOES

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FOREWORD

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

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

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

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

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PLANT REQUIREMENTS FOR MANUFACTURE OF RUBBER SOLE FABRIC SHOES

INTRODUCTION

There are many different designs of rubber sole fabric shoes produced in the United States. The shoe made in the plant described in this manual is a simple circular vamp oxford with a rubber sole.

This shoe is commonly referred to as a tennis shoe or "sneaker" in the United States and this type of rubber sole shoe is widely used in foreign countries.

GENERAL ASSUMPTIONS

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

1. The costs of the building and general facilities are based on United States prices.

2. Material costs are based on sizes and specifications of materials used in the United States.

3. Labor costs are based on the average for the industry as recently published by the United States Bureau of Labor.

4. Adequate power and water are available at the plant site.

5. Adequate transportation facilities are available at the plant site.

6. The plant operates eight hours a day, five days a week, and fifty weeks per year, except in the mill and calendering department where two men work an eight-hour night shift.

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. Taxes.

   While general estimates will be made of each of these items except taxes, 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 manual should be adjusted to conform to local conditions.

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

PRODUCT SPECIFICATIONS

A circular-vamp oxford, as distinguished from a blucher-type oxford, is a low cut shoe laced or tied over the instep, in which the vamp extends a short distance over the quarters and tongue. In a blucher-type oxford, the quarters extend a short distance over the vamp, their inner edges being loose. The tongue in a blucher is cut as part of the vamp. In this circular-vamp oxford, the tongue is cut separately and attached as part of the operation in which the vamp is sewed over the quarters and tongue. The vamp is the front part of the shoe above the sole and the quarters form the sides from the heel to the vamp.

Manufacture of circular vamp oxfords is contemplated for the following groups, and in the following sizes:

Group	Size Range
Men	6 - 13
Boys	2-1/2 - 6
Youth	11 - 2
Women	3 - 10
Misses	12-1/2 - 3

Half-sizes are included at each step in a range so that a total of 55 different sizes would be made. Experience will determine the number of shoes to be made in the various sizes and this, in turn, will determine the extent of lasts required in the manufacturing process. Making time, per pair of shoes, does not vary with the size or group for which the shoes are being made, although, obviously, the amount of material used does vary with the difference in shoe size.

MANUFACTURING UNIT

Twelve pairs of rubber sole fabric shoes is the manufacturing unit for this plant. Scheduling production in twelve pair lots provides for more advantageous use of the lasts, thus requiring fewer lasts.

PRODUCTION CAPACITY

The production capacity of this plant is 1,720 pairs of shoes per eight hour working day. However, it is necessary to have two men work an eight-hour night shift in the mill and calendering department. This avoids the purchase of additional high priced equipment.

MANUFACTURING OPERATIONS

Mill and Calendering Department

Crude rubber and the other ingredients which are used to make the compound that becomes the gum stock for outsoles and foxing strips, are delivered to the mill mixing area. The crude rubber comes in bales and the other ingredients come in drums. The mill mixer uses a unit-driven, hydraulic rubber cutter to cut the crude rubber into slabs which can be conveniently handled. He then weighs appropriate amounts of the various ingredients which make up a batch, for compounding.

Approximately 1,500 pounds of gum for outsoles and 200 pounds of gum for foxing are required for the plant's daily production needs. Consequently, the mill mixer mixes or mills 15 one-hundred pound batches of outsole gum and two one-hundred pound batches of foxing gum in a day. About 30 minutes is required to mix a batch.

The outsole gum batch is made up as follows:

Ingredients	Pounds
Crude rubber	60.00
Pine oil	2.00
Whiting, clay, and other inert filler	35.00
Sulfur	2.75
Organic accelerator	.25
Total	100.00

The batch for making foxing fum is composed of the same ingredients used in the outsole gum, except that 10 percent more crude rubber is used and the amount of inert filler is reduced proportionately, to make up a one-hundred pound batch. The organic accelerator activates the linkage between the sulfur and the hydrocarbon in the crude rubber.

The compounds listed on page three are mixed on two open 50-inch mills. These mills, and others used in the plant, have hollow rolls through which water circulates to act as a coolant. Two mills are used so that the mill mixer can work on both mills. Crude rubber slabs are fed to a mill. The two rolls on a mill are set so that one roll turns approximately one and one-quarter times faster than the other roll, thus causing a tearing action. After the crude rubber has been sufficiently mixed or ground-up, the mill mixer gradually adds the other ingredients, ending with the sulfur and accelerator, feeding them in between the rollers as the crude rubber continues to be milled. As the entire mass begins to blend the mill mixer continues to cut the rubber that goes through the mill and to put it back in again for further milling. A pan at the base of the mill catches any spillage of the ingredients. This is collected and put back into the mill, thus keeping the proportion of the various ingredients in balance. When the mixing process is completed, the mill mixer cuts the gum from the rolls in slabs and places the slabs about the room or puts them into a water cooling tank, to cool for about 10 or 15 minutes. The slabs are then stored on hand trucks for at least one day before further processing. This is done so that the required molecular arrangement in the gum rubber can take place before subsequent warmup and calendering.

The rag stock millman is responsible for making the rag stock with which binders are made and with which the insole, counter, and toe cap fabrics are calender coated. He operates two mills. One is a 36-inch corrugated "cracker" mill and the other a 40-inch plain, open mill. Rag stock is made of scrap fabric, paper, and scrap rag stock. There is no fixed formula for the amounts of each of the items used in a batch. The scrap is fed into the corrugated mill first. The rollers on this mill are corrugated and they cut up the scrap thoroughly. For further blending, the resultant mass is shifted to the 40-inch mill. The blended rag stock is also cut from the mill rolls in slabs and is permitted to cool on hand trucks before subsequent warming up and calendering. The cooling period for rag stock is relatively short. Rag stock making requires only a small portion of the rag stock millman's time. He spends the rest of his workday assisting the mill mixer. These two men form the second shift crew. The mills they use are the same ones used during the day shift for warming up the gum and rag stock prior to calendering. These men also prepare the rubber cement required in the making of the shoes. This cement is a mixture of 97 percent crude rubber and three percent sulfur. The crude rubber and sulfur are mixed on one of the open mills. After being thoroughly mixed, the mixture is placed in a churn, which is a large tank with a paddle activated by an electric motor. Naphtha is added to the mixture while it is being churned, until the desired viscosity is obtained. A thick cement is used for cementing tops, whereas a light cement is used for insoles. The churn is located outside the plant building as a safety measure because the naphtha creates a fire hazard.

On the day shift in the mill and calendering department, one warmup man operates the two 50-inch mills to warm up or plasticize the gum stock to prepare it for calendering. He adds gum outsole scrap to

the previously unused gum stock in a 50-50 ratio, during the warm-up process. Another warmup man warms up the rag stock for the rag stock calender. He uses the 40-inch mill. This second warmup man assists the gum warmup man and also feeds the gum and rag stock to their respective calenders.

Gum stock is fed to an outsole and foxing calender. This calender has three stock rolls and one offset roll. The offset roll is the one which calenders or imprints the design or shape on the bottom of the outsole. The offset roll is interchangeable so that a roll making the foxing can be substituted. The rolls are eight inches in diameter and 18 inches across the face of the roll. This calender is operated by a calender operator, who is also the department work leader, and his helper. The operator adjusts the rolls so that gum stock can be gaged to the desired thickness. Gum stock for outsoles is cut from the calender in slabs or sheets. Two men, called boarders, place the sheets on boards fitted with short legs so that they can be placed on top of each other. The boards are piled on hand trucks. The outsole gum sheets are brought to the Wellman cutting area by the two boarders. Foxing is run off on reels which are delivered directly to the "making" line.

The rag stock is fed to a three roll calender. Binders are calendered from the rag stock. For calender coating fabric parts, the rag stock is fed between the second and third rolls and fabric is fed between the first and second rolls. In this operation, a calender operator and a back tender watch the fabric as it is fed through the calender. As noted, the rag stock warmup man feeds the calender. A general utility helper completes the staff for the department.

The rolls on the calenders are hollow also, but steam, in addition to water, circulates through the rolls. Binder stock and the calender coated fabrics are delivered by hand truck to the clicker cutting area.

Equipment and machinery used in the mill and calendering department --

A.	Crude rubber cutting machine ...	1 "Black Rock" rubber cutter
		2 50-inch mills
		1 40-inch mill
		1 36-inch cracker mill
B.	Calendering equipment	1 Outsole calender (3 stack rolls, 1 offset roll)
		1 3-roll calender for rag stock
C.	Other equipment	1 Platform scale with beam (200 lb. capacity)
		1 Churn for rubber cement
		Wood boards for gum sheets
		10 Reels for foxing sheets
		4 Hand trucks
		1 Extra offset roll (foxing)

Cutting Department

Activity in the cutting department is divided between the clicker cutting section and the Wellman rubber outsole cutting unit.

A unit-driven double arm clicker machine is used to cut the following shoe parts:

Binder
Vamp
Quarters
Tongue
Insole
Eyelet stay
Toe cap

The binder is made of rag stock and the other parts are made of fabrics, some of which are calender-coated. The various materials used are spread out on a table in layers by the clicker operator's helper. The table is levelwith the cutting surface of the clicker. The helper feeds the materials to the clicker machine with the clicker operator pulling the layers of goods across the cutting surface, positioning the goods, and bringing the cutting die down upon the goods so that the desired parts are cut out. The die, of course, is changed for each part cut. There is no marking of the goods to guide the clicker operator. An experienced and efficient operator cuts out the parts leaving a minimum of scrap. The operator and his helper tie the various parts, except for insoles, into bundles and set them on a hand truck for movement to the temporary storage bins servicing the "stitching" line in the assembly, finishing, and packing department. The clicker cutting group, in addition to the two workers noted, includes one worker who separates the insoles and counts them. Working on a table, this worker hand-cements the calender coated surface of the insoles, places them between the cloth leaves of a book so that they will not adhere, and the book is brought to the "making" line. The book referred to is similar to that used to keep gum outsoles from sticking together. It is made of a piece of flat board to which six or seven cloth leaves are attached.

Outsole cutting is done on a Wellman outsole cutting machine. The machine operator feeds the cutter with sheets of gum stock and depresses a foot pedal to start the machine. An air compressor raises the machine's steel table surface to the cutting knife suspended from above the table. The knife cuts around the positioned pattern, being guided by a leader. Patterns are changed with each foot and size change. The left foot outsoles in one size are cut first, and then the right outsoles in the same size are cut. The operator tosses gum scrap aside for reuse in the warming up of gum outsole stock for calendering. The outsole gum stock is cut on a steel plate, as noted, and while still on this plate, the worker who assists the machine operator hand-stamps the cut outsoles with the appropriate size number. He uses a metal hand stamp. After stamping, this same

worker picks up the outsoles and places them on the cloth leaves of a book of the type previously described. The cloth leaves are 18" by 24" in size. After marking the book with the size and number of outsoles contained in it, he places it on a hand truck for movement to the "making" line of the assembly, finishing, and packing department.

Equipment and machinery used in the cutting department --

A. Clicker cutting

Clicker cutting machine	1	U.S.M.C. double arm clicker
Clicker cutting dies	260	Dies
Table for spreading goods	1	Wood table, approximately 5' wide by 10' long
Table for preparing insoles ..	1	Wood table, approximately 3' wide by 12' long
Books for insoles		Company made or purchased

B. Outsole cutting

Outsole cutting machine	1	Wellman Co. machine cutter
Air compressor to service cutting machine	1	5-hp. compressor
Books for outsoles	100	Books (company made or purchased)
Metal outsole patterns		Metal patterns in various outsole sizes, for use with Wellman cutter

C. Other equipment

Hand trucks	4	Hand trucks

Assembly, Finishing, and Packing Department

This department includes all the manufacturing processes that follow gum stock and fabric cutting.

Stitching Line

Cut fabric parts for the upper of the shoe are taken from the temporary storage bins adjoining the stitching line and brought to the line for assembly. Operations in the stitching unit are performed in the following sequence:

1. Cement vamp, place and roll toe cap. On a table placed at the head of the sewing line, a general assembler lays out the vamps, in shingle fashion, with the inside surface facing up. Vamps are counted as they are spread out. The toe of each

vamp is cemented, by hand, with a scraper. The same worker then picks and peels off a calender coated toe cap from a pile of caps, places it on the vamp at the toe, and rolls it, by hand, with a small roller. This fixes the toe cap on the vamp.

2. Sort and count quarters. Quarters for the uppers come tied in bundles from the clicker cutting unit. A general assembler unties the bundles, checks the number of quarters against the attached work ticket and notes any shortages or defects. Then ties the bundles of quarters together again and places them back in the temporary storage bin. This worker also assists with the performance of the No. 1 operation.

3. Stamping. A machine operator, using a U.S.M.C. marking machine, stamps the identifying size and style number of a shoe on the inside of one of the two quarters going into the shoe. (A rubber hand stamp can be used for this operation although it increases the operational time.) The worker at this task also performs operation No. 9, eyeletting.

4. Close quarters.

5. Stay quarters.

6. Stitch in counters. Operations No. 4, 5, and 6, are performed by three sewing-machine operators who turn out the required day's production for these tasks. Closing quarters (No. 4) involves the quarters at the back and trimming off thread. A Union Special Machine, model #2600A, is used for this job. Staying quarters (No. 5) is done on a Union Special Machine, model #8200, with a special attachment. The attachment opens up and spreads back the inside seam edges caused by closing the quarters, so that the stay can be sewed flat over the seam. Stitching in counters (No. 6) is done on a Singer Sewing Machine, model #112W140. The operator sews the counter inside the closed quarters, at the heel of the shoe.

7. Bind quarters.

8. Bind tongues. Three sewing-machine operators are used to perform operations No. 7 and 8 in order to produce the required day's production. Binding quarters (No. 7) includes sewing a strip of binding around the outside edge of the quarters. In sewing the binding, an eyelet stay is attached simultaneously with that part of the binding that is sewed

to the forepart of the quarters. The stay acts as a reinforcement for the area in which the eyelets are to be placed. Binding quarters is done on a Singer Sewing Machine, model #111W152. Binding tongues (No. 8) is the sewing of binding around the tongue, except for the small area at the bottom of the tongue where it is attached to the vamp and quarters. A Singer Sewing Machine, model #108W20 is used for binding tongues.

9. Eyeletting. The machine operator who performs operation No. 3 also does the eyeletting operation. The operator uses a U.S.M.C. Duplex Eyeletting Machine, model B, to clamp the eyelets into a shoe where the eyelet stay has been sewed. There are eight eyelets per shoe.

10. Turn vamp. A sewing-machine operator, using a Singer, model #111W152, takes the top edge of the vamp, where it attaches to the forepart of the quarters, turns it in and sews down over the fold. This prevents the raw edge of the fabric from showing.

11. Vamp. Three sewing-machine operators are needed to produce the required vamping needs. They use Singer machines, model #45W.

    In vamping, an operator picks up and positions the vamp, the closed quarters and the tongue, and stitches them together. Notches, which were made in the parts indicated during their cutting by the clicker machine, guides the operator as the parts are sewed together.

12. Lacing. After vamping, a machine operator positions the shoe on a U.S.M.C. Regulation, Class 4215B Machine. This machine causes a heavy thread to be tied through an eyelet in each quarter of a shoe so that the quarters are held together at the front until the shoe has been lasted. If this were not done, the shoe might shift its position while being machine lasted.

    At this point in the stiching process, the shoe is right side out.

13. Machine cement tops. The machine cementer gets the shoe upper, turns it inside out and positions the bottom part of the reversed upper against the wheel on a U.S.M.C. Top Cementing Machine. This applies a coating of rubber cement around the inside of the bottom edge. The tops, or uppers, are then stacked on rods by the cementer, placed on hand trucks and pushed over to the adjoining "making" line for the joining of the upper and bottom of the shoe.

The machines in the "stitching" unit are powered by a main line shaft. Each machine table has its own transmitter.

Equipment and machinery used in the stitching line of the assembly, finishing, and packing department --

A.	Stamping machine	1 U.S.M.C. marking machine, model A
B.	Eyeletting machine	1 U.S.M.C. duplex eyeletting machine, model B
C.	Thread lacing machine	1 U.S.M.C. regulation class 4215B
D.	Top cementing machine	1 U.S.M.C. top cementing machine
E.	Sewing machines and use	1 Union Special - #2600A - close quarters
		1 Union Special - #8200 - stay quarters
		1 Singer - #112W140 - stitch counters
		2 Singer - #111W152 - bind quarters
		1 Singer - #108W20 - bind tongues
		1 Singer - #111W152 - turn vamp
		3 Singer - #45W - vamping
F.	Other equipment	15 Machine tables with transmitters
		1 Motor for drive shaft
		3 Work tables

Making Line

Operations on the making line are as follows:

1. A general assembler gets a rod of tops from the hand truck which the machine cementer pushes to the making line. This worker reverses the tops so that they are right side out and places them on a table, in pairs. The worker then places each top on a last which is obtained from a last basket. This is called "hooding." The hooded lasts are passed on to two hand lasters who work at the same table.

2. The two hand lasters pick up hooded lasts and place them on jack pins attached to the table. A jack pin is an extended metal pin over which a last is hooked. The hand lasters then pick up an insole from the insole book, and place it on the bottom of a last which is facing upward at this point, and pull the quarters of the inverted top over the insole at the shank of the shoe. A hand roller is used to bring

pressure upon the area where the quarters have been pulled over the insole. The parts pressed together are held fast by the cement with which the insole has been covered in the cutting room and the top has been cemented in the top cementing machine. The shoes, which remain on the lasts until after vulcanization, are then passed on to the next operation.

3. A machine laster picks up the partially lasted shoe an positions it in a U.S.M.C. Tennis Lasting Machine. A knee pedal is pressed and this operates a clamp which holds the shoe in the machine. The starting arm of the machine is pulled and it begins to operate, causing the remainder of the shoe top to be pulled around the insole thus completing the lasting or forming of the shoe. The lasted shoe is then thrown mechanically, out of the machine onto a conveyor belt which leads to the skiver's table.

4. The skiver, using a 10-inch flat blade knife, trims off the rough edges where the top has been drawn over the insole and then places left and right shoes in separate trays.

5. A cement dipper takes a shoe from the tray and partially dips it in a tank containing latex cement. It has a metal stop rising from the bottom upon which the shoe bottom rests so that the shoe is not cement coated beyond a depth of 9/16-inch. The cement dipper maintains the cement in the tank at the proper level by adding cement, as required, from a supply container located above the tank.

6. Another cement dipper removes the dipped shoe from the tank and wipes off the excess cement from the bottom by drawing it over a rubber strip which is attached to the tank. The shoe is then placed in a dryer tray. This is a tray with thin rods upon which the shoe rests. This worker will gage one out of every 10 shoes, at several points, to check the depth of the cement line.

   The drying tray carrying the shoe goes into an enclosed steam-heated oven or dryer and travels up and down a distance of 18 feet within the dryer, on a chain-driven sprocket-type conveyor. When the shoe leaves the dryer conveyor, it is ready for the series of operations which take place on a 32-jack conveyor line. This conveyor line is set to move each jack one station every 12.5/100 of a minute. This movement will yield the planned production of 1,720 pairs of shoes per eight-hour day.

7. The next worker, a general assembler, takes the shoe from the dryer tray, checks the lasting, removes lumpy cement by hand or knife, and then places the last on a jack on the jack conveyor. The operator raises the jack to an upright position so that the shoe is in position for the next operation, i.e. placing of binder on insole.

8. Another general assembler loosens a group of binders (fillers). Loosening is required because the binders are made of calendered rag stock and their surface is tacky. This worker places the binder on the insole, applies a little pressure, and then pushes the jack down, on a pin pivot, from its upright position so that it is extended outward, horizontally.

9. At this point, a general assembler removes gum outsoles from the book in which they were placed when cut. The operator takes a pair of outsoles, and cements the side to be placed against the binder, with a brush. The operator then places the outsoles, cemented side up, on a four-foot diameter, two-tier plywood reel. One tier is used for left outsoles and the other for right outsoles. The reel is located at one end of the jack conveyor and it is turned by the worker who places the outsoles upon its tiers, so that when the outsoles reach the next worker, a cement drying time has been allowed.

10. The next worker, also a general assembler, takes a shoe off the conveyor jack, gets an outsole from the turning reel and positions the toe of the outsole and then the heel on the bottom of the shoe, using a little hand pressure. The shoe is then placed on a table adjoining the line at this point.

11. A machine sole presser picks up the shoe and uses a hand roller to press the outsole onto the bottom of the shoe from the shank to the center of the sole, thus more firmly pressing the outsole to the shoe. Then the shoe is put in a U.S.M.C. outsole press, which is operated by foot pedal, and finish-presses the outsole to the bottom. The operator takes the shoe from the machine and places it back on a jack of the conveyor.

12. A general assembler who works at a table placed beside the line, turns a reel of outside foxing which is hung from the table, and cuts it to length with an electric hot knife. This results in a sheet of foxing, called a "group" because it contains a number of foxing strips which have been

partially cut through during calendering. The group of strips is laid out on the table and rubber cement is brushed over it. The group is then moved over to the foxing placers.

13. The first of two foxing placers tears off a strip of foxing and places it on a shoe which has been brought by a conveyor. The worker applies one foxing strip from the breast of the heel through the shank to the toe of the left shoe and then applies a second strip from the breast of the heel around the heel, on the right shoe.

14. A second foxing placer finishes placing the foxing strips on the appropriate areas not covered by the first placer, and then places the shoe on a small shelf set beside each jack on the conveyor.

15. A press operator takes the shoe from the shelf and presses it in a hand-operated press machine, then removes the shoe from the press and hand rolls the foxing at the shank, which is a vulnerable area. The shoe is then placed on an adjoining table.

16. A general assembler uses a small metal roller with a blunt edge blade to apply additional pressure where the foxing is joined and where it leaves off at the vamp and quarters. This is called "blind-stitching". The worker also cuts the lacing thread which held the quarters together at the front during the lasting. The shoe is then returned to the table.

17. The last operation on the making line requires two workers who are called "rollers". After "blind-stitching" these workers pick up shoes from the table and hand roll the bottom edge of the foxing to the outsole and roll the top of the foxing all around the shoes. They place the finished shoes, in pairs, on steel sticks which have a series of extended pins upon which the shoes are hung. The sticks are then laid crosswise upon metal frame heating cars and are ready for the vulcanizing process.

A utility worker who relieves the other workers on the line, and a service and repair worker, who helps feed the line and repair poor foxing, complete the making crew.

Equipment and machinery used in the making line of the assembly, finishing, and packing department --

A.	Jack conveyor	1 Conveyor - 32 jack
B.	Lasting machine	1 U.S.M.C. tennis lasting machine
C.	Drying oven	1 Steam coil dryer, made to order, with exhaust fan and chain-driven sprocket-type conveyor (3' wide x 2' deep x 10" high)
D.	Outsole pressing machine ..	1 U.S.M.C. outsole press
E.	Other equipment	2,500 pairs - Aluminum lasts
		50 Steel last sticks
		1 Cement dip tank (company made)
		6 Work tables

Vulcanizing Section

After the shoes have been placed on the sticks in the making line and then placed horizontally on the heating cars, as noted previously, they are ready for the vulcanizer. The heating cars are made of steel and are four feet square. They have side brackets which allow for the placing of the shoe-bearing sticks in a horizontal position.

Two workers, called strippers and car handlers, push the cars into the vulcanizer. The vulcanizer is a horizontal, circular-shaped shell boiler with steam coils. It is seven feet in diameter and 22 feet long and is serviced by a 25 hp. air compressor. It can accommodate four heating cars at one time and is used to cure the rubber in the shoes so that the rubber acquires the necessary hardness, strength, and elasticity. The vulcanizing equipment must be attended by an operator who keeps a constant watch of the air pressure and steam gages. After the door of the vulcanizer is closed on the loaded heating cars, an air pressure of 30 pounds must be obtained as quickly as possible. The air pressure compact the rubber and shortens the curing cycle. In conjunction with the air pressure, there must be sufficient steam in the coils to create a heat of 275°F. The atmosphere in the vulcanizer is kept dry at all times. Steam is confined to the coils. Shoes remain in the vulcanizer approximately two and one half hours and are then removed by the two car handlers, who take the sticks from the heating cars and position them on tables so that they can remove the lasts from the shoes. This is called "stripping". The shoes are then placed on the adjoining inspection and packing table and the removed lasts are thrown off into the appropriate last basket for temporary storage or immediate reuse.

Equipment used in the vulcanizing section of the assembly, finishing, and packing department --

A. Vulcanizing equipment ...	1	Vulcanizer, horizontal, circular-shaped shell boiler, seven feet in diameter, 22 feet in length
	1	Air compressor unit - 25 hp.
B. Other equipment	14	Heating cars

Inspection and Packing

An inspector, working at the table upon which the last strippers have placed the shoes, picks up each shoe and inspects it for visual defects, and also ties a pair of shoe laces through an eyelet of one of the shoes in a pair. The shoes are set down on the table and passed on to the packer or boxer who wraps a pair of shoes in tissue paper and places it in a carton. The worker then packs the cartons into shipping cases which hold 24 cartons.

* * * * * * * *

DIRECT MATERIALS
FOR 1,720 PAIRS PER DAY

Description	Units Needed	Estimated Unit Cost	Estimated Total Cost	Actual Cost
Crude rubber	900.00 lbs.	$ .35	$315.00	_____
Pine oil	30.00 lbs.	.15	4.50	_____
Whiting, clay, and other inert fillers	525.00 lbs.	.01	5.25	_____
Sulfur	41.25 lbs.	.015	.62	_____
Organic accelerator	3.75 lbs.	.48	1.80	_____
Fabrics				
Vamp - enameled duck backed with 3.85 sheeting	141.00 sq. yds.	.36	50.76	_____
Quarters - enameled duck backed with 3.85 sheeting	179.00 sq. yds.	.36	64.44	_____
Tongue	28.00 sq. yds.	.36	10.08	_____
Eyelet stay	19.00 sq. yds.	.36	6.84	_____
Counter with 2.85 sheeting	55.00 sq. yds.	.21	11.55	_____
Toe cap - #4-1/2 double thread net	24.00 sq. yds.	.15	3.60	_____
Insole - 3.65 osnaburg	100.00 sq. yds.	.21	21.00	_____
Fabric trimmings				
Bias binding	2,804.00 lin.-yds.	10.50 M yds.	29.44	_____
Back stay tape	379.00 lin.-yds.	10.50 M yds.	3.98	_____
Laces, eyelets and thread			63.79	_____
Total			$592.71	_____

Annual cost of materials 250 x $592.71 or $148,178.

MACHINERY AND EQUIPMENT

Description	Number Required	Estimated Unit Cost	Estimated Total Cost	Actual Cost
Mill and calendering:				
Crude rubber cutting machine	1	$ 2,500	$ 2,500	_____
50-inch mills	2	18,000	36,000	_____
40-inch mill with one 36-inch cracker mill	1	20,000	20,000	_____
Outsole calender (three stack rolls, one offset roll)	1	20,000	20,000	_____
Rag calender (three rolls)	1	35,000	35,000	_____
Offset roll - for foxing	1	600	600	_____
Scale	1	300	300	_____
Churn for rubber cement	1	1,800	1,800	_____
Boards for gum stock	100	5	500	_____
Foxing reels	10	60	600	_____
Foxing stands	2	75	150	_____
Hand trucks	4	50	200	_____
Cutting:				
Clicker cutting:				
U.S.M.C. double arm clicker cutter	1		Rented	_____
Clicker cutting dies	260	15	3,900	_____
Work table for spreading goods	1	100	100	_____
Work table for preparing insoles	1	100	100	_____
Insole books	100	10	1,000	_____
Outsole cutting:				
Wellman outsole cutter	1		Rented	_____
5 hp. air compressor for cutter	1	700	700	_____
Outside books (12 pair in a book)	100	12	1,200	_____
Outsole patterns	110	7	770	_____
Hand trucks	4	50	200	_____

Machinery and equipment - continued

Description	Number Required	Estimated Unit Cost	Estimated Total Cost	Actual Cost
Assembly, finishing, and packing:				
Stitching:				
U.S.M.C. marking machine, model A	1		Rented	_____
U.S.M.C. duplex eyeletting machine, model B	1		Rented	_____
U.S.M.C. regulation machine, class 4215B	1		Rented	_____
U.S.M.C. top cementing machine	1		Rented	_____
Union Special sewing machines (heads)	2	$ 200	$ 400	_____
Singer sewing machines (heads)	8	200	1,600	_____
Tables and transmitters for sewing machines	10	75	750	_____
Motor for main drive shaft	1	230	230	_____
Work tables	3	50	150	_____
Making:				
U.S.M.C. lasting machine	1		Rented	_____
U.S.M.C. outsole press	1		Rented	_____
32-jack conveyor	1	2,500	2,500	_____
Drying oven	1	2,500	2,500	_____
Pairs of aluminum lasts	2,500	6	15,000	_____
Cement dip tank	1	250	250	_____
Work tables	6	50	300	_____
Vulcanizing:				
Vulcanizer	1	11,000	11,000	_____
Controls for vulcanizer		1,000	1,000	_____
Air compressor 25 hp.	1	4,500	4,500	_____
Heating cars	14	500	7,000	_____
Total			$172,800	_____

The cost of the rented equipment will amount to about $666.00 per month or approximately $8,000 per year. The suppliers of the rented equipment are responsible for the repair and maintenance of the equipment. The rental cost is included in supplies.

OTHER TOOLS AND EQUIPMENT

Description	Estimated Cost	Actual Cost
Hand tools	$ 1,000	_____
Spare parts	5,000	_____
Lathe	2,000	_____
Drill press	1,000	_____
Bench grinder	200	_____
Welding equipment	800	_____
Total	$ 10,000	_____

FURNITURE AND FIXTURES

Description	Number Required	Estimated Unit Cost	Estimated Total Cost	Actual Cost
Desks and chairs	3	$ 150	$ 450	_____
File cabinets	2	75	150	_____
Typewriter	1	150	150	_____
Adding Machine	1	150	150	_____
Total			$ 900	_____

SUPPLIES

Item	Estimated Cost	Actual Cost
Lubricants	$ 100	_____
Spare parts	2,000	_____
Maintenance materials	2,000	_____
Hand tools	300	_____
Cutting tools	300	_____
Office supplies	200	_____
Naphtha	100	_____
Rental equipment	8,000	_____
Total	$ 13,000	_____

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Estimated Annual Cost	Actual Cost
Mill and calendering department:				
Mill mixer	1	$ 1.75	$ 3,500	_____
Rag stock millman	1	1.75	3,500	_____
Warmup millman	2	1.60	6,400	_____
Outsole calender operator group work leader	1	2.00	4,000	_____
Helper on outsole calender	1	1.50	3,000	_____
Boarders	2	1.60	6,400	_____
Rag calender operator	1	1.70	3,400	_____
Back tender	1	1.50	3,000	_____
General helper	1	1.50	3,000	_____
Cutting department:				
Fabrics:				
Clicker operator	1	1.75	3,500	_____
Helper to clicker operator	1	1.50	3,000	_____
Insole picker, counter and cementer	1	1.50	3,000	_____
Outsole gum:				
Wellman cutting machine operator	1	1.75	3,500	_____
Wellman helper and stamper	1	1.60	3,200	_____
Assembly, finishing, and packing department:				
Stitching:				
General assembler	2	1.70	6,800	_____
Eyeletting and stamping machine operator	1	1.60	3,000	_____
Sewing machine operators --				
Closing quarters, stay quarters and stitch in counters	3	1.50	9,000	_____
Bind quarters and tongues	3	1.50	9,000	_____
Turning vamp	1	1.50	3,000	_____
Vamping	3	1.50	9,000	_____
Cord lacing machine operator and assembler	1	1.50	3,000	_____
Machine cementer	1	1.50	3,000	_____

Direct labor - continued

Occupation	Number Required	Hourly Rate	Estimated Annual Cost	Actual Cost
Assembly, finishing, and packing department: continued				
Making:				
General assemblers	7	$ 1.50	$ 21,000	
Shoe laster - hand	2	1.50	6,000	
Lasting machine operator	1	1.50	3,000	
Skiver	1	1.50	3,000	
Cement dipper	2	1.50	6,000	
Machine sole presser	1	1.50	3,000	
Placer, foxing, and bind - hand	2	1.50	6,000	
Foxing press machine operator	1	1.50	3,000	
Roller - finish foxing	2	1.50	6,000	
Utility	1	1.50	3,000	
Service and foxing repair	1	1.50	3,000	
Vulcanizing:				
Vulcanizer	1	1.80	3,600	
Strippers and car handlers	2	1.60	6,400	
Inspection and packing:				
Inspector	1	1.50	3,000	
Packer	1	1.50	3,000	
Total	36		$ 177,200	

INDIRECT LABOR

Manager	1		$ 10,000	
Bookkeeper	1		5,000	
Secretary-clerk	1		3,600	
Superintendent	1		7,000	
Foreman	1		6,000	
Assistant foreman	1		5,000	
Receiving and shipping	1	$ 1.60	3,200	
Maintenance	1	2.00	4,000	
Machine fixer	1	2.00	4,000	
Boiler operator	1	1.60	3,200	
Watchman-janitor	1	1.50	2,000	
Total	11		$ 54,000	

PLANT LAYOUT

A plant layout is shown on page number 24. The area required for each of the various departments is as follows:

Item		Square Feet	Total
Manufacturing building:			
Mill and calendering department		1,300	
Cutting department		750	
Assembly, finishing, and packing department:			
Stitching	450		
Making	450		
Vulcanizing*	--		
Inspection and packing	600		
Temporary last storage, bins, aisleways ..	1,025		
		2,525	
Office		225	
Washrooms		200	
			5,000
Storage building:			
Raw materials storage		1,100	
Last storage		400	
Finished stock storage		1,000	
			2,500
Total building area			7,500

* The vulcanizer is a horizontal, circular-shaped shell extending approximately 22 feet from the building. It opens into the building.

PLANT SITE

To provide for eventual expansion about 18,000 square feet of land will be required. The site should be level, well drained and located advantageously with respect to transportation facilities, power, water, fuel, raw materials, markets and sources of labor. The cost of the plant site is estimated at $1,000.

BUILDINGS

Two one-story buildings containing a total of 7,500 square feet of floor space will be required. Since inflamable materials are used the building should be fireproof and be well ventilated.

The cost of the buildings including the boiler, adequate plumbing and wiring, is estimated at about $4.50 per square foot or approximately $34,000.

POWER

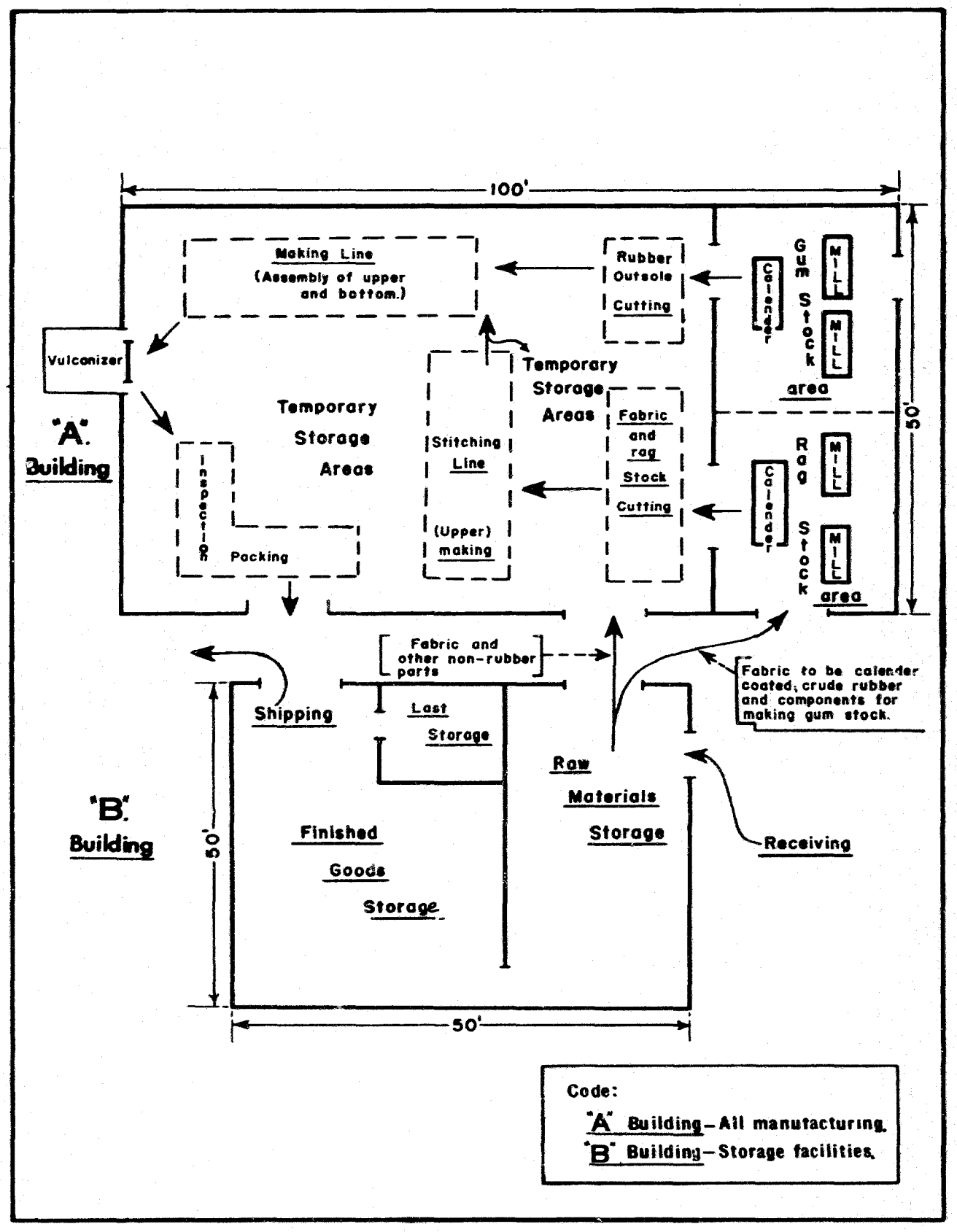
Based on the connected load the cost of power is estimated at about $250 per month or $3,000 per year.

WATER

The cost of water for production and sanitation purposes is estimated at $500 per year.

FUEL

The cost of fuel for the boiler is estimated at $2,000 per year.



PLANT LAYOUT

DEPRECIATION

Item	Estimated Cost	Years Life	Estimated Per Year	Actual Per Year
Building	$ 34,000	20	$ 1,700	_____
Machinery and equipment	172,800	10	17,280	_____
Other tools and equipment	10,000	10	1,000	_____
Furniture and fixtures	900	10	90	_____
Total			$20,070	_____

MANUFACTURING OVERHEAD

Item	Estimated Cost	Actual Cost
Depreciation	$ 20,070	_____
Indirect labor	54,000	_____
Supplies	13,000	_____
Power	3,000	_____
Water	500	_____
Fuel	2,000	_____
Total	$ 92,570	_____

MANUFACTURING COST

Item	Estimated Cost	Actual Cost
Direct materials	$ 148,178	_____
Direct labor	177,200	_____
Manufacturing overhead	92,570	_____
Total	$ 417,948	_____

FIXED ASSETS

Item	Estimated Cost	Actual Cost
Land	$ 1,000	_____
Building	34,000	_____
Machinery and equipment	172,800	_____
Other tools and equipment	10,000	_____
Furniture and fixtures	900	_____
Total	$ 218,700	_____

WORKING CAPITAL

Item		Estimated Cost	Actual Cost
Direct materials	- 30 days	$ 12,000	_____
Direct labor	- 30 days	14,700	_____
Manufacturing overhead	- 30 days	7,700	_____
Reserve for sales collections	- 30 days	57,300	_____
Total		$ 91,700	_____

CAPITAL REQUIREMENTS

Item	Estimated Cost	Actual Cost
Fixed assets	$ 218,700	_____
Working capital	91,700	_____
Total	$ 310,400	_____

SALES REVENUE

This plant produces 1,720 pairs of shoes per day. The annual production would amount to 250 x 1,720 or about 430,000 pairs.

The approximate selling price f.o.b. plant is $1.50 per pair for boys and misses sizes, $1.70 per pair for men's sizes and $1.60 for women's sizes. This is an average price of $1.60 per pair.

On this basis the total annual gross sales revenue would amount to 430,000 x $1.60 or approximately $688,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$ 148,178		_____
Direct labor	177,200		_____
Manufacturing overhead	92,570		_____
Total manufacturing cost		$ 417,948	_____
Interest on loans	$ 10,000		_____
Insurance	1,000		_____
Legal	1,200		_____
Auditing	2,400		_____
Unforeseen expense	20,452		_____
Total administrative cost		35,052	_____
Sales commissions, travel, freight out, bad debts, discounts and allowances		63,000	_____
Profit before taxes		172,000	_____
Total annual gross sales		$ 688,000	_____

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	$_____	$ 1,216	$ 14,600	$_____
20	Sales	_____	5,250	63,000	_____
30	Direct Materials	_____	12,349	148,178	_____
40	Supplies	_____	1,083	13,000	_____
51	Power*	_____	250	3,000	_____
52	Water*	_____	41	500	_____
53	Fuel	_____	166	2,000	_____
60	Unforeseen Expense (Reserve Account)	_____	1,704	20,452	_____
71	Direct Labor*	_____	14,766	177,200	_____
72	Indirect Labor*	_____	4,500	54,000	_____
80	Depreciation (Reserve Account)	_____	---	20,070	_____

Note: Administrative includes interest on loans, insurance, legal and auditing.

PURCHASE REQUISITION	COMPANY NAME	DATE

☐ 10 ADMINISTRATION ☐ 40 SUPPLIES

☐ 20 SALES ☐ 50 UTILITIES

☐ 30 MATERIALS ☐ 60 UNFORESEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

☐ DIRECT MATERIALS ☐ MAINTENANCE SERVICES

☐ MAINTENANCE MATERIALS ☐ 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 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.

SUMMARY

A small plant, built and operated according to the assumptions made in this manual 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 plant. Among the necessary determinations to be made are those with respect to the following items:

MATERIALS AND SUPPLIES

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Are 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

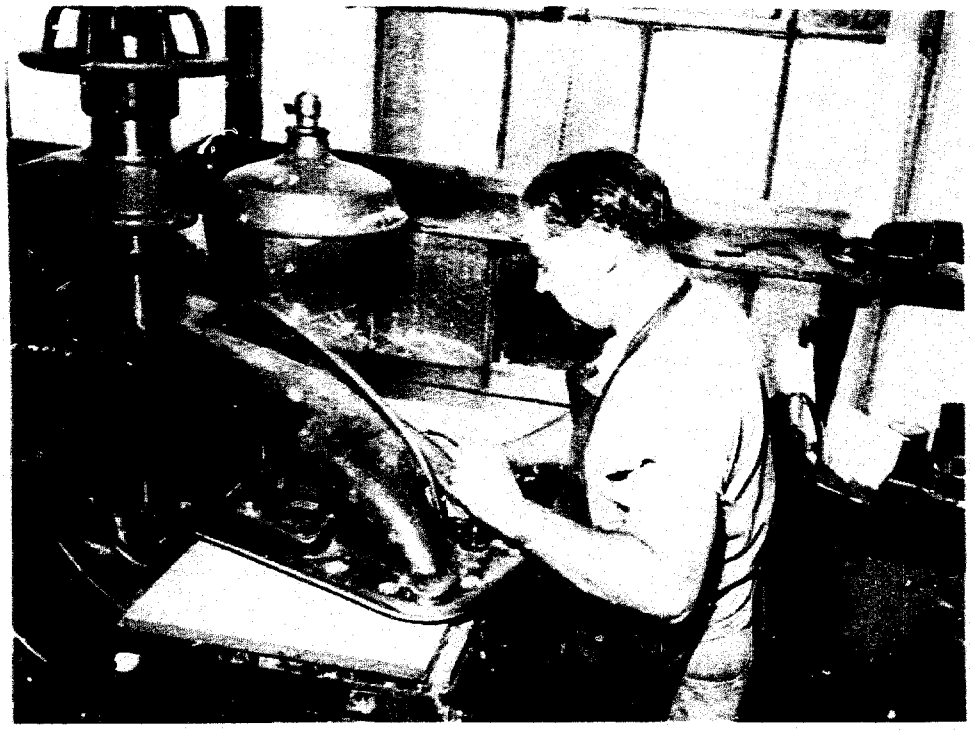
Rubber Soled and Rubber Footwear	United States Government Printing Office Washington 25, D. C.
Factory Management and Maintenance	McGraw-Hill Publishing Co., Inc. 330 West 42nd Street New York 36, New York

Periodicals

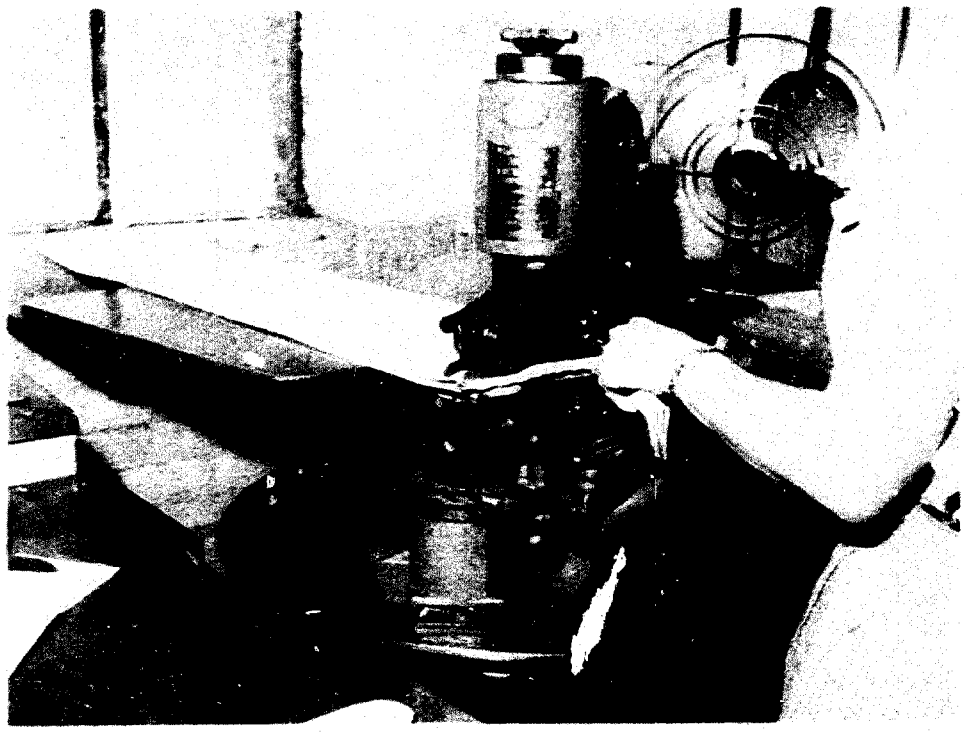
Boot and Shoe Recorder	Chilton Company Chestnut and 56th Street Philadelphia 39, Pennsylvania

ABBREVIATIONS

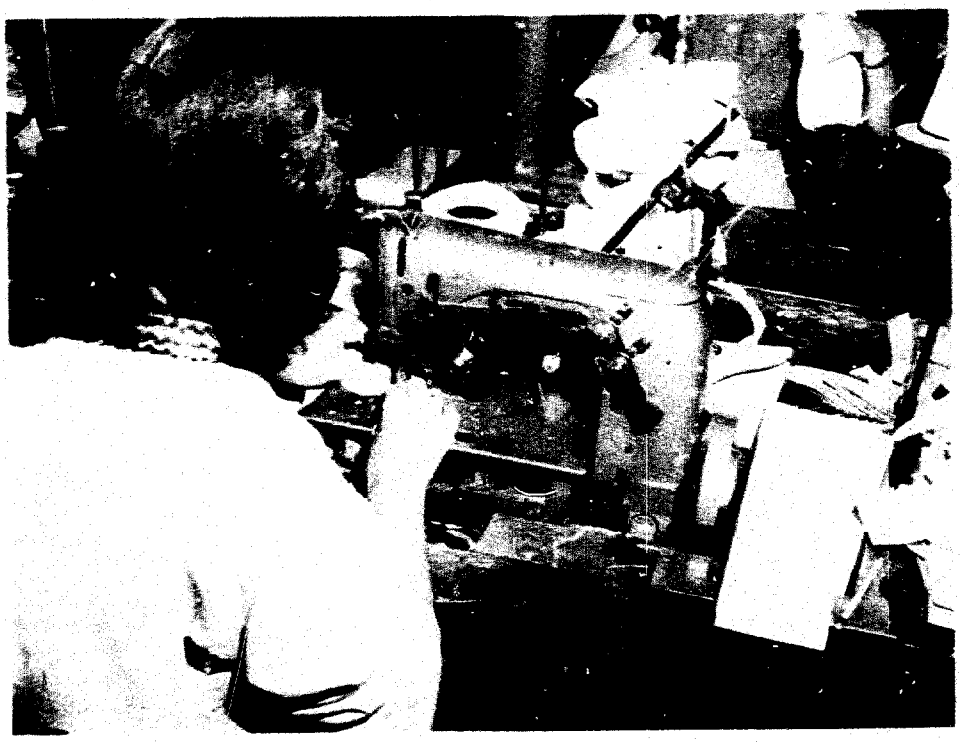
'	Foot or feet
"	Inch or inches
lb.	Pound
lbs.	Pounds
hp.	Horsepower
i.e.	That is
^{o}F.	Degree Fahrenheit
sq. yds.	Square yards
lin. yds.	Linear yards
M yds.	Thousand yards
#	Number
No.	Number
f.o.b.	Free on board



CLICKING MACHINE



INNER SOLE CUTTING MACHINE



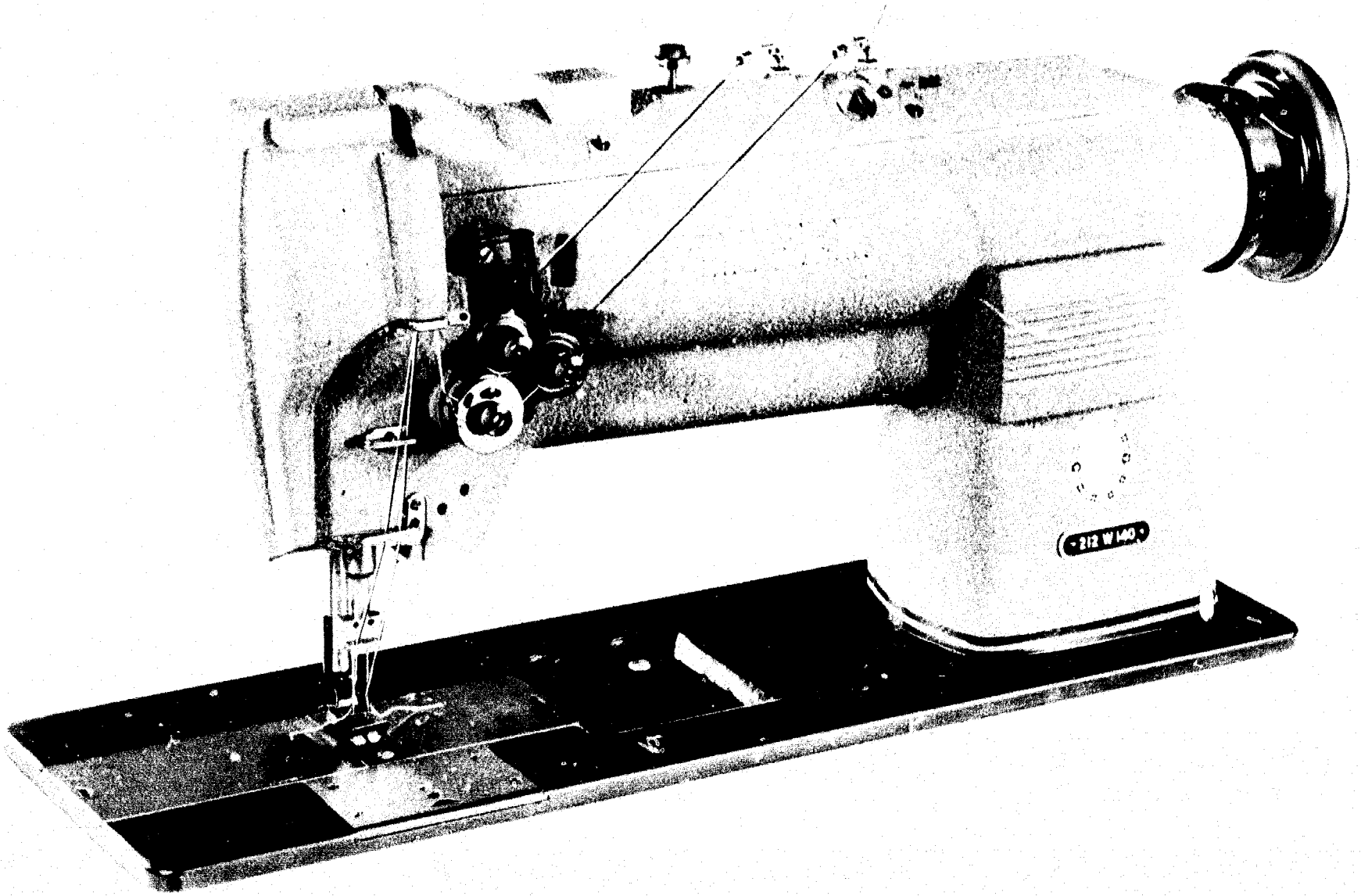
CLOSING QUARTERS

STITCHING QUARTERS TO VAMP

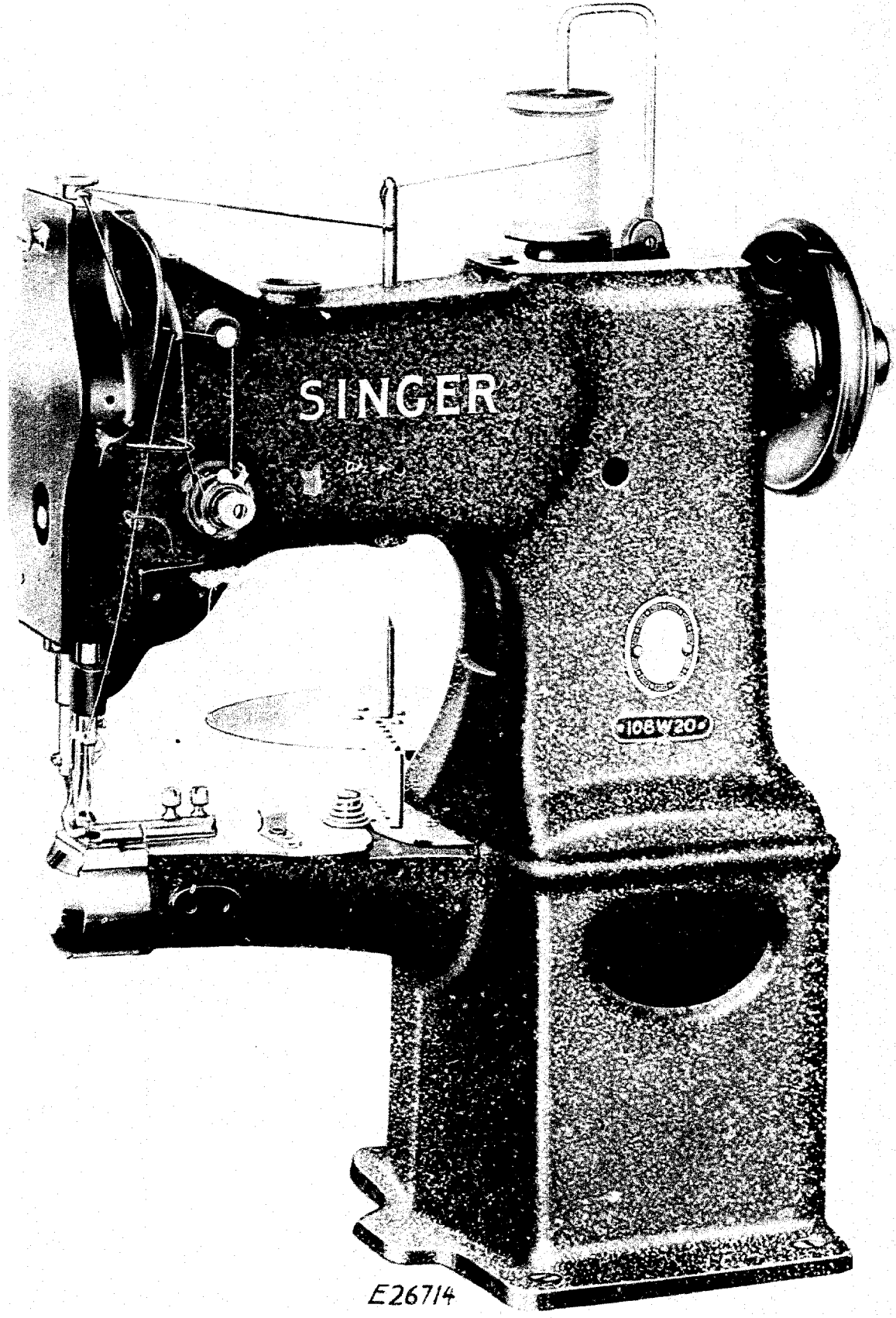
SEWING ROOM

TOE SANDING

CLOSING QUARTERS

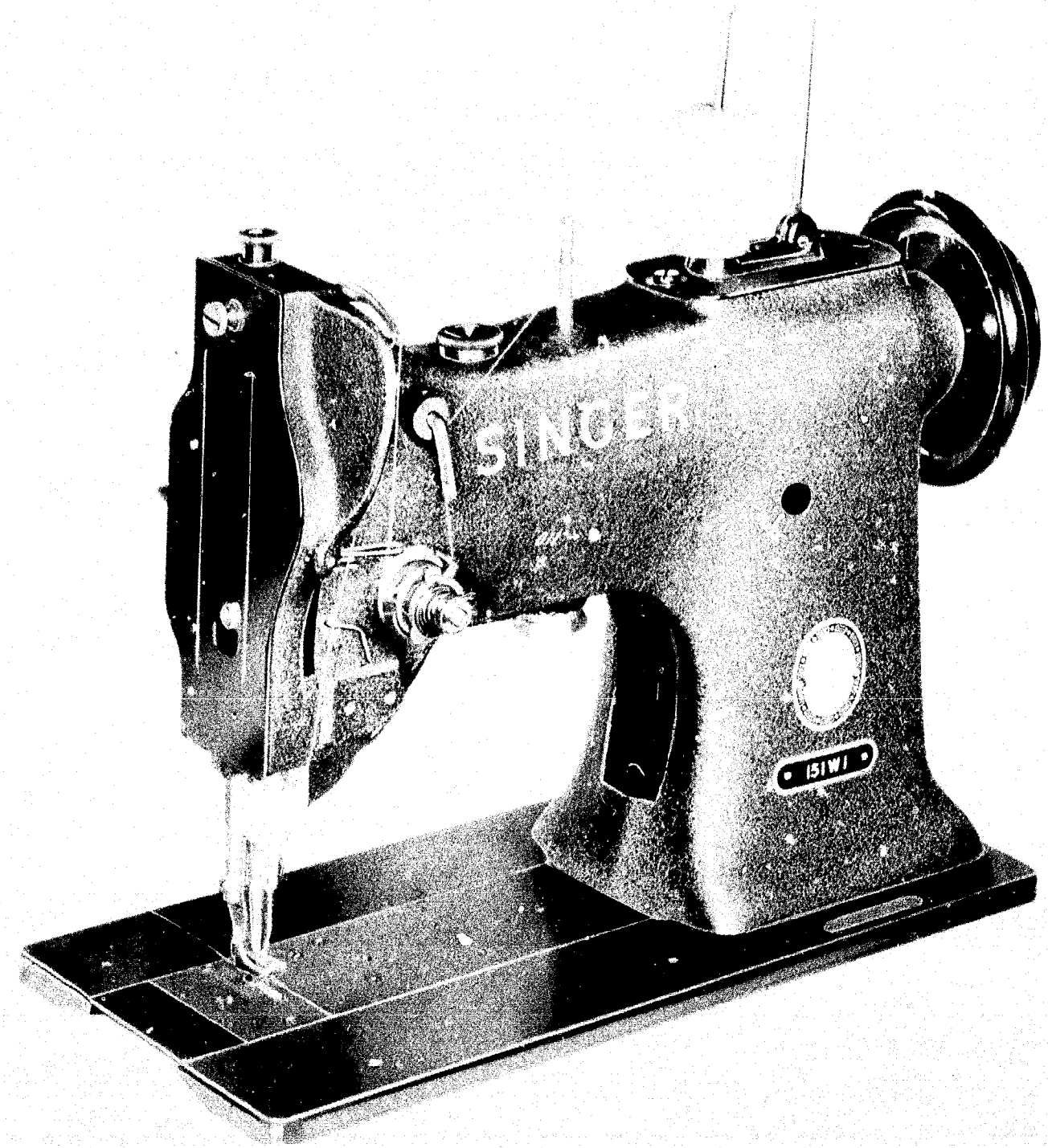


STITCHING IN COUNTERS

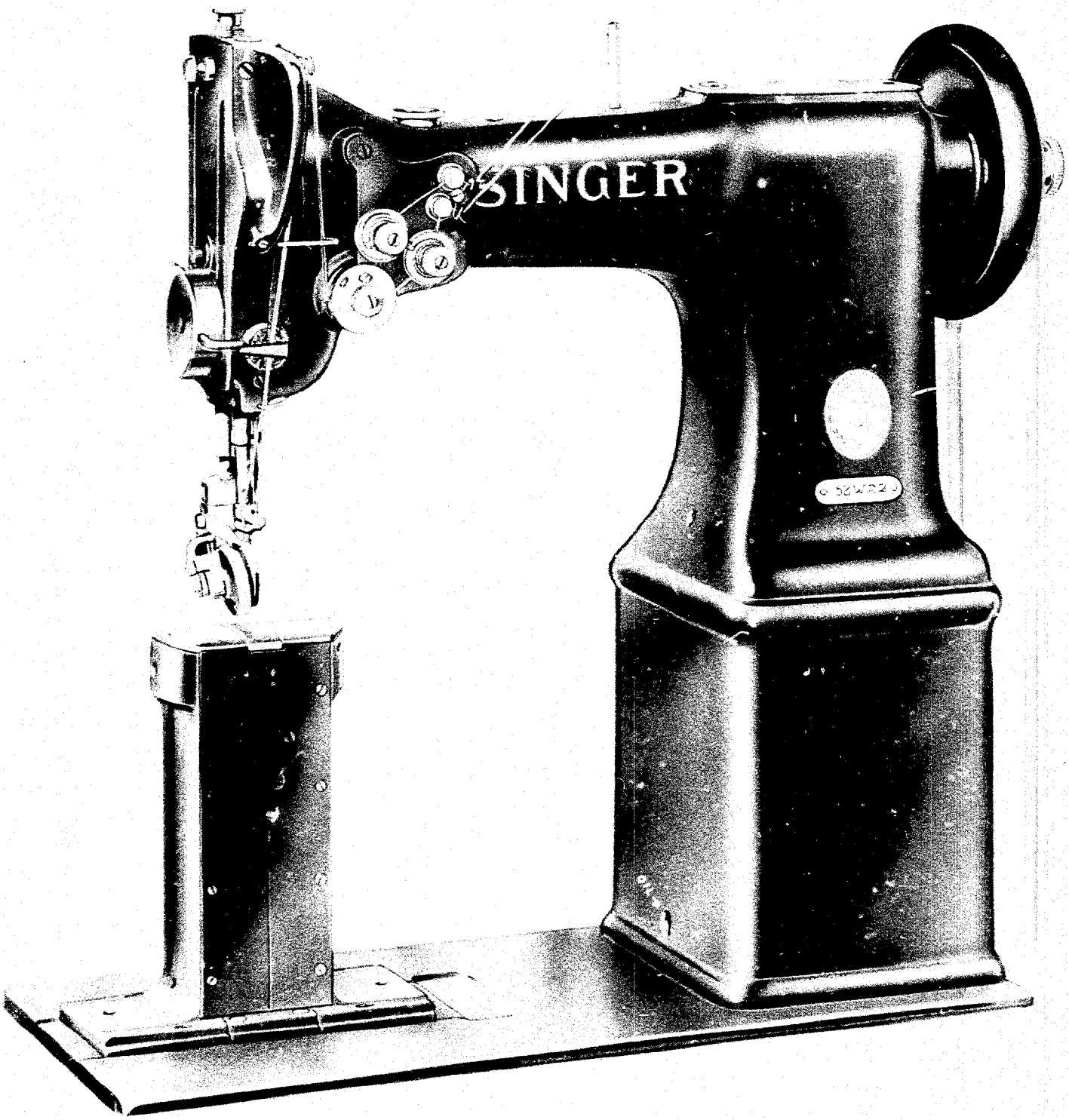


BINDING QUARTERS

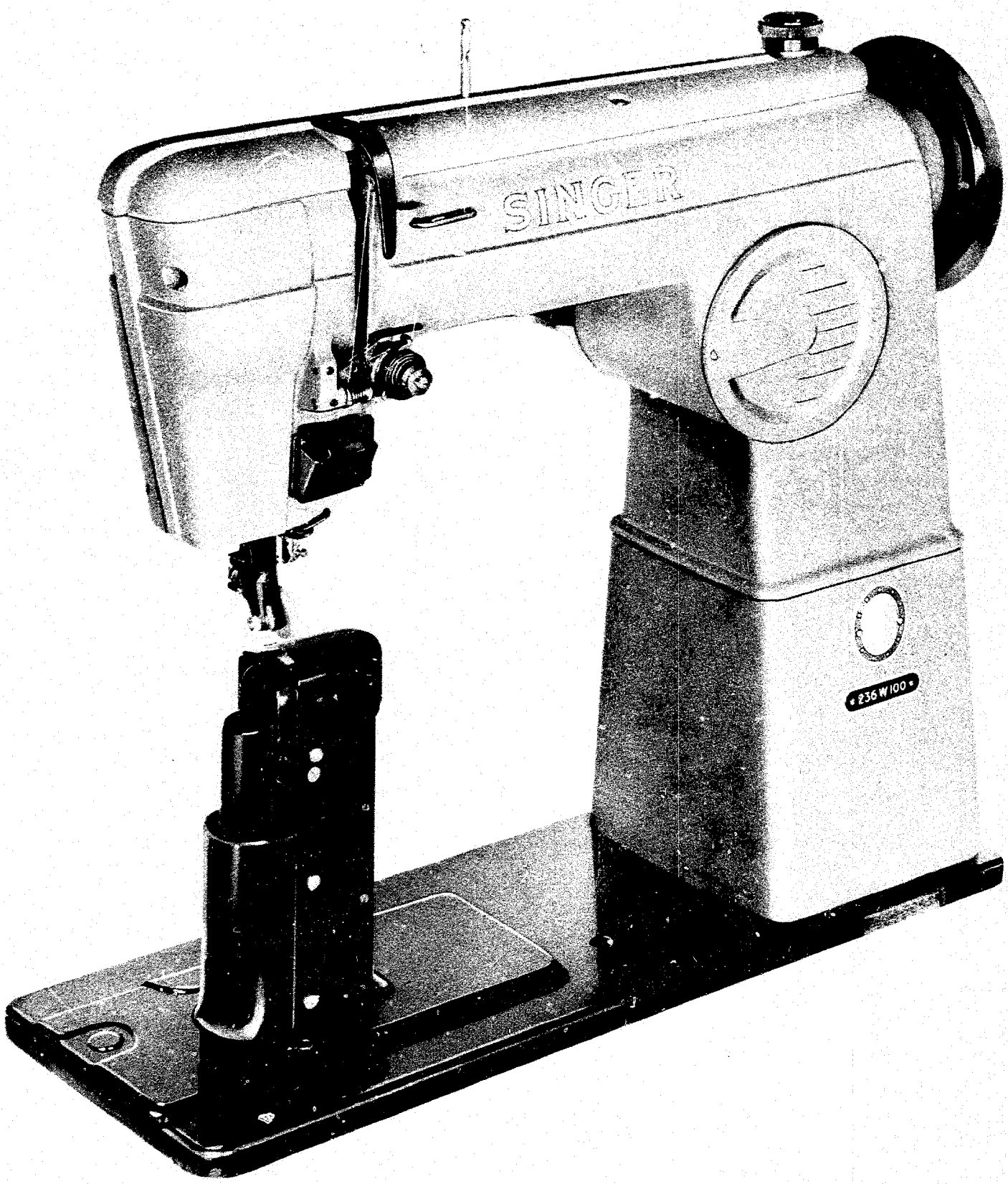
BINDING TONGUES



TURN VAMP EDGES



SEWING QUARTERS AND TONGUE TO VAMP



SEWING QUARTERS AND TONGUE TO VAMP

INTERNATIONAL COOPERATION ADMINISTRATION

SERVICES OF THE INDUSTRIAL TECHNICAL COOPERATION PROGRAM

TYPE III - TECHNICAL AIDS FOR OVERSEAS

- INDUSTRIAL REPORTS SERVICE

Provides basic information regarding:

1. Data and reference materials relating to private capital mobilization and its application in economic development.
2. Requirements for establishing and operating small factories in basic industries.
3. Man-hour requirements, operational characteristics, and equipment utilization in representative U. S. factories in selected industries.
4. Man-hour and materials savings through standardization, simplification, and specialization studies.
5. Supervisory and other specialized training procedures and techniques.
6. U. S. experience in specialized fields.

- TECHNICAL DIGEST SERVICE

Provides digests and abstracts, full length articles, and bibliographical references on U. S. developments in products, processes, and work techniques derived from U. S. technical, scientific, and trade periodicals, and other pertinent sources.

- TECHNICAL INQUIRY SERVICE

Provides answers to individual questions relating to products, processes, machinery and equipment, production operations, work techniques, management practices and concepts, factory engineering, and basic requirements for industrial production.

- TRAINING MATERIALS SERVICE

Provides basic materials for use by specialized technicians in the conduct of management, supervisory and specialized training courses in host countries.

- TECHNICAL LITERATURE SERVICE

Provides recommendations and guidance regarding current useful world-wide publications relating to industry and productivity improvement; distributes carefully selected and representative new publications of particular value for program use; and facilitates mission literature procurement.

- U. S. BOOK EXCHANGE SERVICE

Provides, on Mission approval, technical and scientific books and periodicals on exchange basis to overseas libraries.

- VISUALS AND NEW MEDIA

Provides technical advice and guidance to missions on new industrial visuals. Provides for cooperative program adaptation and use a variety of visual materials, including loan exhibits, silk-screen display panels, graphic brochures, slide and sound kits, and related materials.

- TECHNICAL FILM SERVICE

Provides guidance for and facilitates procurement of U. S. technical and training films for program use; provides representative U. S. technical industrial films and filmstrips on loan basis for short-term program requirements; and facilitates adaptation of films into foreign language versions for program use overseas.