

# PLANNING A LOCKER PLANT FOR THE SOUTHEAST



# Acknowledgements

This publication has been prepared in an effort to help those who plan to build and operate a locker plant. It is intended to furnish such information as is needed to form a clear picture of the problems involved in planning a plant. It is not intended that it shall be a complete design treatise, but rather that it will enable the prospective operator to do his preliminary planning better, and be in a position to state his problems clearly and concisely to those from whom he seeks advice.

This publication is a product of the joint efforts of the several members of the Southeastern States Freezer Locker Engineering Committee.

This committee was formed during the Southeastern Freezer-Locker and Home-Freezer Conference held at the University of Tennessee, Knoxville, September 5, 7, and 8, 1944.

These recommendations for locker plant construction have been approved by all the members. They have also been submitted to a number of manufacturers who have given many helpful suggestions.

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The committee expresses appreciation for the aid furnished by Mr. P. D. Rodgers, Mr. R. D. Haynes and Mr. E. F. Newman of the Commerce Department of the Tennessee Valley Authority in preparing the material for this publication.

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**COLLEGE OF AGRICULTURE AND HOME ECONOMICS**  
**EXTENSION SERVICE . . . LEXINGTON**

CIRCULAR 413

FEBRUARY, 1946

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating. Thomas P. Cooper, Director. Issued in furtherance of the Acts of Congress of May 8 and June 30, 1914.

## ECONOMIC CONSIDERATIONS FOR ESTABLISHING A LOCKER PLANT

A businessman, in deciding whether or not he should build a locker plant, can protect himself against failure by carefully analyzing the factors that contribute to the success of such an enterprise. If the enterprise is to be successful two general conditions must be met.

1. The plant must be properly designed and engineered and must be constructed at a reasonable price in order to minimize operating and overhead costs and render full service to the community.
2. The business must be established and conducted on a sound financial basis.

The design and construction of the locker plant are discussed in the second part of this bulletin.

What constitutes a sound financial basis can be established largely by analyzing the business to determine the extent to which the requirements discussed below are met.

### Community Support

**The community must be able to support a locker plant.** First, within the community being considered there must be a potential need for the services offered. The greatest potential need for locker facilities is in communities where agricultural products suitable for freezing are readily available. This means that the plant should be located in or near an agricultural community.

Both farm and urban families are potential users of frozen food lockers. Farm families are the principal patrons since they rent about 75 per cent of all lockers. Whether or not they will use lockers depends upon the service offered and the resourcefulness of the operator. Farmers use locker facilities because they offer an economical method of preserving their own products for home consumption and an additional market for their excess production at profitable prices. Urban families also find that the use of these facilities offers a convenient and economical method of preserving quantities of fresh products purchased in season for out-of-season consumption.

Only 10 to 20 per cent of patrons now travel more than ten miles to use their lockers. Therefore the actual location of the plant should have easy access to both rural and urban patrons, most of whom should be reached within an area extending to a radius of ten or fifteen miles from the plant. The city, town, or village that serves as the trading center for the area will usually satisfy this requirement. As the value of the services becomes better known, patrons may travel farther; but a new operator should not depend heavily on this type of business immediately after opening a plant.

Successful locker plants have been established in small communities and in the larger towns and cities. However, in the Southeast a greater percentage of the larger towns than the smaller communities have locker plants. For example, 65 per cent of all towns in the region with population of 5000 and over have locker plants, while only 22 per cent of towns with less than 5000 have plants. This may be attributed to the fact that the larger towns have more people with relatively higher income, who are better able to afford the use of these facilities.

On the other hand, people with lower income will rent lockers only when they are convinced that they can obtain more or better food for the same amount of money they are now spending, or, that they can actually save money by renting a locker. Thus an increase in the use of lockers in areas where the average family income is relatively low cannot be expected to be as rapid as in the areas where incomes are higher.

However, the fact that 22 per cent of the smaller towns and villages already have plants and that these plants comprise 66 per cent of the total number of plants in the region indicates that the smaller towns do have good possibilities for further locker plant expansion. These possibilities may be enhanced if the prospective locker owner combines the locker business with other diversified activities and does not depend upon locker rental as the sole source of income while building up the locker plant clientele.

A community can support a freezer locker plant if the answer is "yes" to the following questions:

1. Is the community in or near an agricultural area?
2. Will there be a sufficient number of patrons to support a plant?
3. Do most of the prospective patrons live within a radius of ten or fifteen miles?
4. Is the location of the proposed plant in a town or village that is the trade center for the territory?
5. Will the plant be located in a community or town in which a substantial portion of the prospective patrons are in the middle range of income? If not, a plant may be successful in the long run if the operator is prepared to continue in business for two or three years with little or no profit.

### Local Supply of Products

A reliable supply of agricultural products that can be satisfactorily frozen must be readily available. The principal products that are processed or stored in a locker plant are fresh meats, fruits and vegetables. Enough of these commodities must be produced in the trade territory to satisfy the minimum requirements of the locker plant plus the demands of other outlets that the farmers find profitable. It is conservatively estimated that 560 pounds\* of

\* Weights of foods stored per locker in each state vary from about 200 pounds in Maryland to about 900 pounds in Alabama. Agricultural Statistics, 1944, table 429.

the principal agricultural products per locker per year must be brought to the plant to provide a sufficient amount of raw materials for profitable operations. This quantity may be divided approximately as follows:

Meats .....	500 pounds per locker per year
Fruits and vegetables ..	<u>60</u> pounds per locker per year
Total .....	560 pounds per locker per year

Assuming that there is an equal demand for beef and pork, 25,000 pounds of dressed weight of each commodity is required for every 100 lockers installed\*. These figures when adjusted to the size of the proposed plant present a fair indication of the number of animals that must be brought to the plant to be reasonably sure of profitable business.

The requirements for 60 pounds of fruits and vegetables per locker or 6000 pounds per 100 lockers installed may be obtained from local production if the types and varieties available are suited to the quick freezing methods of preservation.

In order to carry on a profitable business many locker plants in the Southeast have found it desirable to process poultry in addition to meats, fruits, and vegetables. It is estimated that at least ten birds per locker are required for this service or 1000 birds for each 100 lockers installed.

The production figures above represent minimum requirements for those commodities that are of principal support to the locker business in this region. However, the availability of other commodities for freezing or for other services that the locker operator develops may provide opportunities for additional source of income.

Many locker plant operators have found that the patrons store only 200 or 300 pounds of frozen foods in their lockers when they first start using them. If this condition continues, the operator cannot expect a very profitable operation, if he can make a profit at all. Some patrons store more food in their lockers as they become familiar with the value of the service, while others fail to renew their locker rental because they find it quite expensive to store such a small amount of food. A locker plant operator must strive to persuade his patrons to store at least the amounts indicated above in order to be assured of successful operation.

A prospective locker plant operator should be able to answer "Yes" to the following questions:

1. Are about 100 beef animals and 200 hogs available for processing for each 100 lockers in the plant?

\* For the Southeastern region the average dressed weight (before processing) of cattle and calves butchered for beef is 260 pounds, and the dressed weight for hogs and pigs is 130 pounds.

2. Are about 6000 pounds of the proper varieties of fruits and vegetables available for each 100 lockers?
3. Are about 1000 birds available for the processing of poultry per 100 lockers?

### Size of Plant

The prospective volume of business must be sufficient to pay a reasonable return on the investment. The number of lockers and the types of services must be determined by community needs and the prospective volume of business.

One of the most important problems a prospective locker operator faces is how large a plant to build. Plants with 25 to 100 lockers are not economically feasible as independent enterprises although units of this size have been installed in conjunction with community canneries, which are generally operated on a nonprofit basis. For plants with fewer than 300 lockers, it is desirable to combine the industry with some related enterprise in order to reduce management and overhead costs. Plants with more than 300 lockers can be operated profitably as separate businesses.

The gross plant income depends upon the number of lockers rented, kinds of services rendered, and volume of business handled together with the locker rental rates and processing charges. However, locker rentals usually produce a lower percentage of the gross income than the revenue furnished by the other plant services. Therefore, a prospective locker operator should not depend too heavily on locker rentals to produce profits but should plan on developing the maximum number of services that can be rendered to those who rent lockers. He should plan to secure a large enough volume of processing and freezing business to make the enterprise profitable.

The plant must be designed to fit the needs of the particular community. These needs will vary from one locality to another because of differences in food habits, differences in types and quantities of foods produced, differences in incomes, and similar considerations. These considerations need to be weighed not only in estimating the number of lockers which can be rented, but also in deciding upon the type and extent of services to be offered.

A careful estimate must be made of the additional income to be secured in the particular community from such activities as slaughtering, bulk storage, commercial processing for the wholesale or retail trade, retailing and distribution of frozen foods, and sale, rental, and servicing of farm and home frozen food cabinets. This estimate must be made before the plant is constructed, for upon it will depend the physical layout of the facilities. If the estimate is accurate and the layout well adapted to the services required by the particular community, it will be reflected directly and favorably in the operating costs and profits. Similarly, a layout ill-adapted to the needs of the community will result in higher operating costs or expensive alterations.

The present trend in locker plant costs is upward. Future trends are uncertain. Locker plants costs during the latter part of 1945 ranged from \$70 to \$80 per locker. Using \$75 as the basis, a \$37,500 investment may be required for a plant with 500 lockers. If the plant services include slaughtering and commercial bulk storage and commercial processing, additional capital investment is required.

The locker plant may be expected to be profitable if the following questions can be answered affirmatively:

1. If the anticipated plant will contain fewer than 300 lockers, will it be combined with some other business which has proved profitable?
2. If the plant will contain more than 300 lockers, will it offer complete service to the patrons?
3. Will the services offered and the volume of business available justify the investment?

**STATEMENT OF ESTIMATED INCOME AND EXPENSE FOR  
THE ANNUAL OPERATION OF A LOCKER  
PLANT HAVING 500 LOCKERS**

Income

1. Locker rentals, 450 @ \$13.50 (90% rented) .....	\$6100
2. Meat curing, smoking, 90,000 lb. @ 4½¢ .....	4100
3. Meat processing, 135,000 lb. @ 2½¢ .....	3400
(chilling, cutting, wrapping, freezing)	
4. Meat grinding, 13,500 lb. 1½¢ .....	200
5. Rendering lard, 9,000 lb. @ 3¢ .....	300
6. Freezing fruits and vegetables, 27,000 lb. @ 2¢ .....	500
7. Processing poultry, 4,500 birds @ 15¢ .....	700
8. Brokerage, bulk storage, etc. ....	1000
Gross income .....	\$16,300

Expense

1. Salaries and wages .....	\$6000
2. Light and power .....	400
3. Repairs .....	300
4. Other plant expense .....	1000
5. Office expense .....	400
6. Depreciation .....	2400
7. Interest .....	1800
8. Taxes and insurance .....	500
9. Other expenses .....	300
Gross expense .....	\$13,100
Net Income (before Federal taxes) .....	\$ 3,200

## Data On Expenses

### Item

1. Salaries and wages include
  - a. Operator \$3,000
  - b. Butcher 2000
  - c. Helper 1000
2. Estimated on basis of 50 kilowatt hours per locker per year. The cost was calculated by using the TVA basic small lighting and power rate, schedule B-2.1A.
4. Include water, supplies, laundry, and delivery service.
5. Includes bank charges, auditing, legal, advertising, postage, office supplies, telephone, and telegraph.
6. The average rate of 6.4 per cent was applied to an estimated investment of \$37,500 for a 500-locker plant.
7. On the basis of 5 per cent on an investment of \$37,500.
9. Includes bonding, bad debts, and licenses.

This statement of income and expense is not necessarily typical but is intended to be used as a basis for preparing an estimate to meet a particular local condition. Some of the income items can be increased greatly. Labor expense can be reduced by efficient management and hard work.

## Plant Management

Efficient management is essential to the successful operation of a locker plant. The operator should possess a technical knowledge and business ability required to run the physical plant and manage its business activities, or know where he can secure management possessing such knowledge and ability for a salary he can afford to pay. Alert and aggressive management is required to attract patronage and sell services. The number of customers that will be attracted to the plant depends upon the type of services offered and how enterprising management is in selling them.

An operator with good sales ability can show patrons how they can save money and get better products by using plant facilities. A manager with a good understanding of the technical problems of freezing and storing food can render a superior quality of service by carefully controlling the various plant operations, such as chilling, aging, curing, blanching, freezing, etc. Quality control is an important responsibility of management and will result in customers satisfaction and increased business.

While good management cannot make every plant profitable, even a well-equipped and well-located plant is not likely to be successful without a capable operator. Experience fails to show any single factor as important to the success or failure of any plant as the resourcefulness and efficiency of the operator himself.



## ENGINEERING CONSIDERATIONS FOR BUILDING A LOCKER PLANT

Quite frequently requests for information on the "design, construction, and operation of locker plants" are received by agencies interested in this development. The requests are not always so all-inclusive, but in most cases the prospective plant operator indicates that he has learned that there are many details to be worked out and innumerable possible variations to a locker plant plan.

At other times requests are received which indicate that the future operator has arbitrarily made many decisions. He has decided on the size of the plant, thinks he is ready to sign a contract, and asks only that he be given a floor plan, without stating his conditions other than the number of lockers desired and the size of lot to be used.

In all cases the inquirers can be divided into two groups. One group recognizes that there are many questions to be answered. The other thinks primarily of one or two major problems while minimizing all the rest. Both groups have one thing in common—a feeling that someone can give them definite and concise answers to all of their problems. Unfortunately, this cannot be done.

There are many rather definite statements which can be made about locker plant design, but so many decisions must be based on existing local conditions that there is no such thing as one ideal design. All that can be done by a discussion such as this is to point the way so that the prospective operator will be in a better position to seek information and make decisions.

The first step in planning a locker plant is to determine whether the community will support one. A major function of a locker plant is to store food. If sufficient food suitable for locker plant processing is not available in the community, it may be very difficult to operate a plant. There will always be exceptional plants, but nearly all successful plants in the Southeast will be located in good producing areas.

### Size and Type of Plant

If it seems reasonably certain that the area will support a plant, the next step in planning is to decide the size and type of plant needed. The size is stated as being 300, 450, 600, or some other number of lockers. This is not a complete statement of size, as we shall see later, but is indicative and is commonly used. This decision should not be an arbitrary one. It should be based on the ability of the area to support a plant and of the manager to build up and handle the business. Quite definitely, the number of lockers cannot be determined by the population of the town in which it is to be located. There are instances, such as plants of 300 lockers in a town of 350 persons, or a plant of 1,000 lockers in a town of 1,500 persons, at one extreme; at the other, there are plants of 300

lockers in towns of 5,000 persons, which seem to be sufficient. It is not the population of the town but rather the conditions in the surrounding agricultural area that determine the potential size of the plant located in small towns.

This decision can best be made by comparing conditions at the proposed location with those at one which seems similar and already has a plant in operation.

It is obvious that the available funds may limit the size of the plant. If this should be the case, the builder will have to decide whether he will build a plant smaller than the town needs with the expectation that he may soon have a competitor, or may have to expand his plant, or that he will give up the project altogether. In any case, he should hesitate to build too small a plant and expect it to be self-sustaining. Usually any plant of less than 300 lockers should be operated in connection with some other business so that the overhead can be divided.

Decisions as to the type of plant needed cannot be made until the future operator has himself become familiar with each of the processes carried on in a plant, the equipment needed, and the labor involved. He should visit at least three plants so as to be in a better position to decide or seek advice from others as to what types of services he should provide. These services may include some or all of the following: chilling, aging, cutting, wrapping, freezing, salt-curing, ham-smoking, lard-rendering, poultry dressing, ham storage, bulk commercial zero storage, fresh vegetable storage, ice cream making, sausage making, retail sales, slaughtering, vegetable processing, and meat specialties.

Too often plants are planned on the basis that the locker room constitutes almost the entire plant. These extra services are resisted as being too expensive or just plain nuisances. In actual practice, however, the extra services may bring in two-thirds of the income and the locker rentals one-third. As this becomes apparent to the operator, he tries to crowd into his plant more equipment to increase his income; then he adds other rooms to his building, if he can, and finally has a plant which costs more than it should, and is so poorly arranged as to add considerably to his labor costs. Labor costs generally are about one-half the total. The operator should also note that some of these extra services bring in much more revenue per dollar invested than does the locker room proper.

### Location of Plant

After the size and type of plant needed has been determined, the builder can select possible plant locations. Frequently the lot is selected first, and then the plant must be designed to fit it. This often leads to undesirable results when the lot happens to be too small or improperly shaped for the best planning. The type and size of plant should be determined and the lot selected which will contain it properly, together with parking space and a trucking approach.

The same policy should apply in selecting a building, if an existing building must be used. The two most common drawbacks to old buildings are that they are too narrow for an economical layout, and that the ceiling heights is not great enough to give sufficient clearance after the floor, floor insulation, ceiling insulation, and overhead supports for coils or trackage have been installed. Ordinarily, more satisfactory results will be obtained by using a new building, one which will be built to contain the plant properly laid out.

For plants in small towns, as most of those in the Southeast will be, the lot selected should be centrally located in the trade area. Since the patrons will be mostly rural, it is advisable to locate the plant among other business houses at which farmers trade. It is not profitable in the long run to select a lot remote from the business district on the sole basis that it is cheaper.

The lot should be well drained, not subject to flooding, and so situated to provide ample parking area. The slope and nature of the soil should be such as to minimize construction and foundation costs. Facilities for water, power, and waste disposal should be available. A location on a thoroughfare is best when on the right-hand side for patrons leaving town.

The lot selected should be adequate to allow for future expansion of the plant. The building should generally be placed on the lot so that additions can be made readily to one side and the back of the building.

### Floor Plan

The next step for the planner is to draw, or have drawn, a floor plan or plant layout. This will show where each room will be in relation to the other rooms and the work area. It will show the sizes of the refrigerated rooms and work spaces. All the major equipment should be shown. A set of general specifications should be made which will indicate what refrigeration capacity should be supplied to each room, or what refrigeration loads must be carried during peak conditions. Other items, such as track height, door sizes, aisle widths, and insulation thicknesses, should also be listed.

At this point the prospective operator is ready to submit his plans to contractors for their bids. By following this procedure, he will give the contractors a clear idea as to just what type and quality of plant he wants. They will all submit bids on the same plant rather than each one bidding on a different plant. No contractor will be in the position of having to cut corners in order to meet competition. Each will have to detail his own plans and designs and, therefore, there will be some variations; but these will not be variations of fundamental planning or of standards of design, as would be the case if each were asked to submit the plan of a plant he thought the owner should have.

As an aid to one who is planning a plant, the following set of recommendations is submitted. These should be considered as a

guide to planning and as a standard for evaluating bids. None of these recommendations is correct for all cases. On the other hand, none should be compromised without very good reason in any instance.

No attempt is made to predict the future. Only what has been found by past experience to be good in various plants is recommended. New equipment will be available from time to time. When and if it proves in practice to be satisfactory for locker plant operation, these recommendations can be revised.

### Health and Sanitation

A locker plant is a foods processing plant and should be designed and constructed accordingly, and should conform to various city, state, and Federal regulations covering sanitation and



Two different types of construction — both suitable for locker plant



health. The prospective operator must learn what existing laws apply to his particular community. Some states have already enacted legislation setting up regulations applying specifically to locker plants. In time, all states will likely have such legislation.

### Building Construction

The locker plant equipment should be housed in a good building. The building should be of such construction as will adequately protect the equipment for at least 20 years.

Some type of masonry construction is preferred. Brick, tile, concrete-block, and cinder-block materials are all acceptable.

Masonry walls should be at least eight inches thick. Extra care is necessary to avoid seepage through the walls. A little water can do tremendous damage to the insulation.

Sub-floors and top-floors in refrigerated rooms should be of concrete.

The sub-floor in the locker room and the freezer room should be laid on a fill of well-tamped gravel to keep it dry. If water collects under the sub-floor, it will freeze and cause heaving and cracking. Piping under the freezer and locker room should be avoided, and as far as possible under all other rooms. Interior walls of the building should be smooth and finished in tile or with a quality-proved, light-colored paint which can be cleaned satisfactorily. Sanitation, lighting, and appearance are thereby improved.

### Plans and Specifications

A complete set of plans and specifications should be furnished by the contractor. The plans and specifications should include details of building construction, insulation erection, equipment and refrigerant pipe-line installation, plumbing and electrical wiring. Upon completion of the plant, all plans and specifications should be corrected to show all revisions or changes made during construction and installation.

The possession of such plans may prove invaluable if certain repairs or expansions should be made, or if the plant ever should be offered for sale.

### **PLANT LAYOUT**

Plant layout must be planned for convenience and service. As competition increases, the operator will find it necessary to reduce labor costs. He cannot do this if there is confusion in the work-room arrangement. Competition and a discriminating public will have to be met with better service and products of better quality. These can be offered only if the plant is properly engineered in the beginning. The possibility of future expansion should also be considered in laying out the building.

## Locker Room

**Location**—Make convenient for patrons, with door near street entrance. Make convenient for operator, minimizing walking distances.

**Size**—For 300 lockers and freezer cabinet — 16 ft. 6 in. by 30 ft. 6 in. For 500 lockers and freezer room—16 ft. 6 in. by 50 ft., or 24 ft. 6 in. by 34 ft. These dimensions may vary according to arrangement.

Have ceiling height about 10 ft. 6 in. for 6-high lockers, or about 2 ft. 6 in. more than locker height, but vary according to the arrangement of the overhead refrigeration equipment.

Lockers at least 24 in. wide are preferred. Four-drawer type and 2-door type lockers make a good 6-high unit.

**Arrangement**—Place lockers in rows lengthwise since this arrangement is more economical than short rows crosswise. Provide aisles 36 in. wide between rows.

Leave 3 to 6-in. space between side walls and lockers, and raise the lockers at least 2 in. off the floor, to allow free air circulation.

Provide bulk storage space in the locker room. Add about 10 ft. to length of 300-locker room for this, but vary according to local needs.

Arrange for a safety light, on a separate circuit, always to be "on" in the locker room. This is to guide patrons to the door in case the room lights are accidentally turned off.

Provide a buzzer so that a patron having difficulty opening the locker-room door can signal for assistance.

**Doors**—Use superfreezer, overlap type, 6 in. of cork or equal.

Very strong "door-bucks" or supports are required.

Smooth-working latches that a woman can operate will reduce the amount of time spent helping patrons enter and leave the locker room. In many installations, an automatic latch release has been very helpful.

**Insulation**—Block-type cork insulation or its equivalent, erected in a bed of hot asphalt, in the following thicknesses is preferred:

Ceiling—8 in.

Side walls—6 in.

Floor—6 in.

If a loose fill material is used, the greatest of care should be exercised in obtaining a vapor seal on the outer or warmer surface of the insulation, and the fill should be packed to the proper density to prevent settling.

Surface ceiling and visible portions of walls with a good grade, light-colored paint or finish to improve lighting and appearance.

**Temperature**—Maintain 0° F. with no fluctuation over 2° F. above or below 0° F.

**Evaporator**—For pipe coils or plates, install sufficient surface for refrigerant temperature of -10° F. or higher.

For air-duct systems, install sufficient outlets to obtain uniform distribution of cold air and to avoid noticeable drafts on patrons. This usually requires eight outlets or more for a locker room with 300 lockers.

### Freezer

**Function**—To cool and freeze food before it is placed in lockers. Should unfrozen food be placed directly in the lockers, the quality of nearby frozen food would be impaired through warming-up.

**Location**—Place in locker room for refrigeration economy and convenience of operator.

**Size**—For still air and plate or pipe-coil shelves, provide 1/2 sq. ft. of shelf area for each locker.

For rapidly moving air, provide 1/4 sq. ft. of shelf or tray area for each locker and refrigeration capacity, based on freezing a minimum of four lb. per locker per day, or about 700 Btu per locker per day.

**Arrangement**—Use a cabinet with six or eight shelf plates or shelf coils in one corner of the locker room for plants having 300 lockers or fewer.

Use a freezing room in the locker room for plants of more than 300 lockers.

In addition to the shelves, provide coils or plates overhead to maintain the freezer-room temperature.

Place bottom shelf 12 in. above the floor and the others 8 in. apart.

**Insulation**—No insulation is necessary between the freezer-cabinet room or tunnel and the locker room. All that is required is an air-tight wall made of plywood and studs, or the equivalent.

**Doors**—Use a light-weight door without insulation between the freezer and the locker room.

**Temperature**—Design for 0° F.\* air blast or -10° F. still air at heaviest loads.

### Chill and Aging Rooms

**Function**—to chill all meat to 34° F. and to age beef at a constant temperature of 34° F.

\*Tennessee Senate Bill No. 587, enacted February 1945, specifies "10 degrees below zero Fahrenheit or lower" without mention of method of freezing.



A large, well-designed pipe coil type of freezer in a plant of 760 lockers, capacity. Each shelf is 30" wide and 12' long. Far too many plants have freezers much too small.

**Location**—Have one wall in common with the locker room for economy. Have the chill-room door convenient to the truck-loading platform. Locate the aging-room convenient to the processing room.

**Size**—Provide a total area of 1.0 sq. ft. per locker MINIMUM in the Southeast. However, this figure varies upward according to locality.

**Arrangement**—Separate the chill and aging rooms by a removable wooden partition.

For most of the Southeast make the chill room and the aging room approximately equal in size. In areas where much beef is to be handled, make the aging room larger.

Have overhead track at least 8 ft. 2 in. high.\* If beef is to be handled in halves install a track 10 ft. 2 in. high.

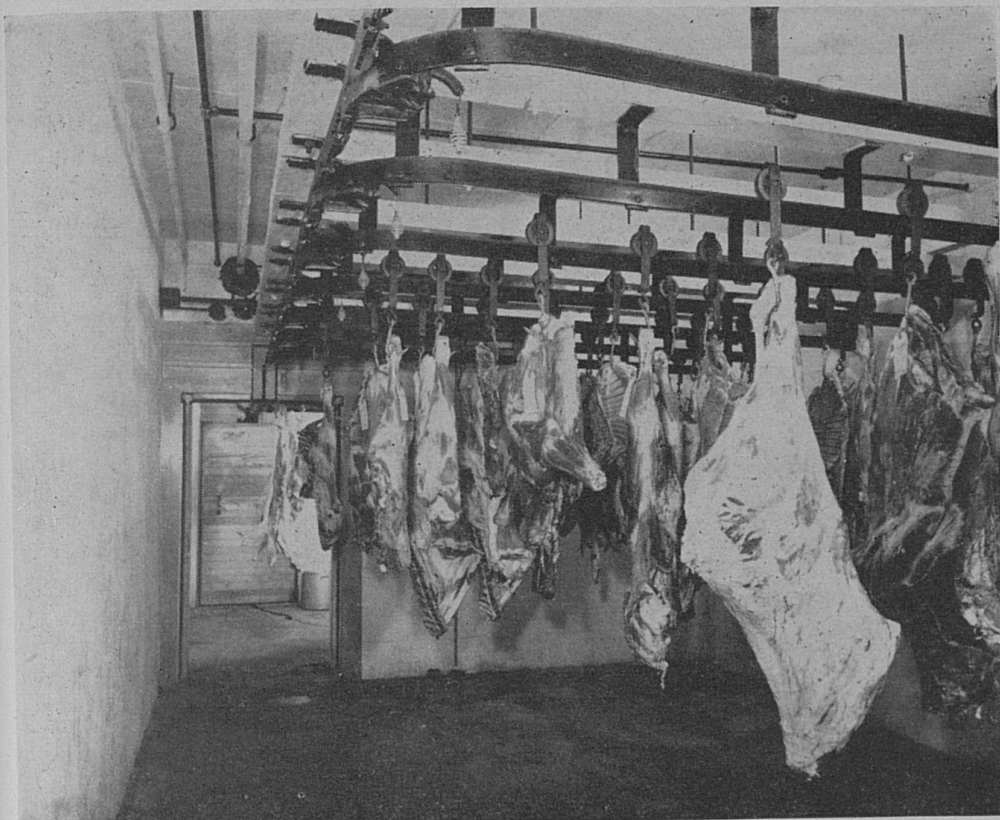
Arrange the tracks 36 in. apart and 24 in. from any parallel wall.

Provide a drain with grease trap in the floor in both chill and aging rooms.

**Insulation**—A block-type insulation as cork or equivalent, erected in a bed of hot asphalt, in the following thicknesses is preferred:

\* Alabama Department of Public Health requires 10 ft. 2 in.





Large chill and aging rooms with plenty of refrigeration installed enable the operator to do an excellent job of producing good hams or frozen steaks on a volume basis with a minimum of labor.

Ceiling—4 in.

Side walls—4 in. (adjoining locker room 6 in.)

Floor—4 in.

If a loose fill material is used, the greatest care should be exercised in obtaining a vapor seal on the outer or warmer surface of the insulation, and the fill should be packed to the proper density to prevent settling.

Surface inside ceiling and walls with a waterproof light colored paint or finish to improve lighting, appearance, and to facilitate cleaning.

**Doors**—Use standard track door, 4 in. of cork or equal.

Between the chill and aging rooms use an ordinary wooden door, or double-swinging, self-closing doors which are manufactured for this purpose.

**Temperature**—Maintaining rooms at 34° F\*

**Evaporators**—Use ceiling-type unit coolers in each room.

The refrigerant should be maintained at a temperature not lower than 24° F. in order to assure proper storage conditions.

\*Tennessee Senate Bill No. 587 enacted February 1945, specifies 36° F for the chill room with no mention of temperature for age room.

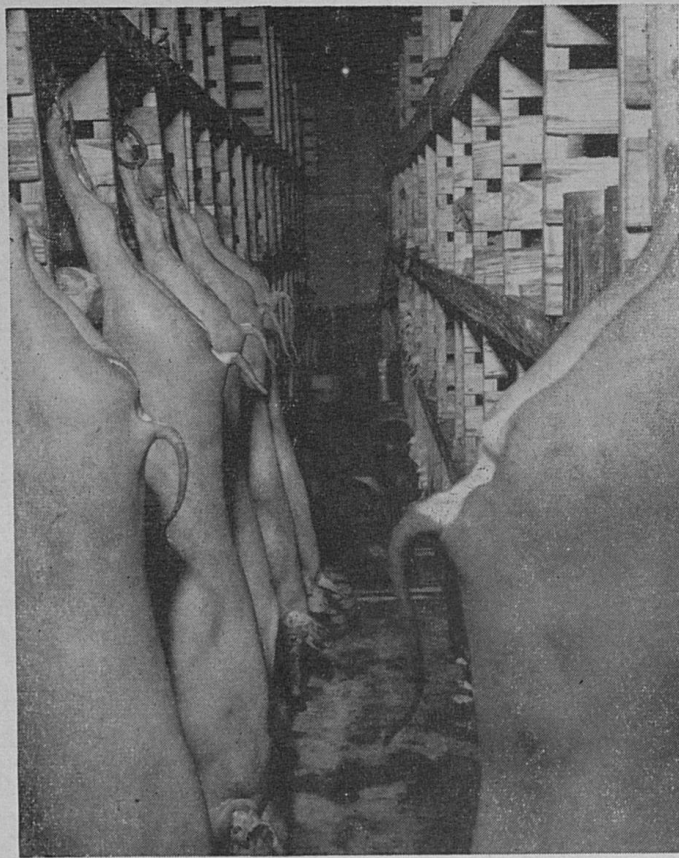
### Salt-Curing Room

**Function**—To provide cold storage for hams, shoulders, and bacon while curing compound penetrates and provides the cure.

**Location**—Have one or two walls in common with other refrigerated rooms for economy in construction and refrigeration.

Preferably, locate salt-curing room toward the rear of the plant.

Open it into the receiving room or rear work room.



Hog carcasses hanging in the salt curing room because the chill room was built too small. This condition doesn't make for the best product and it requires extra labor.

**Size**—The size will vary from a very small room to one larger than the locker room, depending on local conditions.

Generally a room having 1.0 to 1.5 sq. ft. for each locker is suitable. Medium sizes are:

For 300 lockers—17 by 20 ft.

For 500 lockers—17 by 35 ft.

For 1,000 lockers—25 by 50 ft.

**Arrangement**—Install in the salt-curing room rows of bins. Have the bins 24 in. wide, 24 in. high, and 30 in. deep. Use hard wood or a corrosion-proof material.



Large, adequately equipped salt-curing rooms provide a fine service to the community and a good return to the operator.

Salt the sides of the bins to allow free air circulation. Use solid bottoms sloped to front to provide proper drainage. Make bin floors removable to aid in cleaning.

Provide drain troughs in front of each row of bins. Locate the troughs below the floor line of each row.

Have the floor of the bottom row of bins about 12 in. above the floor. A tier of 4 bins 12 in. above floor has an overall height of about 9 ft.

Place the bins at least 3 in. from walls.

Provide 36-in. aisles.

Have at least one non-corrosive drain and grease trap in the floor. Drains should not be less than two inches in diameter.

One of the chief difficulties encountered in the average salt-curing room is improper drainage. To eliminate this condition, slope the floor about  $\frac{1}{4}$  in. per linear foot.

**Insulation**—A block-type insulation as cork or equivalent, erected in a bed of hot asphalt, in the following thickness is preferred:

Ceiling—5 in.

Side walls—4 in. (adjoining locker room 6 in.)

Floor—4 in.

If a loose fill material is used, the greatest care should be exercised in obtaining a vapor seal on the outer or warmer surface of the insulation, and the fill should be packed to the proper density to prevent settling.

Surface inside ceiling and walls with a waterproof light colored paint or finish to improve lighting, appearance, and to facilitate cleaning.

**Door**—Use a standard cooler door, 4 in. of cork or equal.

**Temperature**—Maintain 38° F.

**Evaporator**—Use one or more unit coolers.

The refrigerant should be maintained at a temperature not lower than 24° F. in order to assure proper storage conditions.

### General Storage Room

When it is expected that some fruit, vegetables, and other commodities may be stored at above-freezing temperature, a separate room should be provided. In many plants, such commodities are being stored in the chill room. This practice does not conform to accepted cold storage methods and may result in damage to meat, customers' ill will, and financial loss. In most plants, an extra room for this service is recommended.

**Location**—Place toward rear of plant convenient to the truck-loading entrance.

Have at least one wall in common with other refrigerated rooms.

**Size**—This room may vary from a small compartment to one as large as the salt-curing room.

Investigate local needs for bulk storage of produce by individuals, restaurants, hotels, stores, and others to determine size.

**Arrangement**—Provide shelves and bins for separating produce according to ownership.

Provide space without shelves for stacking crates or baskets.

**Insulation**—A block-type insulation as cork or equivalent, erected in a bed of hot asphalt, in the following thickness is preferred:

Ceiling—4 in.

Side walls—4 in. (adjoining locker room 6 in.)

Floor—4 in.

If a loose fill material is used, the greatest care should be exercised in obtaining a vapor seal on the outer or warmer surface of the insulation, and the fill should be packed to the proper density to prevent settling.

Surface inside ceiling and walls with a waterproof light colored paint or finish to improve lighting, appearance, and to facilitate cleaning.

**Door**—Use standard cooler door, 4 in. of cork or equal.

**Temperature**—Maintain 34° F. plus or minus 2° F. fluctuation.

Keep relative humidity at 85 to 90 percent.

**Evaporators**—Use unit cooler (or coolers).

The refrigerant must be maintained at a temperature not lower than 24° F. in order to assure proper storage conditions.

Provide ample refrigeration capacity to cool large quantities of produce per day.

**Ventilation**—Not considered necessary in relatively small storage rooms.

### Processing Room

**Function**—To provide space and facilities for cutting, grinding, slicing, weighing, and preparing products for freezing.

**Location**—For small plants, locate adjacent to the lobby and receiving room so that the operator can watch all activities.

In large plants, locate near the receiving room, and, for convenience, near the freezer.

**Size**—Make the room large enough to contain all needed equipment, properly placed.

Size and area are factors of less importance than arrangement.

A room 13 ft. wide and 20 ft. long is adequate for smaller plants.

**Arrangement**—Place a counter between the processing room and the lobby to keep patrons out and to act as a service counter for dealing with patrons.

In small plants one man is the meat cutter and operator. He should be able to see all parts of the plant from the processing room.

Allow at least 3 ft. to 4 ft. between pieces of equipment standing away from the walls. More than 5 ft. between adjacent pieces of equipment requires unnecessary walking.

Arrange the equipment and work spaces so that the work will progress smoothly from the aging-room door through each processing operation and then to the freezer.

Avoid any arrangement which will make it difficult to maintain sanitary conditions during busy season.

**Equipment**—The major items of necessary equipment for efficient operation are:

Heavy-top meat table, 30 by 60 in.

Counter space for wrapping, sealing, etc.

Counter space for cleaning pans and equipment

Sink for washing utensils  
Motor-driven band saw for meat cutting  
Motor-driven meat grinder  
Computing counter scales  
Sealing machine or iron

### Work Room

**Function**—Primarily to provide space for the less eye-appealing and objectionably odorous operations as lard rendering, ham smoking and poultry killing and dressing.

If receiving is done at rear of plant a portion of the work room may be devoted to receiving operations.

**Location**—Place in the rear of large plants, or on one side of small plants.

**Size**—The size needed depends on the overall size of plant, number of operations to be housed, extent to which each operation is promoted and the arrangement of equipment used in each operation.

In many plants the machinery is located in one corner of the work room.

For a plant with 500 lockers have a floor space about 31 by 36 ft. or its equivalent in area. This should provide sufficient space for ham washing and soaking, ham smoking, lard rendering, poultry killing and dressing, for storing of supplies and for machinery.

If fruit and vegetable processing is to be done in rear allow some additional space for this purpose.

**Arrangement**—Have ham washing sink and soaking vat near salt-curing room. A good location is along a rear insulated wall.

If a portable smoke oven is chosen, locate it near the soak vat. Along an outside wall is a good place.

Place lard rendering kettles in such a place as to facilitate the removal of obnoxious odors which are liberated. Along a wall is a good place for kettles.

Use a hood or exhaust fan to expell processing odors.

Poultry processing equipment may be assembled in a straight line or in a "U" shape. The processing line may be placed along a wall or out in open floor space. In addition to table space the equipment needed consists of a bleeding trough, scalding vat, drum picker, cooling vat, and sink.

Place machinery in a dry place near refrigerated room but preferably out of the way of other operations.

Space for supplies, machinery and men's rest room may be partitioned off from other operations.

## Receiving Room

**Operations**—Primarily to receive meat, fruits, and vegetables for processing and storage.

**Location**—Place at the rear or side of the plant near the chill room. If at rear it would become a section of rear work room. If at side it would be part of corridor leading from processing room to the rear work room.

**Arrangement**—Have a door opening to the receiving platform. Have an overhead track running from the platform into the chill room.

Place a track scale just inside the receiving door.

Have a drain in the floor under the track so dirty carcasses can be washed.

## Lobby

**Location**—Place at front of plant or at main entrance.

**Size**—Provide ample space for patrons to stand while waiting or sorting their packages. A space about 10 by 12 ft. is usually sufficient. More for sales.

**Arrangement**—It should open into the locker room, processing room, and front or entrance of the plant.

Provide a table so that the patrons may leave packages while they are in the locker room.

## Rest Room

Rest rooms must be built, equipped, and located in accordance with the rules and regulations of the State Board of Health.

## Refrigeration Equipment

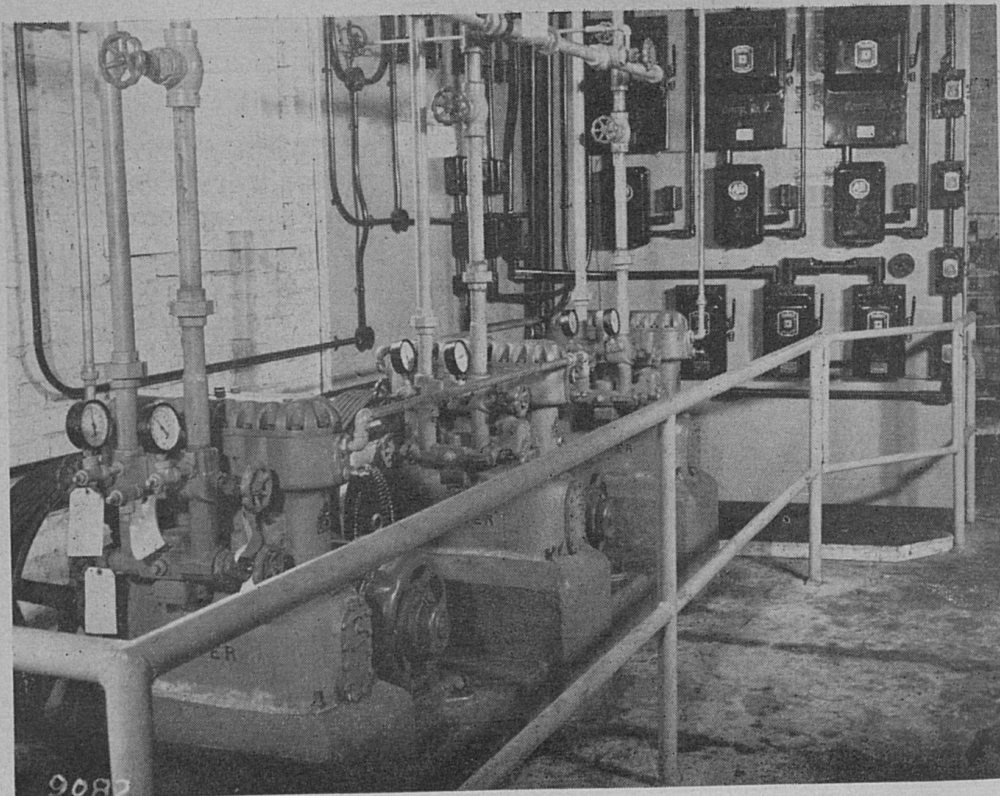
**Compressors**—Use machines which are designed for HEAVY-DUTY work. Have adequate capacity for peak loads. Select compressors which will provide necessary capacity when operating at medium speeds recommended in the manufacturer's catalog.

Install two or three compressors. Usually two are sufficient. Use one compressor for low-temperature rooms, i. e., freezer and locker room. Use one compressor for high-temperature rooms, i. e., chill, aging, salt-curing, etc.

Interconnect so either compressor may be used on all rooms in an emergency.

The refrigeration system can be designed to use ammonia or freon or other refrigerants suitable for the specified temperature ranges.

The prospective locker plant operator need not concern himself with the respective merits of the refrigerants. It is more im-



A good layout of compressor and central control panel. Three compressors were used in this plant because some semi-commercial freezing of fruits was done. One compressor was connected to the freezer, one to the locker room, and the third handled the chill, aging, and salt-curing rooms.

portant to employ a reputable contractor who will guarantee his installation to fulfill all specific requirements and who has adequate service facilities to provide complete maintenance for equipment.

**Condenser**—The evaporative type of condenser is generally preferred for a locker plant, for it combines into one compact unit the functions of a condenser, a water pumping system, and a cooling tower. Furthermore, it occupies little plant space and is economical in operation.

In some instances where a plentiful, cheap supply of water is available, a shell-and-tube condenser may be better.

**Evaporators**—Evaporators have been listed already with the respective rooms. Be sure they are of adequate capacity for peak loads.

**Controls**—Install a high-pressure cutout switch on the high-pressure side of each compressor. Be sure there is a safety valve on the receiver.

Provide suction and head pressure gauges on each compressor. Gauges are essentially control indicators but are generally considered in connection with controls.



Centralize controls, valves, gauges, etc., on one panel near the compressors.

Other specifications of control equipment vary so much that they cannot be listed here. Allow your contractor sufficient funds to install a complete and efficient system of controls.

### LAYOUT FOR PLANT OF 500 LOCKERS

The drawing shown on the following page is for a locker plant of 500 lockers. It provides, in addition to the locker room, a freezer, a chill room, an aging room, a salt-curing room, a bulk storage room, and a general storage room. The sizes of these rooms meet the minimum requirements for good design.

In addition to these rooms, space is provided for fruit and vegetable processing, poultry killing and dressing, lard rendering, and meat smoking.

**Building and Lot**—The plant building is 65 ft. wide and 97 ft. long. A lot for this building should be at least 75 ft. wide; that is 10 ft. wider than the building to provide driveway space to the rear of the plant. It is desirable to have the length at least 125 ft. or 28 ft. greater than the length of the building. The additional length is to allow for future expansion. If parking space is desired either in front or on the side of the plant, these dimensions should be increased accordingly.

**Locker Room**—The locker room is  $24\frac{1}{2}$  ft. wide by  $34\frac{1}{2}$  ft. long. A room of this size is necessary to house 500 lockers in rows 6-high, 3-foot aisles, and a freezer of suitable size.

By far the most expensive room in the entire plant to build and operate is the locker room. In order to justify this expense, it is necessary to have patrons utilize their lockers to the fullest, for the more food that goes through the lockers the more the income that is realized through processing charges. In reverse this statement would be to have as few lockers as possible for the quantity of food handled.

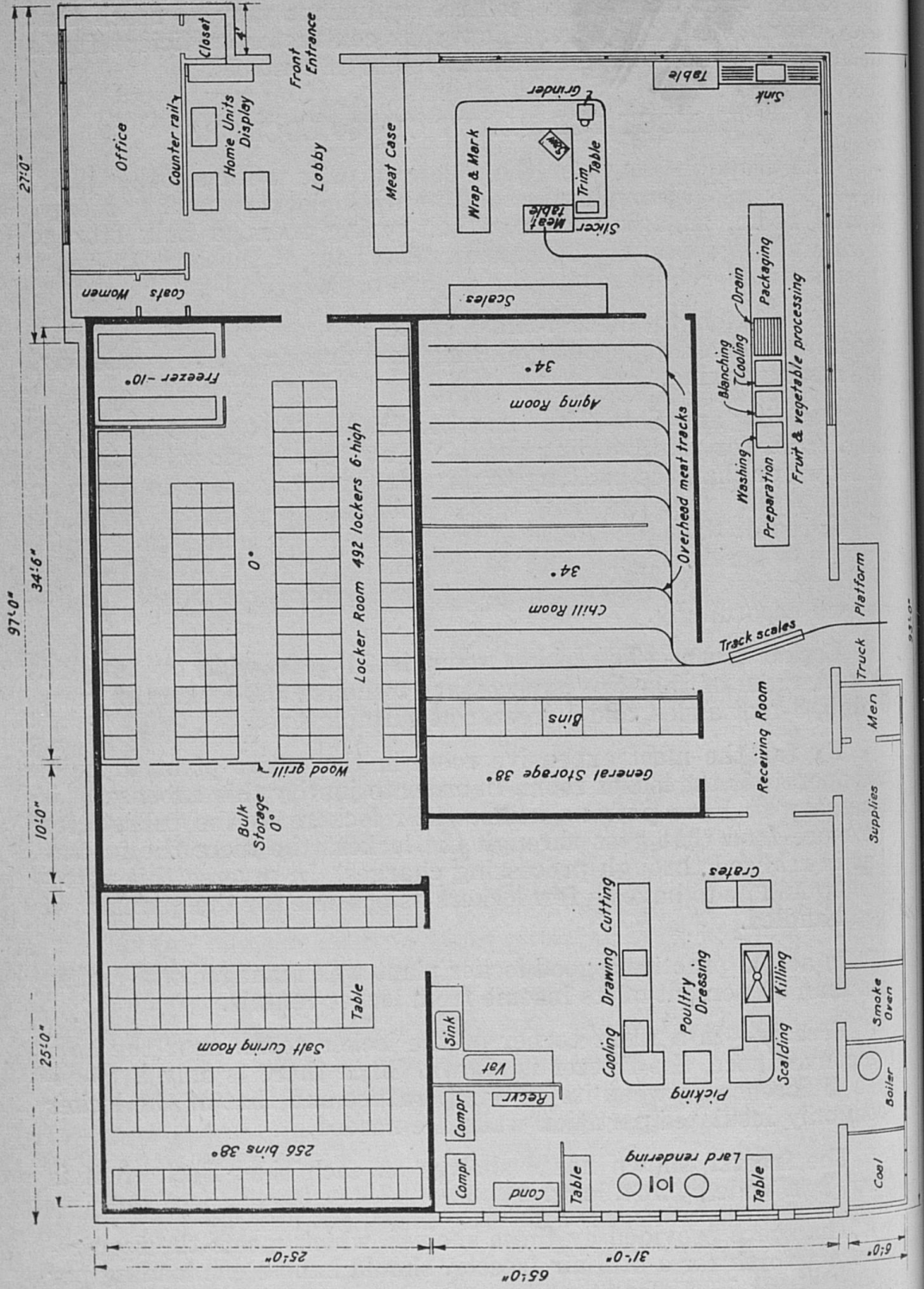
In actual practice a good locker plant well managed will realize less than 50 percent of its income from locker rentals.

**Freezer**—In a front corner of the locker room, near the door for convenience, the freezer is shown. Since there is only a 10-degree difference between its air temperature and that of the locker room only insulated partition walls are needed.

The freezer shown has 8 shelves on each side. Each shelf is about 2 ft. wide by 9 ft. long.

The space provided by these shelves, which meets the requirement set forth for a still air freezer, should handle one loading per day of about 2,000 lbs.

# SUGGESTED LAYOUT FOR PLANT OF 500 LOCKERS



**Bulk Storage Room**—To the rear of the locker room and separated from it by a grill is a bulk storage room. It is in reality a 10-ft. extension of the locker room. The actual size needed depends on the use to which it will be put. It may serve as a temporary storage space for overflow from lockers, or it may supply freezer storage space should a semi-commercial freezing operation be contemplated, such as the freezing of chickens for non-producing patrons and for local or near-by meat markets and restaurants. Again, it could be rented to some distant ice cream company for use in serving the local market area. Furthermore, the space could always be used for additional lockers if other uses do not prove desirable or profitable.

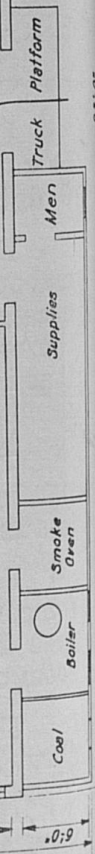


Patrons frequently want to store more food than their lockers will hold. Unless a bulk storage room is available, this excess material must be stored in the aisles, which is very undesirable.

For convenience, the room is arranged so as to provide a door outlet to the rear of the plant.

In order to save the cost of construction and insulation, it is desirable to have as many common walls as conveniently possible among the various refrigerated rooms. This floor plan complies with this principle.

**Chill and Aging Rooms**—Adjoining the locker room are the chill and aging rooms. For the Southeast, these rooms should be about equal in size, in view of the large quantities of pork to be



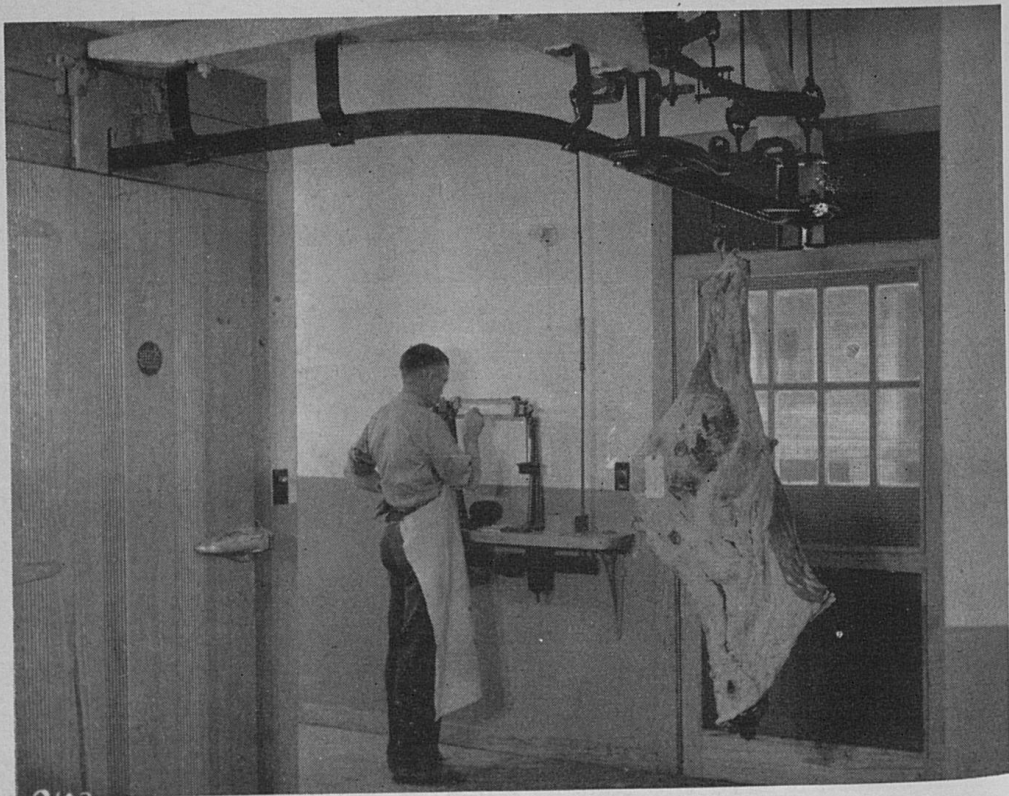
chilled. In other parts of the country, a substantially larger aging room may be necessary.

The over-all size of the two rooms is 30 ft. by 21 ft., which is in accordance with the recommended space requirement of at least one square foot per locker. A room of this size should care for the requirements of the plant and perhaps for a little outside custom chilling and aging. However, should substantial outside chilling and aging be contemplated, larger rooms are recommended.

The rooms are separated by a non-insulated, movable wall. No insulation is needed as the temperatures on both sides are substantially the same.

The overhead meat tracks are 3 ft. apart and 2 ft from parallel walls. These clearances have become pretty much standardized.

The receiving platform is located on the side of the plant near the entrance to the chill room. The aging room adjoins the chill room and gives a straight forward flow of meat from unloading platform through the chill and aging rooms to the meat cutting table.

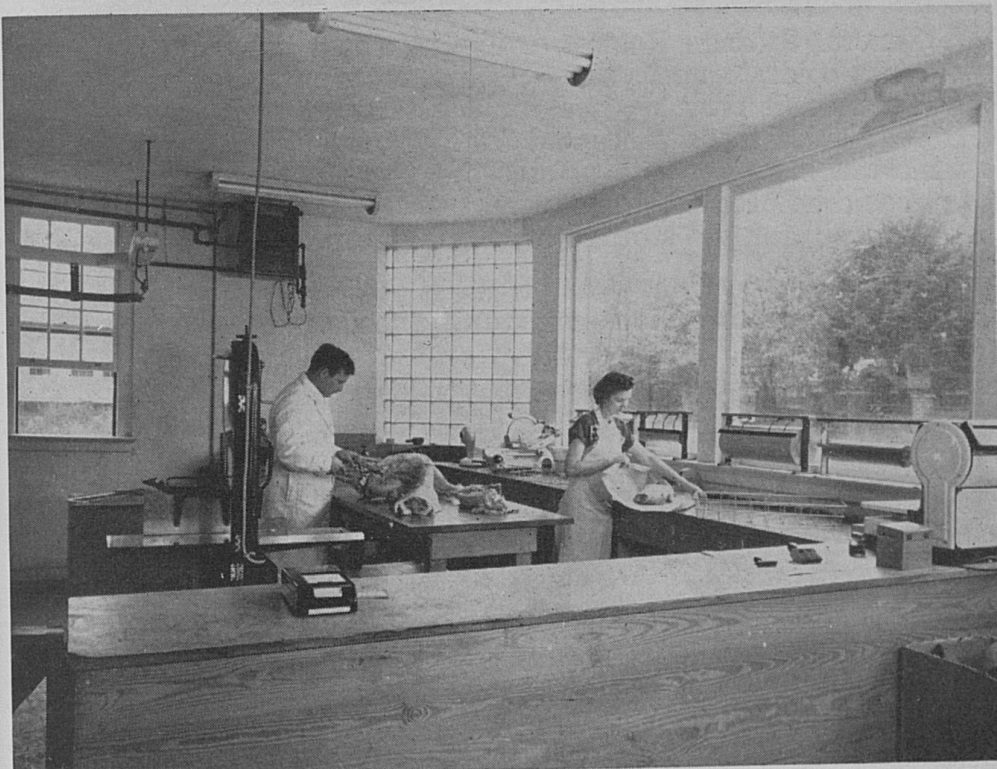


Fresh carcasses are received at the unloading platform, weighed while hanging on the track, then rolled into the chill room.

**Processing Room**—The processing room is located in the front of the plant, and is separated from the lobby by a meat case or service counter. The front of the plant is the logical place for this work space for several reasons.

In the first place, such a location permits the processing of meat in a continued straight-forward motion toward the freezer and locker room. In the second place, it makes for the most economical use of labor. Usually, during a working day the office employee has much spare time. With the processing room just across the lobby, the employee can easily step over and assist in the wrapping and marking of meat cuts. At the same time, patrons can be observed entering and leaving the building by any employee working in the processing room.

If meat is sold retail, then there is still further justification for having the processing room in front adjoining the lobby.



A neat, well-lighted processing room is an asset to any plant.

A processing room which is visible to the public and is clean and modern in design is one of the cheapest and yet best forms of advertisement.

The U-shaped arrangement of the meat table, saw, and counter space for meat trimming, grinding, slicing, wrapping, and marking is employed to better utilize the space and to effect economies in labor.

The fruit and vegetable processing line extends from the receiving room into the processing room. This location and arrangement gives a straight-line flow from the receiving room toward the freezer. The processing line is set out from the wall to make possible working on both sides.

The processing line shown can be used by employees if the plant does the processing, or by the patrons if it is desired to let them do the work on a so-called "community basis". More and more operators of plants are realizing that their patrons are going to avail themselves of frozen fruits and vegetables, whether it be from their locker plants or from retail competitors handling frozen foods. Furthermore, they see an opportunity for increasing their patrons' use of plant facilities, with a resulting increase in processing income for the plant and satisfaction of the patrons.

Centralized processing of fruits and vegetables in the plant, rather than unsupervised, improper processing in the patrons' homes, assures good quality of the products frozen.

**General Storage Room**—Adjoining the rear wall of the chill room is a cold storage room. Such a room may have many uses. For instance, it may be used for the temporary storage of fruits and vegetables to be processed for patrons' lockers or on a semi-commercial basis for sale outside the plant. As alternatives, this room could be used for the storage of Irish potatoes, or it could be used entirely for the storage of cured meats.

In addition to these possible uses, there may be others which differ according to various community needs.



Every plant has occasion to store miscellaneous produce such as watermelons, head lettuce and so on. It is better to have a general storage room for these commodities rather than attempting to crowd them into the chill room.

The size of the miscellaneous storage room will depend on the use to which this room is put and to the extent to which the operator wishes to satisfy his community's need.

**Salt-Curing Room**—Opening into the rear work room and adjoining the bulk storage room is the refrigerated salt-curing room. The need for and the importance of this room cannot be over emphasized. It is through the proper use of this room and the smoke oven that the locker operator saves his farm patrons untold quantities of meat that would ordinarily be lost through spoilage brought about by improper curing methods and unfavorable weather conditions. In addition it gives the operator one of his chief sources of income. No locker operator can afford to be without a sizeable salt-curing room.

Today many plants admittedly have salt-curing rooms too small for needed operations. Such mistakes need not be repeated.

The salt-curing room is 25 ft by 25 ft. which gives space sufficient to meet the required minimum of one square foot per locker.

Inside the room are wooden bins in rows four high. Aisles between the rows are 3 ft. wide. A table for use in applying the salt-curing mixture to the meat is located near the door.



Prefabricated, sheet-metal ham ovens are also available. One like this will handle the smoking for a plant of about 300 lockers.

**Rear Work Room**—The less appealing operation with possible unpleasant odors are placed in the rear work room separated from the front of the plant by a corridor and partition wall.

Just outside the salt-curing room in the rear work room is a sink for use in washing surplus salt from the surface of the meat when the meat is removed from cure. Next to the sink is a soaking vat for removing excess salt in the outer tissues of the meat.

For smoking the cured meat an oven is included in the layout. This oven is located between the boiler and supply rooms and opens directly into the rear work room.

Along the rear wall of the work room are two lard kettles, a lard press, and two tables. Lard rendering can be quite profitable. Furthermore, it is another service that furthers the satisfaction of the patrons and makes them increasingly dependent on their locker plant.

No locker plant is complete without facilities for processing poultry. Every locker plant is called upon to process poultry. To ignore such requests and fail to include this service is to turn down profitable business, and dissatisfy patrons.

One of the first locker operators in the Southeast, and today one of the most successful, has publicly said "Adequate poultry processing facilities for locker plants are recommended." As for the size of these facilities, he continues, "I wouldn't say that every plant should have a complete set-up for processing poultry on a commercial basis, but I do recommend it where the set-up is feasible."

The poultry dressing equipment shown in the center of the work room is not too costly. In fact, all tables and vats shown can be home-made. The only piece of equipment that must be purchased factory-made is the small drum picker.

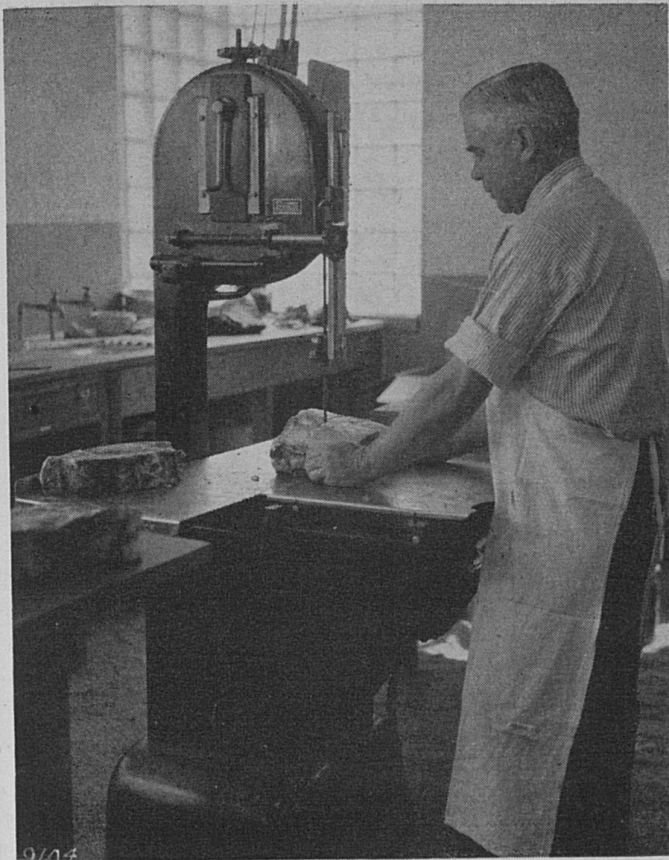
With the equipment arranged as shown one person can work handily, or six people can work without confusion. Production, then, can be had on a small or semi-commercial scale, as desired.

**Machinery Room**—The machinery room which houses the compressors, condenser and receiver, should be located near the rooms which it serves and yet it must be out of the way of other operations. The location shown is perhaps the best place in this layout for this room.

**Other Facilities**—In a building wing adjoining the rear work room are the coal bin, boiler room, smoke oven, supply room, and men's toilet.

Every plant of this size has need of a small boiler. In addition to heating the plant, steam from the boiler can be used for heating the lard kettles, heating water for poultry scalding, heating water for cleaning small pieces of processing equipment, and for general scouring and cleaning of plant walls and floor.





Every plant should have a motor-driven bandsaw for cutting meat. It will save much time and eliminate bone splinters in the meat.

A locker plant unless it has semi-commercial freezing operations does not need a large supply room, but a small one of about the size shown is essential.

No rest room should open directly into a food processing room. It should be noted that the men's room opens into the supply room and the women's rest room opens into the lobby.

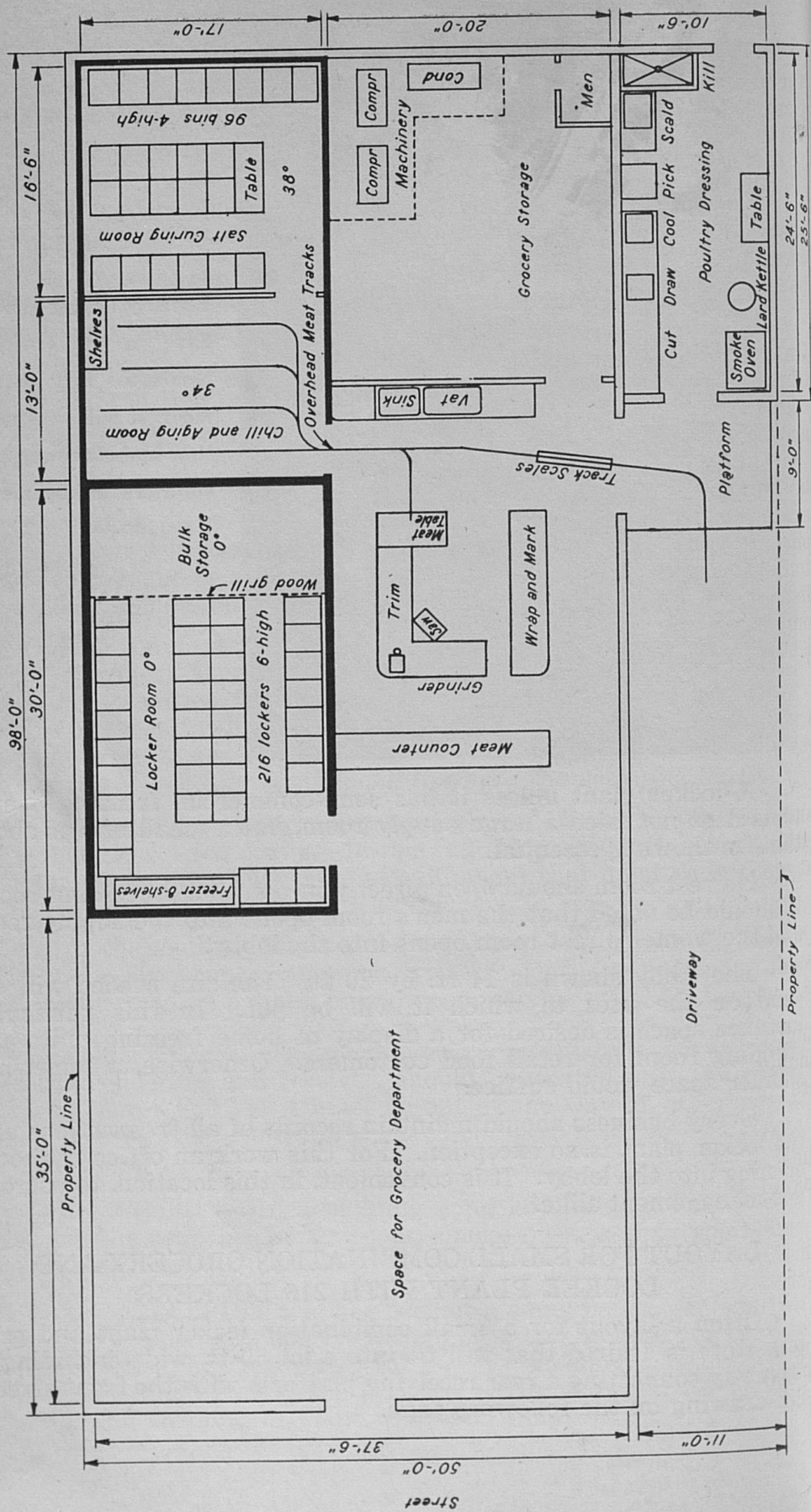
The lobby shown is 14 ft. by 20 ft. The size needed will depend on the uses to which it will be put. In this particular instance space is desired for a display of home freezing units and standing room for retail food customers. Otherwise, a somewhat smaller space would suffice.

Every business should maintain records of all transactions and the locker plant is no exception. For this work an office is shown opening into the lobby. It is convenient, in this location, to patrons and management alike.

#### LAYOUT FOR SMALL COMBINATION GROCERY AND LOCKER PLANT WITH 216 LOCKERS

Often a layout for a small combination locker plant and grocery store is desired that will fit into a lot 50 ft. wide, including a driveway connecting a rear receiving platform with the front street. See drawing on the following page.

**SUGGESTED LAYOUT FOR SMALL COMBINATION GROCERY AND  
LOCKER PLANT WITH 216 LOCKERS**



Obviously it would be better if no width limitation was set, for usually limitations necessitate compromises on good design. Sometimes, however, compromises may be justified on the basis of getting an excellent plant location. With the layout shown such is the case.

The front of the building houses the grocery operation. The space needed will depend on the size of the grocery operation desired. It, therefore, follows that the length of the building will depend on the extent of the grocery operation.

The entire locker operation is in the rear section of the building. On one side are located the refrigerated rooms. This combination of rooms is much longer than it is wide. Obviously some insulation could be saved and subsequent power bills lowered if the rooms were arranged in a square. But such an arrangement is not advisable in the building shown in spite of the economies offered. The narrow building is the limiting factor. Any other arrangement would separate the work spaces and make it impractical for one operator to observe patrons entering the locker room, wait on retail meat customers, handle unloading at platform and supervise poultry dressing, and meat curing. The layout shown is to effect as many economies in labor as possible, so necessary in the operation of a small locker plant which has as many unit operations as a larger plant.

The entrance to the locker room is on one side and in front of the retail meat counter. This location enables the operator from his work space to observe traffic in and out of the locker room.

In the chill and aging rooms there is no separation of the chill and aging operations. This is not considered necessary as large quantities of hot meat are not expected to be received at the plant at one time.

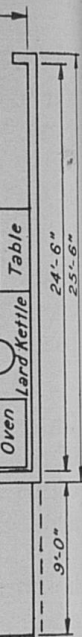
Space for machinery, men's toilet and storage of groceries is at the rear of the plant and it is partitioned off from the processing room.

The door to this space is near the unloading platform, thus minimizing distances that grocery supplies must be hauled. It should be noted that the receiving platform and the storage room are connected with the grocery department by a straight 5 ft. aisle.

In a side wing opening on to the receiving platform are located the less appealing and malodorous operations; namely, poultry dressing, meat smoking, and lard rendering.

A room for the temporary storage of live poultry (not shown on the layout) can be located just outside and to the rear of the work room that houses the poultry operation.

Other details of this layout are either apparent from the drawing or have been discussed under the suggested "Layout for Plant of 500 Lockers," pages 25 and 26.



Property Line

