

**PLANT REQUIREMENTS
TO SET UP AND OPERATE
A MEAT PROCESSING PLANT**

37

TECHNICAL ASSISTANCE

**INTERNATIONAL COOPERATION
ADMINISTRATION**
Washington, D. C.

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 MEAT PROCESSING

INTRODUCTION

The purpose of this manual is to provide information about the establishment and operation of a small meat processing plant. The manual provides a description of the slaughtering and of the processing of meat products as these activities might be carried out in a small plant in United States. It includes a description of the plant layout, equipment and personnel and estimates of investment, operating costs and revenues.

Local situations might make some changes desirable but the plant described is satisfactory for a considerable variation in materials and methods of processing and product without serious modification of the design and operation.

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 but some of the personnel are required to work at night and some more than 40 hours per week.
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

The product specifications are based on the assumption that the plant will be engaged, chiefly, in the slaughtering of hogs and the processing of fresh pork and pork products resulting therefrom. It also slaughters other types of livestock, but on a very limited basis.

The plants production will be as follows:

	<u>Per Cent</u>
<u>Fresh Pork Primal Cuts</u>	
Hams, loins, shoulders, feet, tails, bellies	12
Pickled, smoked, and boiled hams and bacon	38
Lard (fats)	20
<u>Pork Products</u>	
Fresh pork sausage	10
Other sausage products such as frankfurters, salamis, bolognas	5
Scraple	10
<u>Other Slaughtering</u>	<u>5</u>
Total	100

PRODUCTION CAPACITY

Number of hogs slaughtered annually	12,000
Total live weight per year	27,750 cwt
Average 231.25 lbs.	6,716.5 cwt loss
Total dressed weight per year	2,103,350 lbs.

MANUFACTURING UNIT

The manufacturing unit is one pound. Market prices for hogs and for large quantities of the products of the industry are generally based on hundredweight.

MANUFACTURING OPERATIONS

The plant's operations are performed in the following departments: killing; which includes dressing, and cutting; scrapple making; sausage making; pickling, smoking, and boiling of hams, and the curing and smoking of bacon; rendering and printing lard; and the packaging of certain of the processed products. Refrigeration is required during the entire operation after the animal is dressed.

Killing and Cutting Department

Hogs. Local farmers supply the plant's hog requirements and all deliveries are made by motortruck. A driveway along one side of the plant building leads to a raised enclosed platform scale. The hogs are unloaded from the trucks directly onto the scale. Each hog is weighed and a record is kept for each supplier's shipment. The supplier is paid so much per pound, live weight. Each supplier's shipment is processed through the killing line as a unit.

Killing, as the term is used in the plant and in this manual, includes every step from the shackling of the animal, prior to its being bled, until it is a dressed hog carcass ready for chilling, prior to cutting.

Killing and cutting operations are performed on three days of the workweek. The men working in this department begin their workday with cutting operations, cutting up hog carcasses killed on a previous day. Cutting can only be done effectively and efficiently on carcasses which have had an opportunity to become chilled or "firmed-up" in the hog chillbox for at least one night. As the cutting operations near completing, certain men on the cutting tables shift to the performance of certain tasks preparatory to the

killing process. Once the initial preparations have been made and the killing process has begun, the rest of the men on the cutting tables assume their positions on the killing line.

From the platform scale, the hogs are driven into hog pens to the rear of the killing and cutting room. When killing is scheduled to begin the following morning, the man who shackles and bleeds the hogs and the worker at the scalding vat proceed to drive the hogs into a hog alley adjoining the hog pens. This alley opens into the shackling pen. The shackler opens a gate and allows one hog to enter the pen. He then attaches an iron shackle and starts an overhead electrically-operated conveyor, called a hog hoist, which carries it to the bleeding rail.

After the hog is dead it is pushed to a point in the cutting room where a worker, called a hog dropper, releases the suspended hog from the shackle and the hog drops, via a short chute, into a large scalding vat. The scalding vat stands on a raised platform level with the scalding vat, and pushes the hog through the heated water in the vat, using a long wooden pole. About eight hogs can be kept moving through the vat at a time. When the hog has been pushed the length of the vat, it falls into a metal cradle resting on the bottom of the vat. This cradle is a part of the dehairing machine which follows the scalding vat in a direct line.

Scalding is done to prepare the hog for dehairing. It softens the hair on the hog and makes it easier to remove from the body. Water in the vat is kept at a temperature ranging from 138°F. to 145°F. The temperature of the water is varied with the thickness of the hair on the hogs being processed and the degree of hair thickness varies with the seasons of the year. In the fall, hogs have little hair on their bodies and a lower water temperature is maintained. In the summer when hogs' hair is thickest the water temperature is raised. Water temperatures must be carefully watched as too high a temperature for the requirements will soften the skin. If this occurs the beaters used to remove the hair in the dehairing machine will cut the skin.

After the hog has been in the vat about a minute or two, the scalding vat starts the powered cradle in motion and causes it to throw the hog up and over into the dehairing machine. The dehairing machine has 72 flat-tongued beaters attached to the drive shaft of the machine. These beaters begin operating as the cradle starts moving and the hog is spun round and round as the beaters remove most of the hair from its body. Two average-size hogs, approximately 200 pounds, can be processed in the dehairing machine at the same time. After about one minute in the dehairer, the scalding vat stops the beaters and sets a cradle on the opposite side of the machine in motion. The hog falls into the cradle and is then thrown off onto the gambreling table. This is a metal, curved-top table, approximately six feet wide by six feet long. Here one man known as a shaver, shaves the head and shoulders of the hog with a knife and pulls the hog's toe nails with a hooklike implement. A second man assigned to the

gambreling table is known as a gambreler. After the shaver has done his job, the gambreler attaches each hind foot of the hog to the hooks at each end of the gambrel, a metal rod, approximately two feet long, with a hook at each end. The gambrel is then attached to an overhead rail. The hog is suspended by its hind legs, and the cleaning and dressing of the hog continues, via overhead track, along a path following a semicircular route which ends near the refrigerated hog chillbox. Workers on this line are spaced a few feet apart. The first worker to dress the hog after it leaves the gambreling table is also known as a shaver. Using a knife he shaves the rest of the hog as it hangs from the rail, and washes it with a water hose. Then he pushes the hog on to the next man, a gutter. The gutter uses a knife to open the hog at the stomach area. He removes the edible entrails, such as the stomach, heart, liver, and milts (spleen), most of which are used for scrapple making. These edible parts he throws upon a small inspection table at which a State inspector sits. The inspector (a veterinarian) examines the parts for disease or parasites and promptly tosses off as waste any diseased or affected parts. These condemned parts are sold to inedible renderers. Those parts which he finds free of any disease or parasites he tosses on to the "gut-table" which stands nearby. The gutter removes inedible offal, which includes the lungs, and this too is thrown into waste barrels which go to renderers of inedible products.

Two workers are assigned to the "gut-table." One is a casing puller who manually removes the skin from the small intestines of the hog for eventual use as the natural casings used for fresh pork sausage. The other worker is the chitterling cleaner. He uses a knife to clean the chitterlings (small intestines), and he sets the caul fat (stomach cover) and ruffle (gut) fat to one side for use in the lard which the plant renders. These two men also separate the heart, liver, and milts and place them in metal trays.

After the gutter performs his task on the line, the hog is pushed on to the splitter. He uses a cleaver to split the hog down the middle, and he chops off the head, dropping it on the "head-table" which is placed at this point in the line. A butcher works at the "head-table," shaving and cleaning the head and removing the eyes and ear drums which are thrown off as waste. Most of the heads are used in the scrapple making process, but some heads will be boned at this table, that is, the meat will be removed from the skull. This meat is pickled and sold as souse which is similar to pickled pig's feet. The skullbone is sold to inedible renderers.

On the line, the splitter pushes the carcass along to a worker known as the ham facer and leaf-lard puller. Using a knife, this worker cuts the ham and faces it for easier removal during the cutting operations. The ham remains hanging in the carcass. While facing the ham he also pulls the arteries in it so that the man who subsequently picks the ham by injecting it with a pickling solution, will not have any difficulty in finding the arteries through which the solution is pumped.

He also pulls the leaf lard in the hog, that is, he cuts it partially, and leaves it hanging in the carcass for removal during the cutting process. He removes the kidneys, too, throwing them into metal kidney trays. Kidneys are used in scrapple and also sold fresh.

The "ham facer and leaf-lard puller" is the last of the 12-man crew engaged in killing and dressing hogs. When he completes his task, the hog carcass is dressed. It is pushed, a few feet, to a temporary storage area where it hangs long enough to cool slightly. Then it is weighed, examined by the inspector, approved, and officially stamped by him if found satisfactory, and pushed into the big chillbox, still suspended from the gambrel. It hangs in the chillbox for at least one night, and is brought out on an ensuing day for cutting. Killing time varies with the number of hogs slaughtered, but, generally it requires about two hours each day that slaughtering takes place.

Other Livestock. The killing of livestock other than hogs is a minor part of the plants operation. The methods followed differ in some ways from those described for hogs and specially skilled persons perform the various operations.

Scrapple Department

The scrapple room opens into the killing and cutting room. There is one worker called the scrapple man, who spends most of his time in the department and another man who helps him when not engaged cleaning chitterlings during the killing operations or when not engaged elsewhere in the plant.

Ingredients used in the making of scrapple are brought in metal trucks and trays to the scrapple room. They are weighed, as required, and put into the two scrapple cooking pots. The pots are kettle-drum shaped and have agitator attachments which are lowered into the vats during a part of the scrapple making process. Each pot has a 900-pound capacity and a diameter of approximately four feet. The cooking is done by steam supplied from the boiler servicing the plant.

Some of the ingredients are weighed and others are counted. Per scrapple batch, the following parts of the hogs, and the amounts of each, are used.

- 35 heads (Average weight, per head, 11 pounds)
- 25 liver pieces (Weighing an approximate total of 75 pounds)
- 25 pounds of hearts
- 25 pounds of kidneys
- 75 pounds of pork skins
- 10 pounds of milts (Spleen)

The above ingredients are placed in a pot and cooked for approximately two hours. Everything is then removed from the pot, including the liquor or broth created by the head bones; the broth is kept separate. The heads are boned and the skull sold. All the meat is then ground in a meat grinder.

After grinding, the resultant mass is returned to the pot and the broth is added until a 50 per cent meat and 50 per cent broth batch is obtained. The meat and liquor are thoroughly mixed and cornmeal is added and blended until a desired pastelike consistency develops. Approximately 100 pounds of cornmeal are required. After the cornmeal has been added, the agitator attachment is lowered into the pot and mixes the contents while the batch is cooked for one and a half hours. Following this second cooking, the mixture is scooped out with a ladle and placed in a filling machine. The filling machine automatically drops the soft, pastelike scrapple into one pound or two pound aluminum pans, depending on the amount of scrapple the machine is set to drop at a single discharge. As the scrapple is chilled, it hardens. In the winter, the hardening will take place in the scrapple room, without the need for any refrigeration. In the summer, the scrapple must be refrigerated to harden.

The gelatinlike substance which results from the cooking of the pork skins in the mixture, aids the setting or hardening of the scrapple. When the scrapple has hardened it is blown out of the aluminum pans by a foot-controlled, air-pressure valve. The scrapple molds are then wrapped in parchment paper and kept refrigerated in the pork sales refrigerator in the killing and cutting room.

Scrapple production, more so than the production of other pork products, is maintained on a level as consistent with current demand as possible because fresh scrapple must be sold within a short time after it is made or it deteriorates, even if kept refrigerated.

The scrapple man and his helper also perform other duties.

A hog-casing cleaner in the killing and cutting room is operated by the scrapple man. When the casing puller in the killing line pulls the skin or casing from the intestines, the scrapple man drops the casing into drums where it ferments. This fermenting makes the subsequent stripping of the casing easier. After fermentation has occurred the scrapple man places the casing in the hog-casing cleaner. He removes the cleaned casings from the cleaner and puts them in a barrel where they are salted and cured and thus kept from spoiling. A worker in the sausage department flushes and cleans the casings before they are used as natural casings for fresh port sausage. The hog-casing cleaner is included in the listing of equipment shown for the "kill and cut" department.

Sausage Department

The sausage department is a partitioned space near the scrapple department, and opens into the killing and cutting room. This department has two workers. One is the sausage maker who weighs the amounts of meat and spices which are used in making the various types of sausage products; operates the machinery used in the department; and, with assistance, takes care of the smoking of those sausage products which are smoked. The other full-time worker in the department is called a linker who performs many tasks in the

department in addition to linking sausage, including flushing the natural casings which were cleaned in the scrapple room. After the cleaned casings are removed from the drum in which they were salted, they are flushed by running water through them. This cleans the salt solution from the casings and also enables it to be checked for holes. These natural casings are used only for fresh pork sausage, as such sausage is made to be eaten with the skin or casing. Other sausage products made in the plant have artificial cellulose casings which are to be removed before the product is eaten. These products are skinless frankfurters, bolognas and salamis. Liverwurst is stuffed into a cloth casing.

In accordance with the production needs for the day, as outlined by the owner the first thing each morning, the sausage maker obtains the various meat cuttings to be used in the sausage products. These meats come from the pork or beef sales refrigerators in the killing and cutting room and are brought to the sausage room in metal tub-type hand trucks.

The sausage maker weighs the appropriate amounts of meat and meat trimmings for the sausage product he is about to make. Fresh pork sausage, which represented 70 per cent of the weight of the department's production during the reported week, is made up in 200-pound batches of the following meat cuttings:

	<u>Pounds</u>
50 per cent lean and 50 per cent fat pork trimmings	100
Butt trimmings (lean meat off butt)	35
Lean meat from primal cuts boned down	<u>65</u>
Total	200

Skinless frankfurters, bolognas, and salamis are made up in smaller batches and consist of:

	<u>Per Cent</u>
Pork trimmings	40
Full carcass beef	40
Boneless fore-quarters of veal	<u>20</u>
Total	100

Meat loaf, a sausage product which is made on occasion, consists of:

	<u>Per Cent</u>
Pork trimmings	40
Boneless fore-quarters of veal	40
Full carcass beef	<u>20</u>
Total	100

Liverwurst is made from pork livers.

After weighing the meat components, the sausage maker puts them into a meat mixing machine. He adds the proper seasonings such as salt, pepper, sugar, and sage in the appropriate amounts depending on the

specific sausage product. Types of seasoning and the amounts of each used are determined on the basis of local tastes and demands. The blended mixture is taken from the mixer, put in a double-plate meat grinder and ground. Sausage products which do not require a more finely ground meat are then ready for the stuffing machine. These items are bologna, a small percentage of salami, and approximately 50 per cent of the fresh pork sausage. Where a more finely ground or emulsified type sausage product is desired, the next step involves placing the ground meat in a "chopper" or "silent cutter." This machine causes the meat to become a paste-like mass, which is used for meats for skinless frankfurters, the remainder of the salamis made, and for the remaining 50 per cent of the fresh pork sausage. To meet customer demand, fresh pork sausage is made in both the emulsified style and the coarser type.

The stuffing machine is used to stuff the different sausage products into their casings. It can be adjusted for use with different spouts, depending on the thickness of a specific sausage product. The sausage maker places the casing over the spout and starts the stuffer which fills the casing with the ground meat.

Linking sausage is the next step. Sausage products with artificial casings, such as skinless frankfurters, are linked on a linking machine which can be adjusted to receive sausage items of varying thicknesses and set to measure desired sausage lengths. It separates the long length of sausage into smaller links by automatically thread-tying the sausage at specific intervals. Fresh pork sausage is linked by hand.

After linking, fresh pork sausage is placed on link-racks and stored in the fresh pork sausage refrigerator for subsequent packaging and sale. It receives no further processing, as it is neither cured nor smoked. The other sausage products are cured and smoked. Curing preserves the meat and helps it retain its reddish color. Smoking cooks the meat and prevents exterior spoilage in addition to imparting the desired "smoked" taste. Any product which is to be smoked must first be cured. A pickling or curing solution is added to those products which are cured, in either the first grinding operation, for non-emulsified type sausage, or in the silent-cutter operation, for emulsified style sausage. The pickling solution is made of commercial type cure to which has been added salt, sugar, monosodium glutamate and water to bring the solution up to a 70 per cent solometer reading. Commercial cure consists of 4 per cent nitrite, 6 per cent nitrate and 90 per cent salt.

Cured sausage products are smoked and cured by the sausage maker and his helper after they have been linked. There are two "smoke trees" in the department. They are three feet six inches by three feet six inches square rack-type frames on which the cured sausage products are hung. The trees are suspended from an overhead track and after the racks are loaded, they are pushed along the track, into the smokehouse in the sausage room. The smokehouse is a gas-fired two tree, double door smokehouse which accommodates both trees at one time. Hickory wood is burned below the gas unit. Smoke created by the smoldering wood imparts the smoked taste to the products.

The time required for smoking varies with the size and weight of the sausage product being smoked. Skinless frankfurters generally require two and one half to four hours of smoking. After smoking, frankfurters still hanging on the smoke tree, are removed from the smokehouse and pushed into a steam-heated cooking chamber large enough to accommodate one tree. Here, the frankfurters are steam-heated until an internal temperature of 150°F. to 155°F. is reached. The frankfurters are then removed from the chamber, placed on a rack-type truck and stored in refrigerators. They are subsequently packaged in cellophane.

Bologna salami, and other smoked products are cooked in the smokehouse merely by increasing the temperature of the heat after they have been smoked. These larger sausage products are not packaged.

Pickling and Smoking Department (Ham and Bacon)

Pickling of hams is done by the worker who places the fresh ham on a pickle pumping scale. Using a pickle pump, he proceeds to pump the pickling solution into the ham through the arteries. The arteries have been pulled and tied during the killing process by the ham facer and leaf lard puller so that the pickler has no difficulty in locating an artery through which to begin the pumping of the solution. The pickling solution is the same as that used in curing sausage products and it is known as a sweet pickle liquid cure. All hams which are to be smoked or subsequently boned and boiled, are pickled.

As noted previously, all smoked products must be cured before smoking. Curing helps to preserve the meat and sets or fixes its reddish color. The amount of pickling solution pumped into a ham should equal 10 per cent of the weight of the ham. The pickler is guided in the amount of solution he pumps into a ham by the pickle pumping scale. After the pickler has pumped the solution into the hams, he places the hams in pickling barrels. These barrels are put into a refrigerated walk-in box and remain there from 7 to 14 days, after which they are removed. Depending on the day's production needs, some of the pickled hams are smoked. Those pickled hams which are to be boned and boiled, for sale as boiled hams, remain in the pickling room where they are just boned. Boned hams are then put in stainless steel molds which, in turn, are placed in a sheet metal steam-heated cooking tank until an internal temperature of 152°F. is reached. This takes about 25 minutes per pound of meat in a ham. Approximately 30 hams are cooked at a time. If possible, the pickler attempts to place hams of equal weight in the cooker at one time. However, this is not always feasible, as weight differences do exist and there may not be enough hams of a particular weight to provide a single batch. In such a case, the pickler puts the hams into the cooker according to their weight, the heaviest going in first and the others being added at different time intervals, depending on their weight. This is done so that the entire batch will be ready for removal from the cooker at the same time.

When a primal cut, known as the belly, is cured and smoked, it becomes bacon. The worker who does the bacon curing is known as the bacon rubber.

A dry cure is employed in the curing of bacon. It is made of the same components as the liquid pickling solution except for the absence of water. The bacon rubber rubs the dry cure, by hand, on the belly cuts, and then places them into rectangular-shaped boxes. Each bacon box is packed with 625 pounds of these bellies and the box lid is pressed on until the box is virtually airtight. Twenty-eight pounds of dry cure are used per 625 pounds of bacon. Packed bacon boxes are kept there from 7 to 14 days, removed, and sent to the smokehouse. The pickled hams and cured belly cuts are hung on smoke trees suspended from overhead tracks. The trees are then pushed into the two-tree smokehouse which is gas-fired and utilizes hickory wood for smoking.

Depending on the weather and the weight of the individual hams and bellies, smoking of these products requires from 18 to 24 hours.

Smoked hams are placed in the pork sales refrigerator and sold in bulk form. Bacon, however, is rarely sold in bulk form. After smoking, it is placed in a freezer-refrigerator. Freezing of the bacon makes it easier to slice.

Lard Rendering and Printing Department

Caul fat, ruffle fat, leaf lard and all other so-called green pork fat found in a hog, are accumulated in barrels or drums. The worker in the scrapple room fills a wheelbarrow with the above pork fat and pushes it into the storage room adjoining the scrapple room. Batches of fat ranging from 1,800 pounds to 2,000 pounds are cooked in the lard cooker at one time. The gas-fired cooker renders the lard. The resultant liquid lard is pumped, by a centrifugal pump connected to the cooker, to a metal settling tank. Lard cracklings which are deposited at the base of the lard cooker, are pressed in a crackling press and subsequently sold for use as cracklings for chicken feed. Cracklings are the crisp residue of the hog fat.

Liquid lard is kept in the settling tank approximately one hour so that the sediment therein can settle to the bottom of the tank. The clear liquid lard is then drawn off through a pipe line leading to a lard cooling agitator in the lard printing room. The cooling agitator is connected with a filling unit. It chills the liquid until it becomes thick enough to be run through the filling machine into parchment lined cartons. A tray full of these cartons is placed below the mouth of the filling machine which is set to release exactly one pound of lard into a carton each time the operator presses the foot pedal. The printer positions the cartons under the mouth of the filling machine to receive the pound of lard. Filled cartons are set in trays on a nearby table and the lard is permitted to harden into the mold or form, which produces a uniform shape or "print." Some of the liquid lard is also run off into 50-pound cans for sale to large users of lard. Packed lard is stored in the pork sales refrigerator.

Packaging Department

The packaging department is staffed with four packers. The packaging room is used primarily for packing sliced bacon into cellophane-wrapped half-pound and pound packages. Bacon is sliced on a slicing machine, weighed, and then hand-wrapped. A sealing iron is used to seal the cellophane so that the package does not become unwrapped until the consumer wishes to use the bacon. Fresh pork sausage and skinless frankfurters are also hand-packaged in cellophane wrappers. The packers wrap one-pound or two-pound scrapple molds in parchment paper and pack them into cartons in the lard printing room. Bulk items, such as bolognas, salamis, and hams, are not packaged. All of the packers, at one time or another, assist in some meat-processing chore.

Inspection

In the selected plant, as in all properly operated food-processing plants, the primary function of inspection is to see that sanitary conditions are maintained, and that the products are fit for human consumption. Every employee in the selected plant is expected to report unclean conditions or the presence of contaminated meat which has not been so labeled.

Shipping Department

Local deliveries will be made by refrigerated truck. Care must be taken to maintain cleanliness and other sanitary provisions of these trucks.

DIRECT MATERIALS

The basic raw material for the plant described in this manual is the livestock itself. Livestock represents almost 80 per cent of the plant's total manufacturing costs. All other direct materials used in the making of the pork products, such as spices, liquid, and dry cures, account for less than two per cent of the total manufacturing cost.

Approximately 10 to 12 calves are slaughtered each week to provide the forequarters of veal used in sausage products. The remainder of the animal is sold to the trade. Approximately 225 pounds of veal fore-quarters is used each week. Beef used in some of the pork sausage products is purchased as boneless beef from large cattle slaughtering houses. Approximately 400 pounds of boned beef is required in an average week.

No inventory of livestock is maintained. Hogs are slaughtered on the day after they are delivered and, in some instances, on the day of delivery. If possible hogs should be kept in the pens overnight so that they can lose some of the tension created by their being moved to a new location. Hog meat, is generally more tender after

the hogs have had an overnight stay at the plant. Other types of livestock are delivered during the day slaughtering is scheduled. All animals are delivered to the plant by motortruck. No inbound freight is paid on raw materials.

Cornmeal, for use in scrapple production, is purchased in 1,000-pound quantities. This amount will suffice for one to one and a half weeks.

Some of the spices used in the different sausage products are ground gemel, caraway, red peppers, black pepper, white pepper, salt, sugar, mace, nutmeg, and various sages. Of these spices, white pepper, sugar, salt, and Dalmation sage are used in larger quantities. Scrapple also requires considerable quantities of sale. The amounts of these four spices which are kept on hand, generally are:

		<u>Pounds</u>
White pepper	(one month supply)	150
Sugar	(two month supply)	500
Salt	(two month supply)	5,000
Dalmation sage	(one month supply)	100

The other spices are brought in 10-pound quantities as only a few ounces are used per 100-pound batch of scrapple.

Artificial casings for skinless frankfurters, salamis, and bolognas are purchased. They are made of cellulose and the plant generally uses "visking" casings. Natural casings for fresh pork products are prepared from the casings or intestines of hogs slaughtered in the plant.

The pickling department prepares the solution which is used to pickle hams. Chemicals are purchased and mixed, as required. This plant uses a sweet pickle liquid cure. It consists of a commercial type cure plus salt, sugar, monosodium glutamate and water added to bring the solution up to a 70 per cent salometer reading.

The same ingredients listed above for the liquid cure are used for dry curing bacon, except that water is not added to the chemicals.

Some lard fat is purchased periodically to take full advantage of the plant's lard rendering equipment. Approximately 25 per cent of the lard fat the plant renders is purchased from outside sources.

The spices, pickling ingredients, and lard fat will be purchased from local wholesalers so that the stocking of these items offers no production problem. All deliveries of these items are made to the plant by motor truck.

COST OF DIRECT MATERIALS

Hogs will be purchased delivered at the plant. The average weight will be 231 pounds and the average price \$11.00 per cwt.

The average prices shown for Chicago quotations for 200 to 220 pounds hogs were --

\$16.750 per cwt. for April 14, 1959 and
\$16.625 per cwt. for April 21, 1959

The price used in this manual makes reasonable allowance for the inconvenience and cost of shipping to Chicago.

<u>Item</u>	<u>Estimated Local Price</u>	<u>Annual Cost</u>	
		<u>Estimated</u>	<u>Actual</u>
Livestock			
12,000 hogs, 231 lbs. each at \$11.00 cwt.		\$ 304,920	_____
112 cwt. veal at	\$ 23.00	2,576	_____
200 cwt. boneless beef	25.00	5,000	_____
Corn meal 550 cwt.	4.06	2,233	_____
Spices		560	_____
Chemicals		200	_____
Sugar 3,000 lbs.	.09	270	_____
Salt 30,000 lbs.	.02	600	_____
Other		161	_____
Total Direct Materials		\$ 316,520	_____

Some of the veal and boned beef is produced in the plant. The estimated local price is half the Chicago market price. This slaughtering, combined with the slaughtering of other animals including lambs and calves is relatively a small part of the business. It is, however, different and accordingly note is made of it here. The costs are not detailed but are considered offset by such miscellaneous income as the sale of hides and skins and some veal. About half of the revenue from the sale of such meat and skins is included in the plant revenue. This treatment of these costs and revenues is used for the sake of simplicity.

PRODUCTION TOOLS AND EQUIPMENT

<u>Description</u>	<u>Units Needed</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
<u>Killing and Cutting Room</u>				
Jerkless hog hoist	1	\$1,000	\$ 1,000	_____
Scalding vat with chute	1	1,000	1,000	_____
Dehairing machine	1	2,000	2,000	_____
Gambrel bench	1	600	600	_____
Gambrel hooks		1,000	1,000	_____
Work tables	4	250	1,000	_____
Fresh pork skinning machine	1	800	800	_____
Hog-casing cleaner (operated by scrapple man)	1	600	600	_____
Fairbanks platform scale	1	1,400	1,400	_____
Toledo scale	1	800	800	_____
<u>Scrapple Making Room</u>				
Scrapple cooking vats	2	}	2,300	_____
Meat grinder	1			
Filling machine	1			
Table	1			
Scale	1			
Aluminum scrapple pans				
<u>Sausage Making Room</u>				
Meat mixer	1	600	600	_____
Meat grinder	1	2,000	2,000	_____
Silent cutter or chopper	1	1,400	1,400	_____
Stuffing machine	1	400	400	_____
Linking machine	1	1,000	1,000	_____
<u>Lard Rendering</u>				
Lard cooker with centrifugal pump, settling tank, and crackling press	1	3,000	3,000	_____
Lard cooling agitator with filling machine	1	2,000	2,000	_____
<u>Pickling Room (Hams and Bacon)</u>				
Pickle scale	1	500	500	_____
Pickle pump	1	500	500	_____
Miscellaneous pickling barrels and bacon boxes		2,000	2,000	_____

Production Tools and Equipment - Continued

<u>Description</u>	<u>Units Needed</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
<u>Packing Room</u>				
Meat slicing machine with scale	1	\$1,300	\$ 1,300	_____
Work tables with miscellaneous heat sealing irons	2	50	100	_____
<u>Other Major Equipment Items</u>				
All overhead tracking equipment			6,000	_____
Miscellaneous meat hand trucks and trays			4,000	_____
All refrigeration, including compressors (Includes: 3 walk-in boxes in killing and cutting room; 2 walk-in boxes in sausage room; 1 walk-in box in pickling room; 1 small freezer and 3 compressors; as indicated.)			10,000	_____
Miscellaneous knives, meat saws, and cleavers			500	_____
Smokehouses and related equipment	2	1,000	2,000	_____
Boiler for heat and steam needs	1	4,000	4,000	_____
Other including pipes, equipment, and pumps			<u>2,600</u>	_____
Total Production Tools and Equipment			\$ 56,400	_____

OTHER TOOLS AND EQUIPMENT

Waste disposal equipment			\$ 1,100	_____
Factory trucks	8	50	400	_____
Benches	10	75	750	_____
Other tools and equipment			<u>900</u>	_____
Total			\$ 3,150	_____

FURNITURE AND FIXTURES

<u>Description</u>	<u>Number Required</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
Desks and Chairs	2	\$ 125	\$ 250	_____
Typewriter	1	150	150	_____
Adding Machine	1	150	150	_____
Filing Cabinets	4	60	<u>240</u>	_____
Total			\$ 790	_____

TRUCKS

<u>Description</u>	<u>Number Required</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
Delivery	3	\$ 8,000	\$ 24,000	_____
Utility	1	2,500	<u>2,500</u>	_____
Total			\$ 26,500	_____

SUPPLIES

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Fuel	\$ 1,800	_____
Maintenance Supplies	1,800	_____
Cartons and Other Indirect Materials	2,200	_____
Gasoline, Oil, Other Truck Expense	<u>2,000</u>	_____
Total	\$ 7,800	_____

DIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Hours Per Week</u>	<u>Pay Per Week</u>	<u>Estimated Annual Cost</u>	<u>Actual Cost</u>
Shackler	1	40	\$ 75	\$ 3,750	_____
Hog Dropper	1	40	60	3,000	_____
Shackler Helper	1	40	81	4,050	_____
Gambreler	1	50	120	6,000	_____
Trimmer	1	40	78	3,900	_____
Washer	1	40	78	3,900	_____
Gutter	1	40	96	4,800	_____
Splitter	1	45	112	5,600	_____
Ham Facer	1	40	100	5,000	_____
Butcher	1	40	105	5,250	_____
Casing Puller	1	40	90	4,500	_____
Cleaner	1	40	72	3,600	_____
Sausage Maker	1	45	135	6,750	_____
Sausage Helper	1	40	60	3,000	_____
Scrapple Maker	1	50	112	5,600	_____
Packer	1	40	72	3,600	_____
Packer	1	40	66	3,300	_____
Packer	1	40	60	3,000	_____
Packer	<u>1</u>	40	<u>60</u>	<u>3,000</u>	_____
Total	19		\$1,632	\$81,600	_____

INDIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Hours Per Week</u>	<u>Pay Per Week</u>	<u>Estimated Annual Cost</u>	<u>Actual Cost</u>
Manager	1			\$ 8,000	_____
Secretary-Bookkeeper	1			4,000	_____
Utility Workers	2	40	\$ 120	6,000	_____
Drivers	<u>3</u>	40	180	<u>9,000</u>	_____
Total	7			\$27,000	_____

PLANT LAYOUT

A plant layout indicating the sequence of production operations is shown on page 48.

PLANT SITE

To provide space for a meat processing plant and for eventual expansion the land for the plans should contain about two acres. The site should be level and well drained and should be located as advantageously as possible with respect to transportation, power, water, markets, sources of labor and supplies. The cost of such a site is estimated at approximately \$2,000.

BUILDING

All operations are performed in a one-story building 70 feet by 140 feet, or 9,800 square feet of floor space. The cost of the building is estimated at \$4.00 per square foot or \$39,200. In addition a smokehouse is required at a cost of about \$900 making a total building cost of \$41,000. This cost includes some vats or tanks required but not included in the list of equipment. It also includes the necessary plumbing, wiring and fans for ventilation as well as covering a part of the loading platform as a protection for the trucks.

It does not include the steam boiler or the small disposal plant required to purify the waste water. The equipment for the disposal plant will include an aerator, digester, separator, filter pump together with electrical equipment and piping. The cost of the boiler and the disposal plant is included on page 16 under Other Major Equipment Items and Other Tools and Equipment.

FUEL

It is estimated that the fuel consumption for production, heating and sanitary purposes will amount to about \$1,800 per year.

WATER

The water requirements for the production, heat, sanitary use, drinking and fire protection will amount to \$700 per year.

POWER

About 1,000 kilowatt hours of power per day will be required. Based on a cost of \$.025 per kilowatt hour the annual cost of power for all purposes is estimated at \$6,250.

TRUCKS

Three panel trucks for delivery purposes, complete with refrigeration are estimated at \$24,000. A one-ton pick-up truck for utility purposes is recommended at a cost of \$2,500. The gasoline, oil and maintenance is included in Supplies. Base pay of the drivers is included in the Indirect Labor. They also receive a commission on sales.

DEPRECIATION

<u>Item</u>	<u>Estimated Cost</u>	<u>Years Life</u>	<u>Estimated Per Year</u>	<u>Actual Per Year</u>
Building	\$ 41,100	20	\$ 2,055	_____
Production Tools and Equipment	56,400	10	5,640	_____
Other Tools and Equipment	3,150	5	630	_____
Furniture and Fixtures	790	10	79	_____
Trucks	26,500	5	5,300	_____
Total			\$ 13,704	_____

MANUFACTURING OVERHEAD

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Depreciation	\$ 13,704	_____
Indirect Labor	27,000	_____
Supplies	7,800	_____
Power	6,250	_____
Water	700	_____
Fuel	1,800	_____
Total	\$ 57,254	_____

MANUFACTURING COST

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct Materials	\$ 316,520	_____
Direct Labor	81,600	_____
Manufacturing Overhead	57,254	_____
Total	\$ 455,374	_____

FIXED ASSETS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Land	\$ 2,000	_____
Buildings	41,100	_____
Production Tools and Equipment	56,400	_____
Other Tools and Equipment	3,150	_____
Furniture and Fixtures	790	_____
Trucks	<u>26,500</u>	_____
Total	\$ 129,940	_____

WORKING CAPITAL

<u>Item</u>		<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct Materials	- 30 days	\$ 26,300	_____
Direct Labor	- 30 days	6,800	_____
Manufacturing Overhead	- 30 days	4,700	_____
Reserve for Sales Collections	- 30 days	<u>55,500</u>	_____
Total		\$ 93,300	_____

CAPITAL REQUIREMENTS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Fixed Assets	\$ 129,940	_____
Working Capital	<u>93,300</u>	_____
Total	\$ 223,240	_____

SALES REVENUE

The estimated selling prices of the items produced in this plant are listed below, together with the annual production volume and annual gross sales. The divisions are more condensed than those usually listed in the markets.

<u>Item</u>	<u>Weights - cwt. Approximate</u>	<u>Estimated Wholesale Selling Price Per cwt.</u>	<u>Estimated Revenue</u>	<u>Actual Revenue</u>
Fresh pork cuts - best grade	6,000	\$ 41.00	\$ 246,000	_____
Hams and other	7,000	32.00	224,000	_____
Lard and other	5,000	12.00	60,000	_____
Sausage and other	4,000	25.00	100,000	_____
Beef, veal and other	<u>1,200</u>	30.00	<u>36,000</u>	_____
Total	23,200		\$ 666,000	_____

RECAPITULATION OF COSTS, SALES AND PROFITS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct Materials	\$ 316,520	_____
Direct Labor	81,600	_____
Manufacturing Overhead	<u>57,254</u>	_____
Total Manufacturing Cost		_____
		\$ 455,374
Interest on Loans	\$ 800	_____
Insurance	300	_____
Legal	600	_____
Auditing	900	_____
Unforeseen Expense	<u>6,026</u>	_____
Total Administrative Cost		_____
		8,626
Sales Commissions, Travel, Bad Debts, Discounts and Allowances		_____
		57,000
Profit before Taxes		_____
		<u>145,000</u>
Total Annual Gross Sales		_____
		\$ 666,000

BUDGET CONTROL

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

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

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

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

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

BUDGET CONTROL ACCOUNTS

Account Number	Monthly Expense	Monthly Budget	Annual Budget	Actual
10 Administrative	\$ _____	\$ 216	\$ 2,600	\$ _____
20 Sales	_____	4,750	57,000	_____
30 Direct Materials	_____	26,376	316,520	_____
40 Supplies	_____	650	7,800	_____
51 Power*	_____	520	6,250	_____
52 Water*	_____	58	700	_____
53 Fuel	_____	150	1,800	_____
60 Unforeseen Expense (Reserve Account)	_____	502	6,026	_____
71 Direct Labor*	_____	6,800	81,600	_____
72 Indirect Labor*	_____	2,250	27,000	_____
80 Depreciation (Reserve Account)	_____	---	13,704	_____

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

EMPLOYEE IDENTIFICATION	COMPANY NAME	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

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

R. W. MITCHELL MANUFACTURING COMPANY

BY **SAMPLE CHECK**

VICE PRESIDENT

ACCOUNT NUMBER

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

R. W. MITCHELL MANUFACTURING COMPANY

ENGINEERS

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

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

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

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

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

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

TRAINING

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

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

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

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

SAFETY

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

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

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

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

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

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

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.?

SUMMARY (Continued)

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?

SUMMARY (Continued)

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?

SUMMARY (Continued)

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?**

GLOSSARY

Casing	A cleaned intestine of hogs or cattle used as a container for sausage meat.
Chitterling	The small intestine of a hog.
Crackling	The crisp residue of fat after the lard has been removed.
Dressing	The preparation of butchered meat for marketing.
Gambrel	A metal rod, approximately two feet long, used to suspend slaughtered animals.
Lard	The rendered fat of hogs, often used in cooking.
Offal	The parts of a butchered animal removed in dressing it, especially the digestive tract, lungs, blood, and feet.
Pickle	A salt and water solution for preserving meat.
Print	To mold lard into uniform shapes.

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Food Engineering

**McGraw-Hill Publishing Co., Inc.
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Meat

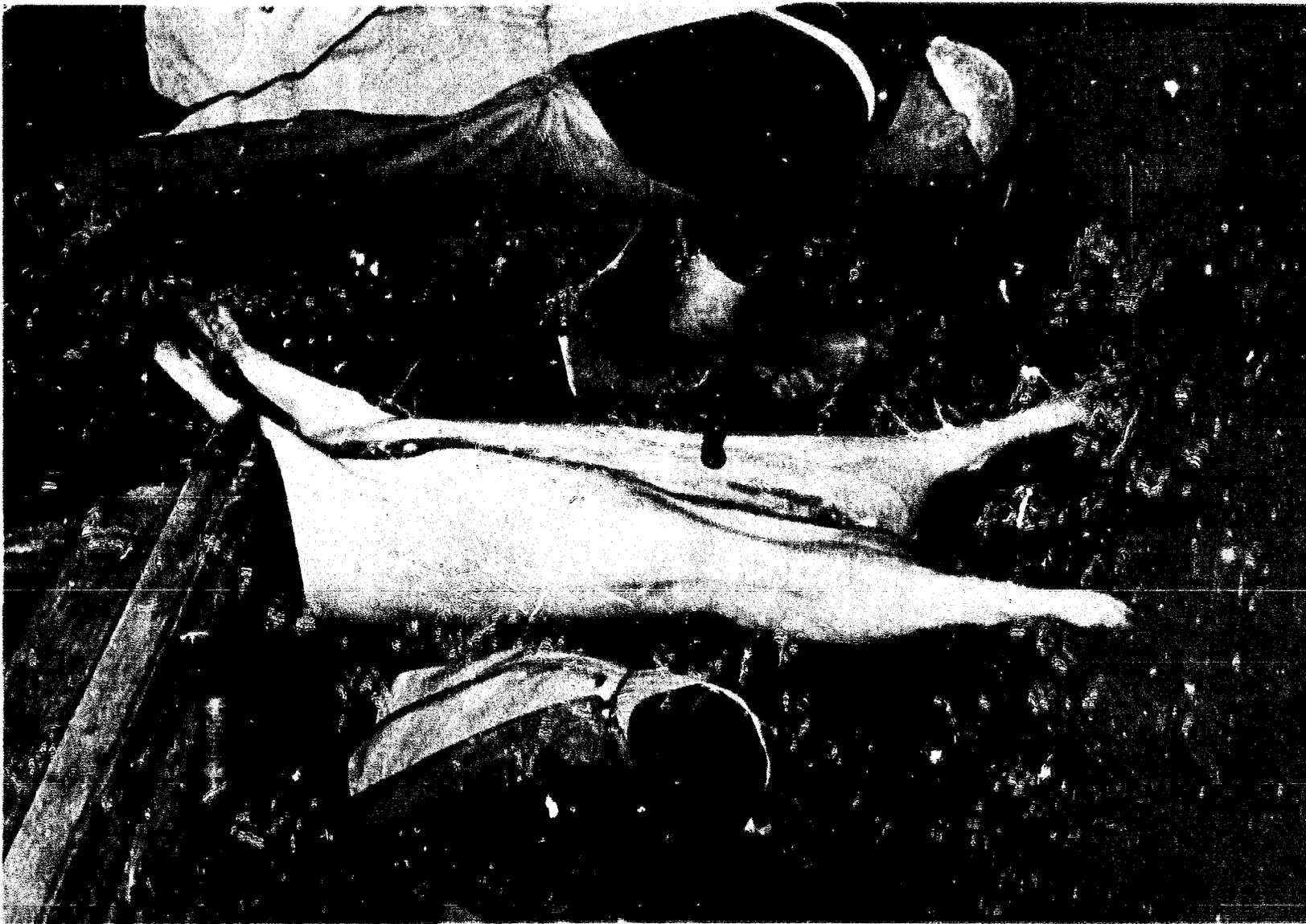
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ABBREVIATIONS

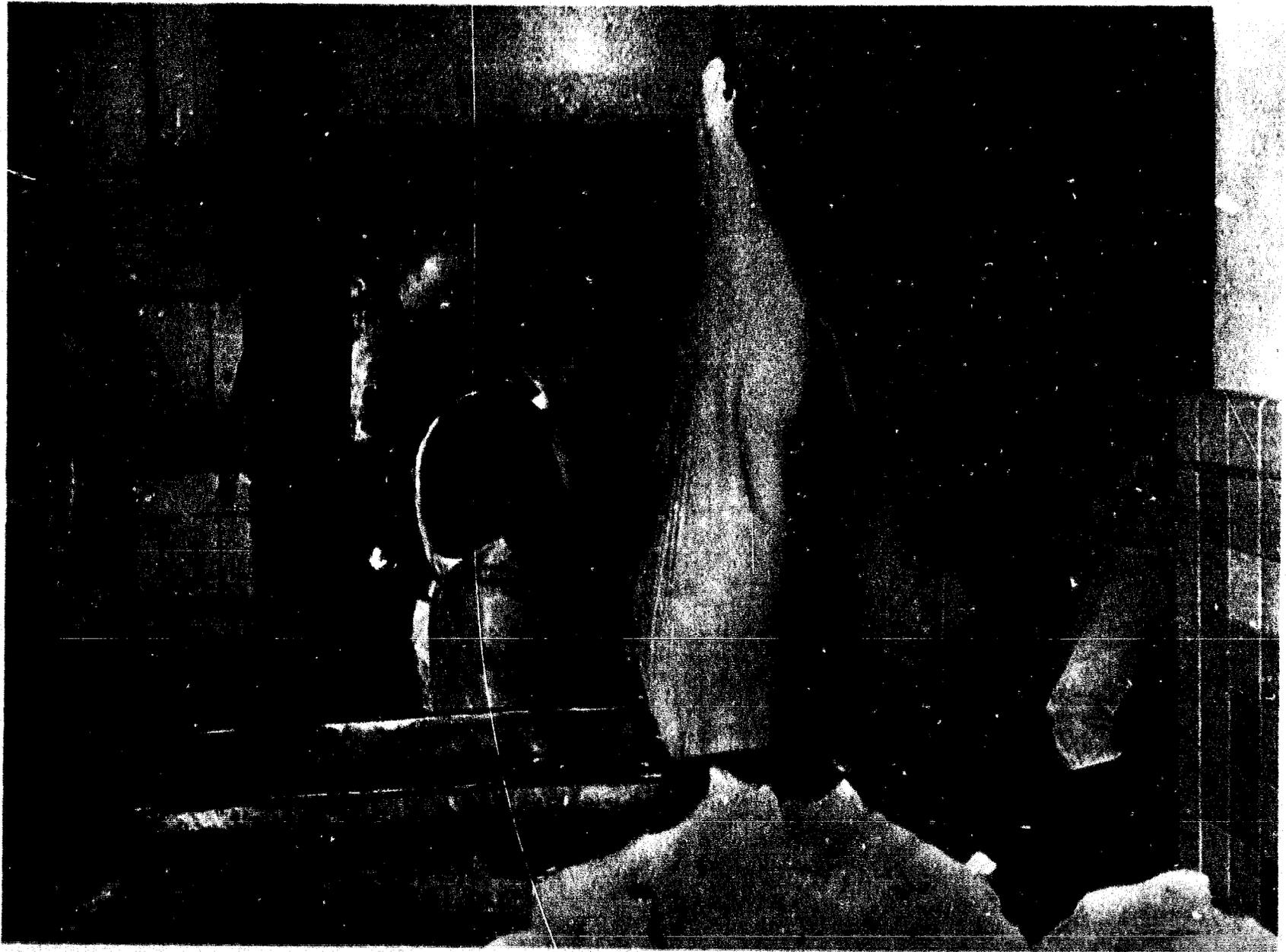
lb.	Pound
lbs.	Pounds
cwt.	Hundredweight
No.	Number
°F.	Degree Fahrenheit



Intestines are removed from entrails for use as sausage casings. Worker is called a casing puller.



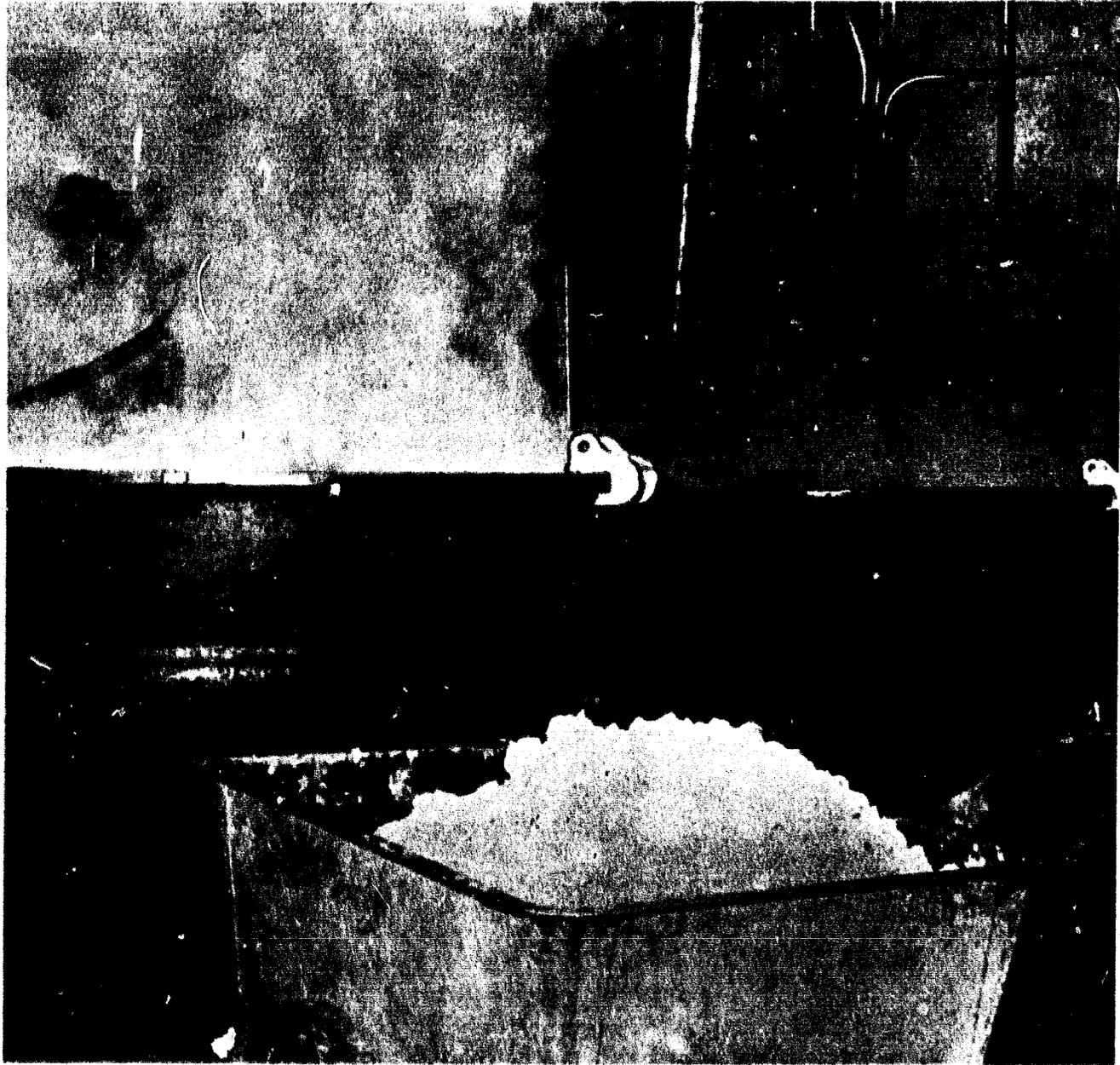
After entrails have been removed, the head is cut off
and carcass split into halves.



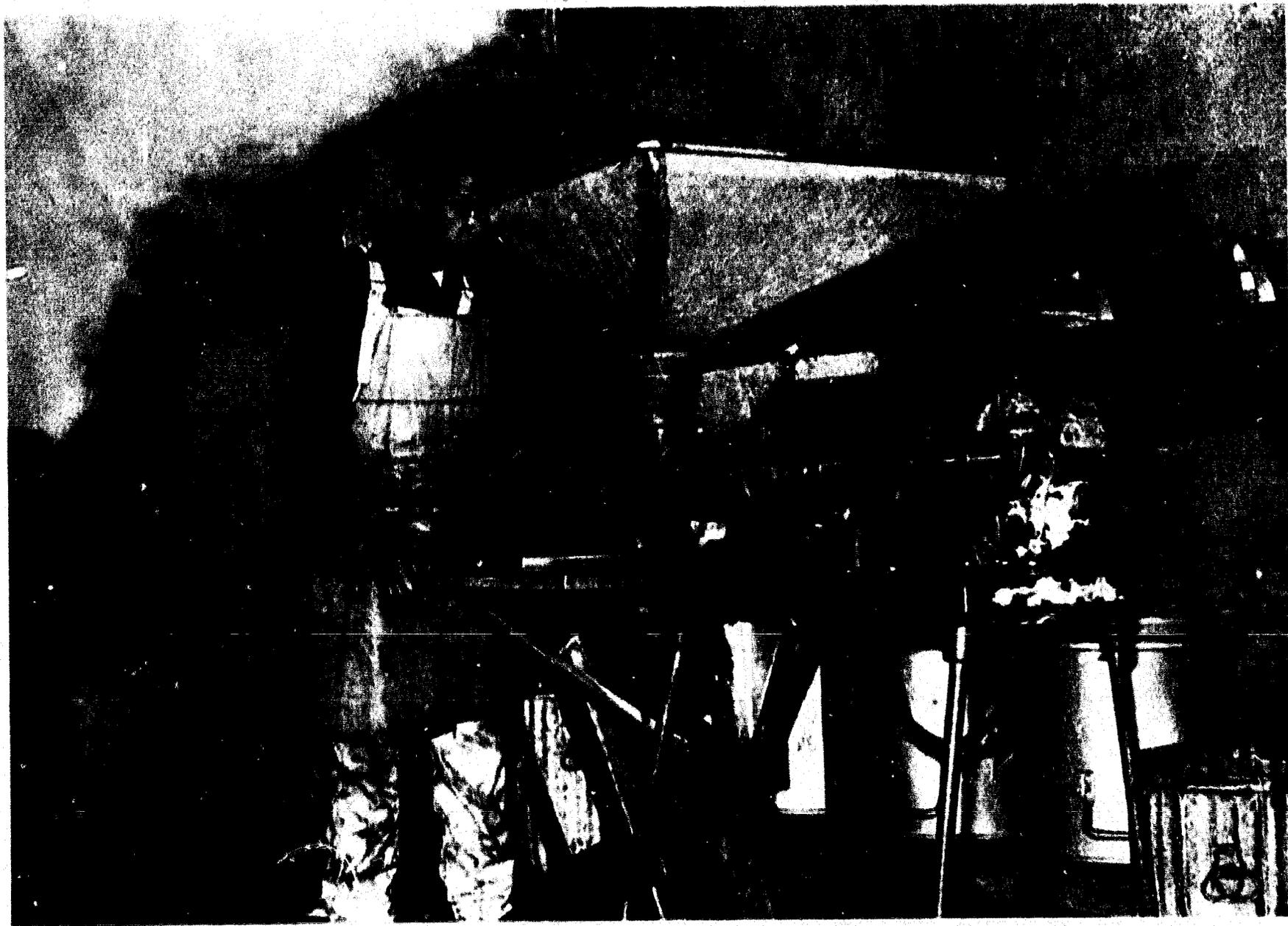
Worker loosening leaf lard and hams but leaving them attached. He also ties ham arteries. Carcasses are then cooled overnight, and butchered the next day.



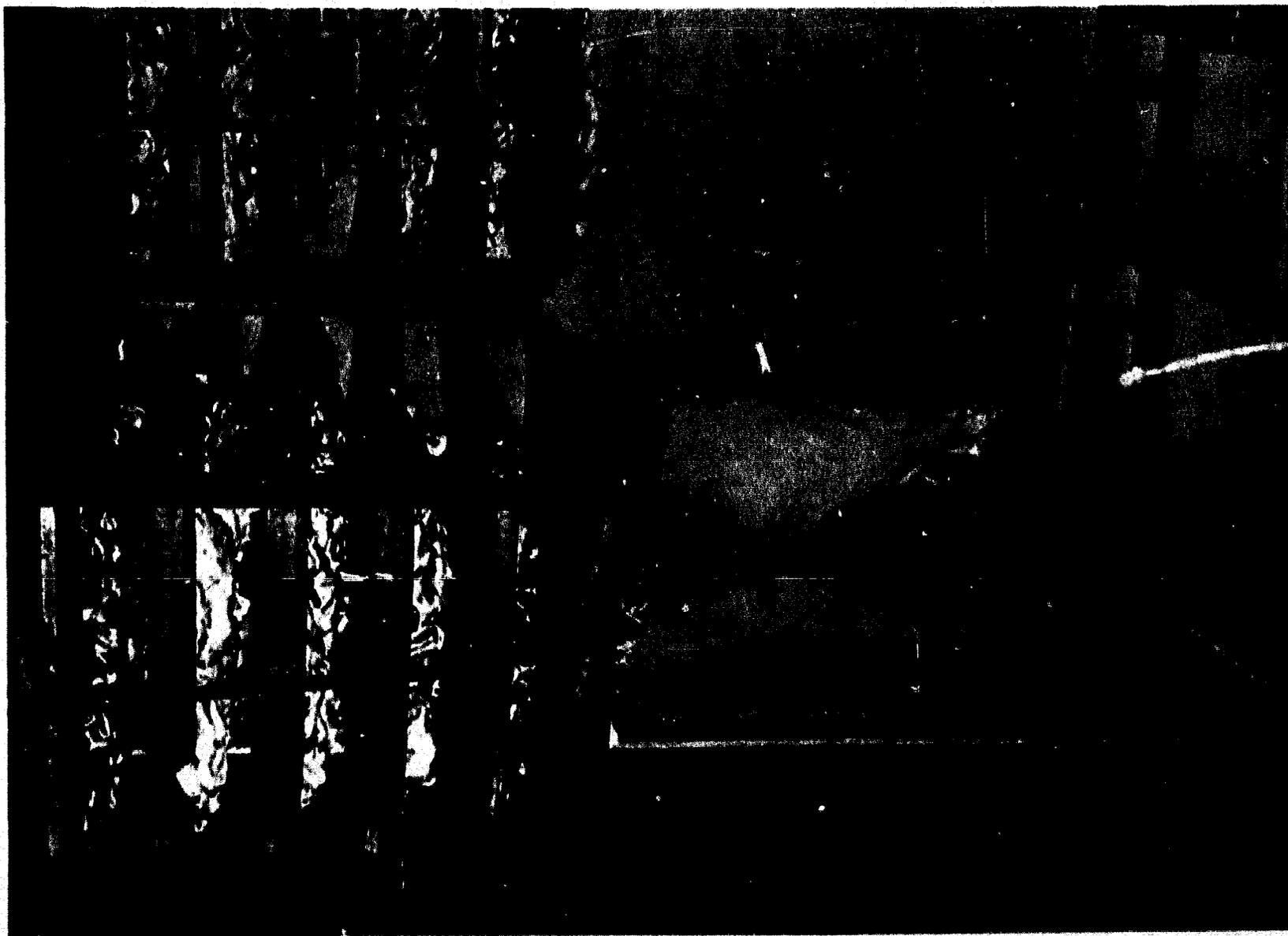
Workers butchering carcasses into various cuts of meat for further processing if necessary.



Cooking scrapple.



Filling tins with scrapple.



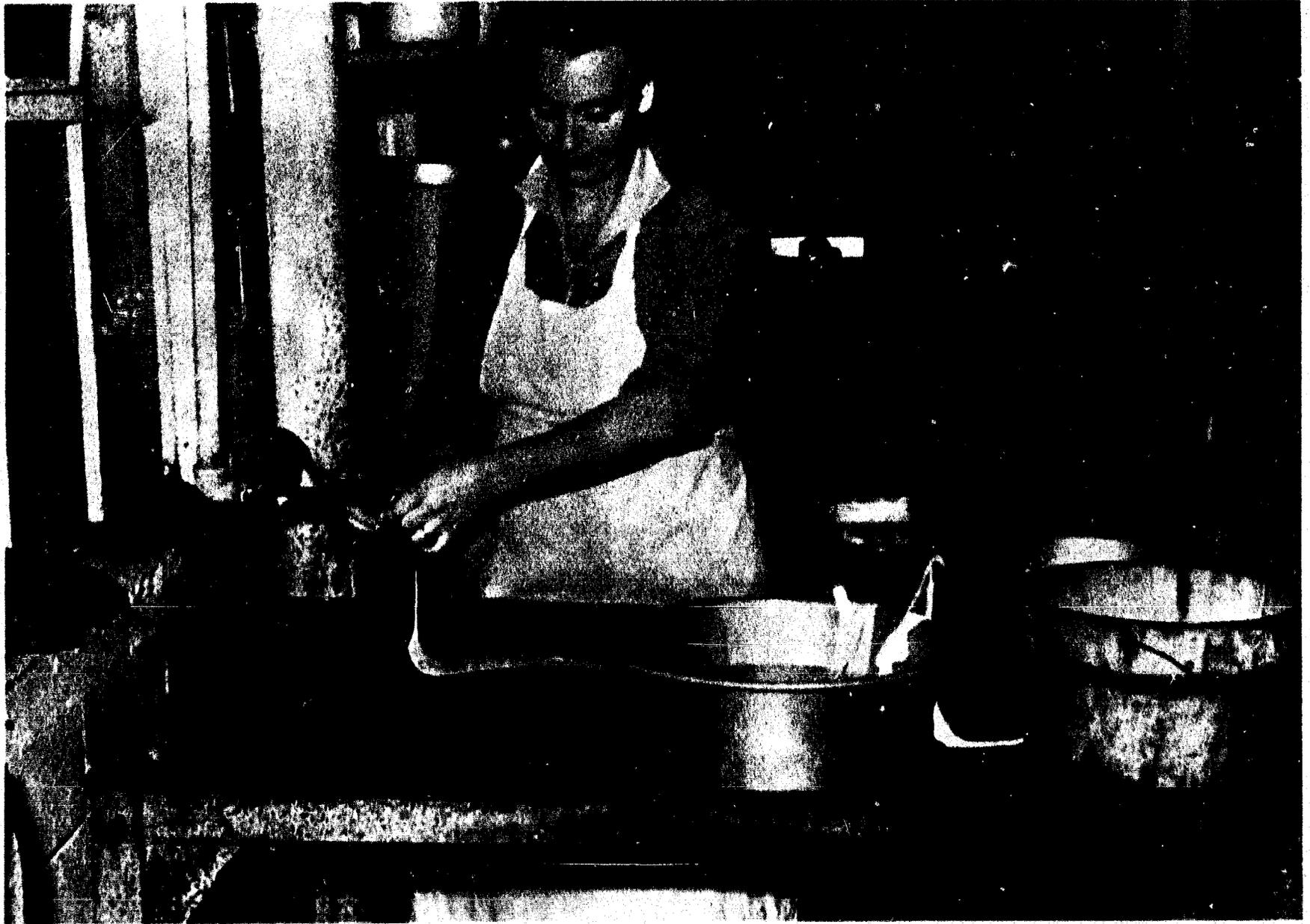
Meats in refrigerator. Beef quarters hanging in background.



Weighing pork, beef, and veal for sausage. Ingredients are accurately weighed before mixing and grinding. Proportions vary, depending on end product. Other ingredients such as cornmeal and spices are added during mixing.



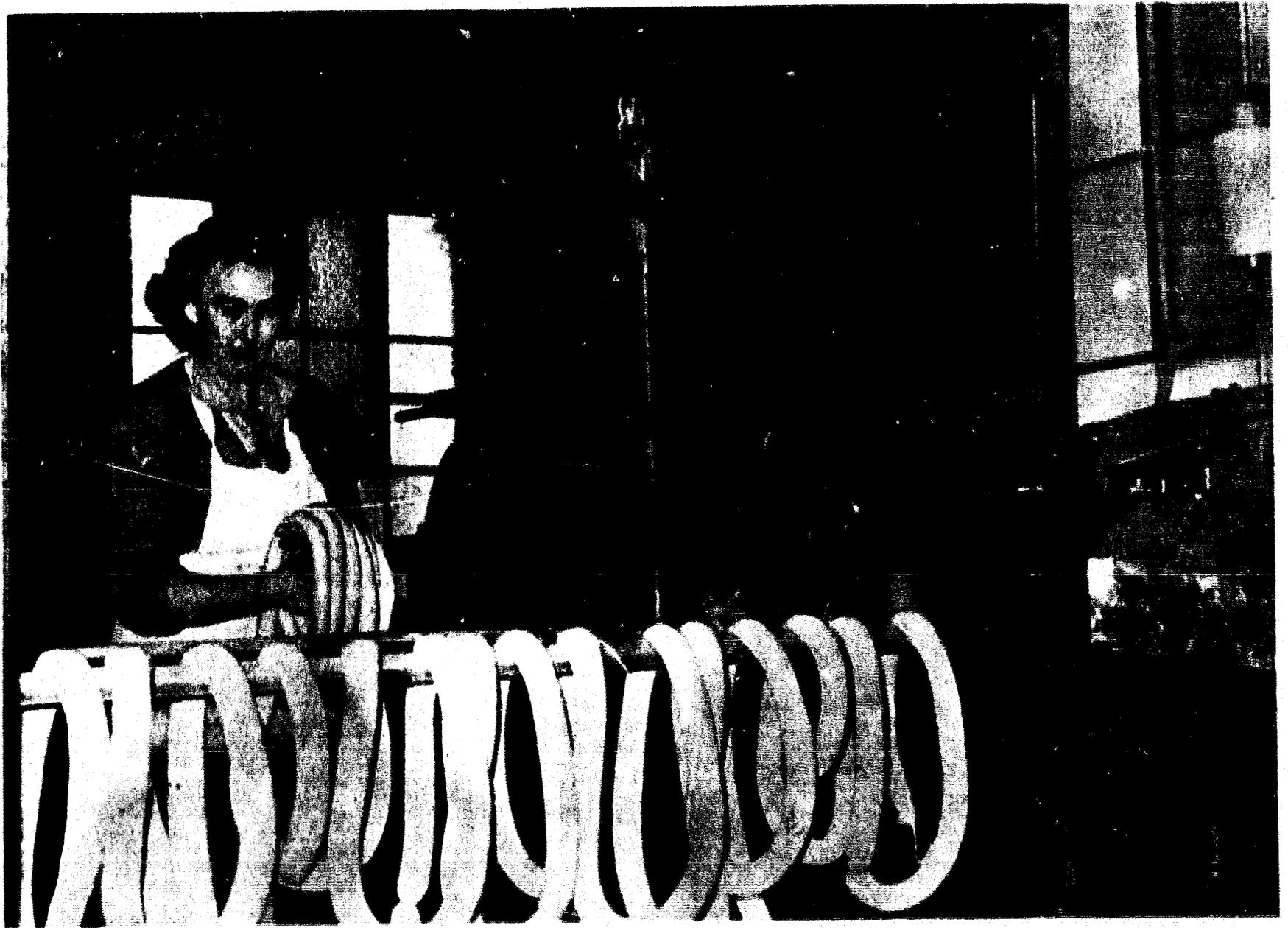
Sausage-grinding machine on left. Sausage-stuffing machine behind worker (sausage maker).



Testing sausage casings with water pressure to check for leaks. Operation is called flushing casings.



Sausage maker stuffing casings with sausage meat. Machine at left emulsifies ground sausage meat for certain types of sausage.



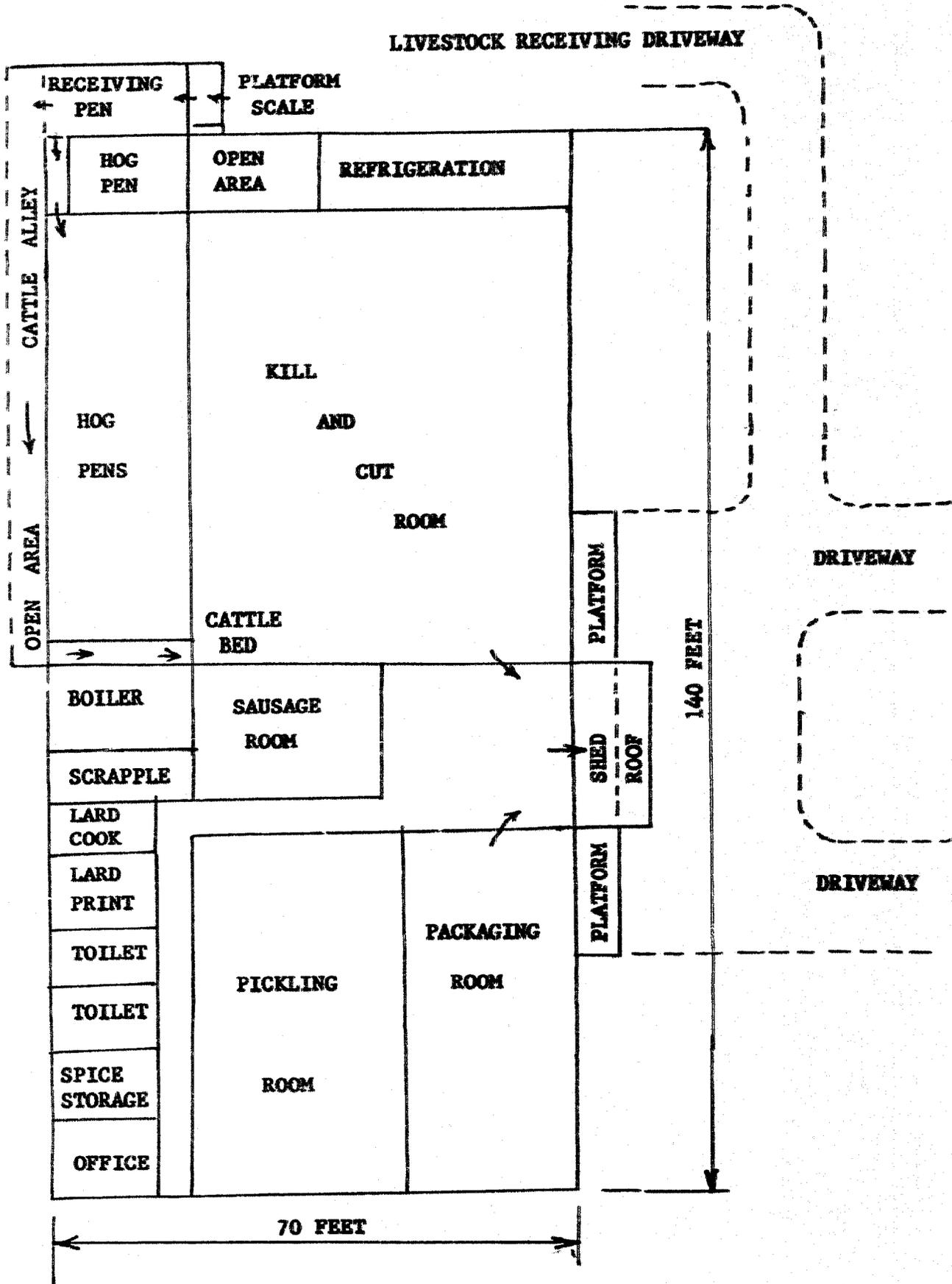
Draping freshly filled sausages on rack. Sausage stuffer in background.



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Cured bacon fitches in background. Fresh fitches about to be smoked.

PLANT LAYOUT



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