Yours Truly,
A. H. Wilder

THE MODERN

PACKING HOUSE

A COMPLETE TREATISE ON THE DESIGNING, CONSTRUCTION, EQUIPMENT AND OPERATION OF A MODERN ABATTOIR AND PACKING HOUSE, ACCORDING TO PRESENT AMERICAN PRACTICE, INCLUDING FORMULAS FOR THE MANUFACTURE OF LARD AND SAUSAGE, THE CURING OF MEATS, ETC., AND METHODS OF CONVERTING ALL BY-PRODUCTS INTO COMMERCIAL ARTICLES

BY

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PREFACE.

In the preparation of this work, the first complete treatise upon the subject of the packing house business ever published, two objects have been kept constantly in view. It was determined, first, to present in a convenient and simple form, practical suggestions, tables and formula that are needed daily in the operation of a plant and in the prosecution of the packing house business along modern lines. Second, it was determined to describe each operation in all the various ramifications of the business, from the unloading of the animals at the pens to the production of the finished product and the disposition of same, in the same order in which the different operations are actually conducted.

In adopting this course, the author and the publishers have been largely influenced by the fact that inquiries are constantly being made asking for information regarding the various methods pursued by packers in obtaining the results described in this work, which would seem to indicate that this arrangement of the subject matter would best subserve the needs of a very large proportion of those operating and conducting packing, slaughtering and rendering plants, both large and small.

All the various operations described and subjects treated upon have been carefully indexed at the end of the volume, so that any matter upon which it is desired to obtain instant information may be easily and readily found. In addition to this, the author has arranged the chapters and the operations described in each, together with descriptions of the machinery and appliances required for same, in the order in which the various functions should be performed in the packing house, as nearly as it is possible to do so. In fact, the established packer or butcher, as well as the new beginner, if he will carefully digest the contents of this work, will find that he has ready to his hand a vast amount of valuable information of an absolutely reliable character, hitherto unattainable, the knowledge of which will aid him materially in conducting his business to the best advantage.

The chapters on the proper construction and arrangement of the various departments of the modern packing house, contain information rarely found in a work of this character, and which is usually obtained only by the expenditure of a large sum for expert advice. The author has given the reader the full benefit of his many years' experience in the construction and operation of some of the largest, most completely equipped and up-to-date packing house plants in the world.

A large proportion of the contents of this work is devoted to tests showing the value and yields of the various products of a modern packing house, based on prices and conditions existing at the time they were made, in which the percentages and comparisons are absolutely reliable, and which will prove invaluable to those hitherto unable to obtain such data.

The numerous formulas given for the manufacture and preservation of the various products of the packing house are those which have been proven to be the best after many years of experience in using same. In every instance they have been put into the simplest form possible, so that no mistake can be made in applying them to the requirements of the reader.

The information furnished in these pages, which has been carefully compiled and arranged, is based almost entirely upon the author's own personal observation and experience, there being very little mere theorizing upon the possibilities of what may be accomplished by adopting certain prescribed methods. For this reason especially it will be found of great practical value to all who are interested in any way in the packing house business.

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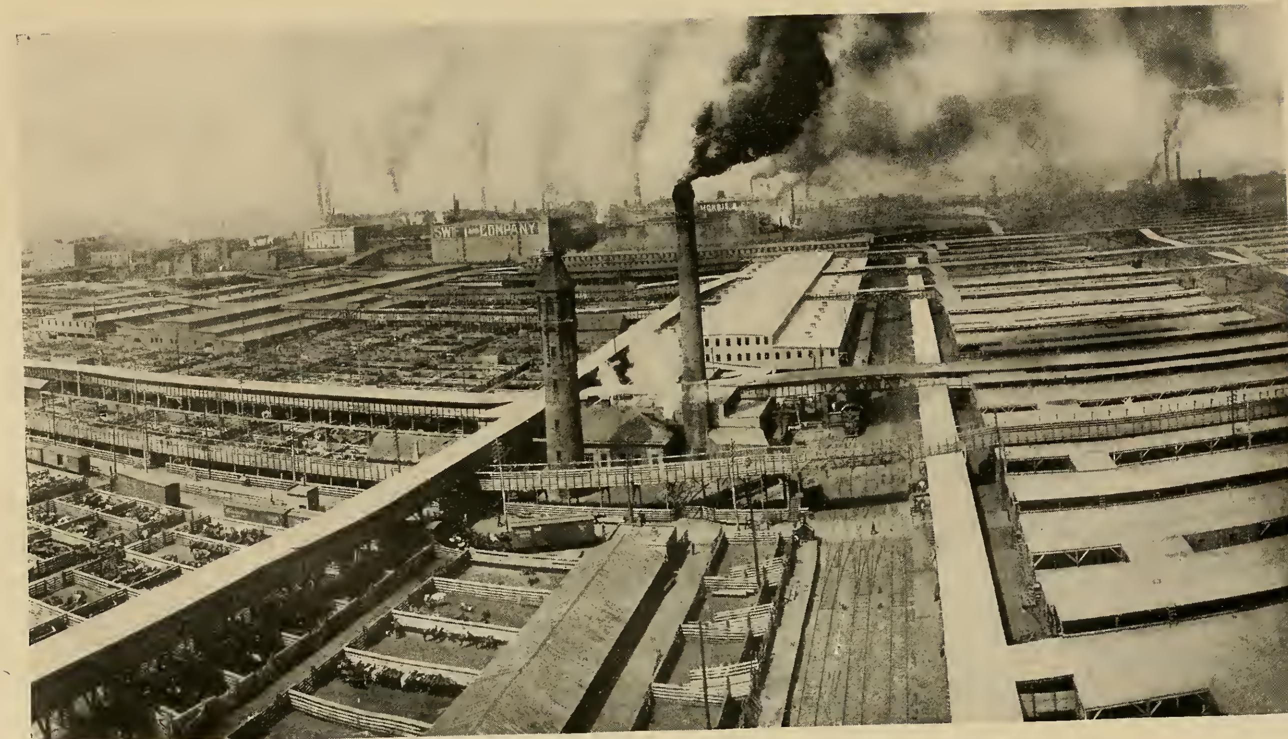


GENERAL VIEW OF UNION STOCK YARDS, CHICAGO, SHOWING PACKING HOUSES IN THE DISTANCE.

ENTRANCE TO THE UNION STOCK YARDS, CHICAGO, U. S. A.

CHAPTER I.

CONSTRUCTION OF MODERN PACKING HOUSES.

INTRODUCTORY.

Probably no industry in the United States has shown such rapid growth in so short a space of time as has the packing house business. The modern packing house as it exists today may be said to be less than thirty years old since its first inception, and one naturally inquires the causes which led to the growth of this industry to its present proportions in so short a time, ranking practically fifth in importance among the industries of the United States. The one main factor which has been instrumental in the consummation of this immense growth is "Concentration"—the watchword of the day in all large and successful industries.

Before the modern packing house was inaugurated the method in vogue was to either ship or drive the live stock to the point of consumption, where it was slaughtered and put on the market in a crude and expensive way, as compared with the methods of today. In the general evolution of the business the first step toward making the modern packing house was the concentration of live stock at a few central market points where it was offered for sale. Prior to that time it would have been impossible for any one point to obtain sufficient stock to much more than supply its local demands.

In the earlier days of the live stock market buyers purchased their supplies where they could and shipped them, alive, to the places where the animals were to be consumed. At this point Yankee ingenuity and energy interceded and devised the opposite plan, viz: that of shipping the live stock to a few central points and there changing it to dressed meats, which were then shipped to

FIG. 1.—LIVE STOCK GOING TO SCALE.

the various markets as required. The development of this plan inaugurated a new line of business now recognized as one of the most important of modern industries —central stock yards and packing house centers.

One of the first and at present the largest in the world, of these central live stock depots, is the Union Stock Yards, Chicago, Ill., U. S. A., where also are located the largest slaughter houses. Views of these great yards are shown on pages 14, 15 and 16, preceding this chapter. Fig. 1 shows one of the places where live stock, as fast as purchased, is run over the scales and weighed, prior to delivery to the purchaser; Fig. 2, a view of the live stock pens and an alleyway on a busy day; Fig. 3, a view of a pen containing choice yearling cattle and Fig. 4, one containing a bunch of choice Polled-Angus cattle.

FIG. 2.—A BUSY ALLEY.

In the development of the modern packing house plant perhaps the first radical innovation, and, doubtless, essential requirement for success, was the adoption of the meat cooler or refrigerator and the modern system of mechanical refrigeration; for this, and this alone, made it practicable to promptly chill the carcasses as soon as the animals were slaughtered and keep the meats in condition to stand exposure to higher temperatures without deterioration. It enabled the packer to keep up continuous, economical operation of his plant and yet sell his meats as the exigencies of the market might require. It enabled him also to furnish first-class meats at any and all times. Furthermore the operation of the refrigerating plant enabled him to freeze the lesser parts, such as livers, kidneys, hearts, etc., and thus, in the first

FIG. 3.—PEN CONTAINING CHOICE YEARLING CATTLE.

place, prevent losses through the rapid decomposition of these parts when exposed to high temperatures, and, in the second place, control the market for such product, preventing an over supply at one period and a scarcity at another.

The next step, and of almost equal importance, was the adoption and developing of the modern refrigerator car, by means of which the packer was enabled to ship his dressed beef to the point where it was to be consumed, and with this and with the improved facilities offered by the railways, the business of shipping fresh dressed beef to any portion of the country, was made possible.

When the pioneers of the business first broached the idea of killing cattle in Chicago and selling the dressed beef in Boston it was considered wholly impracticable and the people that started the business were looked upon as a "little queer." There were many bitter experiences, before it was accomplished, in the way of losses;

FIG. 4.—PEN CONTAINING CHOICE POLLED-ANGUS CATTLE.

for shipping perishable articles so long a distance caused the loss of many thousands of dollars before the proper methods were discovered, but with the tenacity of the new beginner and the people who felt that they were on the right lines, these obstacles were soon overcome and today meats are delivered in eastern markets in a far better and a more healthful condition than they were ever offered to the public under the old methods.

Another feature that made the business possible was the fact that on the vast plains of the west innumerable cattle were being raised at a minimum cost, whereas in the thickly settled east, in the large manufacturing districts, was found a ready market for this beef. The packing business of this country would practically be impossible in older countries that are thickly settled, as the cost of raising live stock would be actually about the same in all parts and the cost of shipping from one point to another would only add to the original cost. In this country with the low cost of raising the animal on practically valueless land, except for grazing purposes, the eastern farmer with his high priced land was unable to compete, hence the practice of raising live stock in the west and consuming it in the east, and the concentration of live stock at the large markets, with the improved devices of today, made the business a possibility and the money and energy expended in adopting the best methods has caused its growth to its present magnitude.

Another very important feature in adding to the growth of this industry is the great saving effected by utilizing the by-products. When cattle were killed promiscuously throughout the country this was impossible, for a man killing a few cattle for some local point could not in any way save the by-products, consequently they were all lost. Neither could the small killer afford the necessary appliances with which to turn the material out economically and compete with one doing business on a modern scale, any more than the ancient cobbler sitting at his bench could afford the labor-saving machines and devices which we see in the modern shoe factories. Furthermore, the general health of the public has been served by having their meats delivered in a much better condition than they could be at the time when the animal was killed and the meat consumed without having the animal heat thoroughly removed—a matter which is conceded by scientists as being deleterious to health. That the meat is delivered to the consumer in better condition than it was formerly is generally conceded by all, and the foreigners who visit this country are invariably impressed with the superior meats with which they are served at our hotels and restaurants.

As regards the by-products which are saved in the modern plants, the value of these products, which under the older methods were almost entirely lost, is enormous. The heads and feet, which were ordinarily thrown away, are today worked up into various products, all of which have a market value. The blood, tankage, etc., are all turned into commercial commodities, and the saving of these different parts creates a handsome profit in the business, a profit which has been entirely lost heretofore. Further details on this matter will be given in the chapters treating on the various by-products.

The next step in the development of the packing house business, and a step which was considered a few years ago as an impossibility, is the shipping of refrigerated beef to England. By the most careful and detailed attention, and the utilization of modern methods, it is possible to kill cattle or sheep in the hottest months of the year in Kansas City, Omaha, or Chicago, ship the meats in refrigerator cars to the seaboard, where it is transferred into refrigerated rooms on the steamers and thence to England, the meat being sometimes four or five weeks en route from the abattoir where the animal is killed to the place where the meat finally reaches the consumer, and though the English authorities give it the most critical examination, it invariably passes. America furnishes the largest part of the meats consumed in that thickly populated country. It is true that for many years we have supplied foreign markets with cured and canned meats, but the fresh meat trade in England is a business developed within a comparatively few years and has today grown to an immense magnitude. The reports of the Bureau of Statistics of the government of the United States show that for the fiscal year ending in June, 1904, there were exported from the United States a total of 57,468,338 pounds of canned beef and 299,579,671 pounds of fresh beef. Of the latter 298,117,225 pounds were sent to the United Kingdom. Of the canned beef 45,155,744 pounds went to the United Kingdom. There were also exported in the same year a total of 76,924,174 pounds of tallow; 249,665,941 pounds of bacon; 194,948,864 pounds of ham; 9,479,312 pounds of canned pork; 18,633,820 pounds of fresh pork; 112,225,176 pounds of salted or pickled pork; 561,302,643 pounds of lard, and 52,605,545 pounds of lard compounds. The total value of the meat and meat products exported from this country in 1904 is given in the report of the Secretary of Agriculture as over $174,000,000, not including hides, glue, grease and scrap, of which over $5,000,000 worth was exported. The bulk of all these exports went to England.

Germany, France and other European countries could also be supplied in the same way, as they undoubtedly will at some future day when their tariffs are revised or reciprocity treaties are made so as to allow the importation.

SUGGESTIONS ON CONSTRUCTION OF PLANT.

This is so voluminous a proposition that it is rather difficult to cover thoroughly the many points which may come up, but the following may serve to give those contemplating building, or changing, some valuable information.

In the building or the starting of a packing house plant it is only within the last few years that this matter was studied from a practical standpoint so as to get the best results for the least expenditure in operating same. Formerly it was considered proper to build the killing house and coolers on the ground level, excavating for a cellar for the storage of some of the products; the power house, tank rooms and other buildings for the disposition of by-products were put anywhere without reference to convenience or to economy in operation. Later experience has proven that it is economical to slaughter cattle on the upper floor of the building, and instead of spreading out on the ground and covering a large area, to build higher with a correspondingly smaller area, and utilizing the floors below for various purposes. With a proper incline cattle will make an elevation of 40 or 50 feet without detriment to condition, and it is much cheaper to walk the animals up to this elevation than it is to kill them on the ground floor and elevate the different products to their respective departments.

Gravitation is the cheapest force which we have at our disposal, hence it is conceded to be the best way to have the cattle killed on the upper floor, and pass the carcass and the offal of the animals by gravity to a lower floor, where it is all treated and made ready for the respective departments. This floor should be on a level with the top of the tanks for the purpose of rendering the material; also the other departments, such as the oleo, or the bone house for handling heads and feet, etc., should be, as nearly as possible, on this level, although it is always considered advisable to have them disconnected, as they are the departments in which is generally found the greatest liability of fire. Fig. 5 gives a cross section of one of the largest plants built on this idea, and the reader will note that the cattle are slaughtered on the upper floor, the offal being passed by gravity to the floor below, where it is worked up. Heads and feet are sent

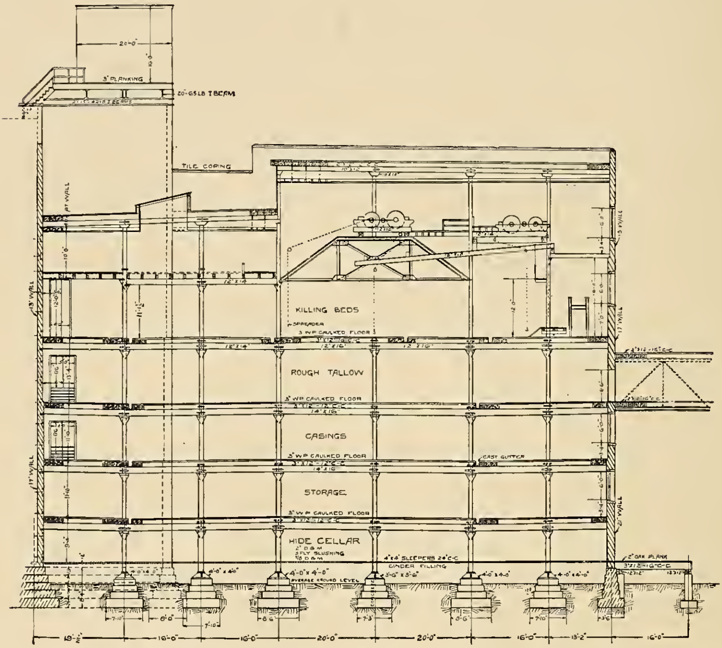


FIG. 5.—CROSS SECTION THROUGH MODERN PLANT, SHOWING DEPARTMENTS.

from there to the bone house; all fats go directly to the oil house; on this floor casings are cleaned and packed ready for shipping; tripe is cleaned, ready to be sent to the curing cellars; livers, tongues, hearts, etc., are trimmed ready for the respective coolers. Thus it will be seen that all this material, which amounts to many tons per day, on an average killing, has found its way to places specially provided at a nominal cost for labor.

Floors below can be readily utilized for storage and the handling of the products, storage space in a packing house being something that is never found wasteful. From the killing floor the beef finds its way into the coolers, which in this particular case were double-decked, the beef necessarily being lowered when being sent to the lower cooler. Fig. 6 shows a cross section of a double-deck beef cooler.

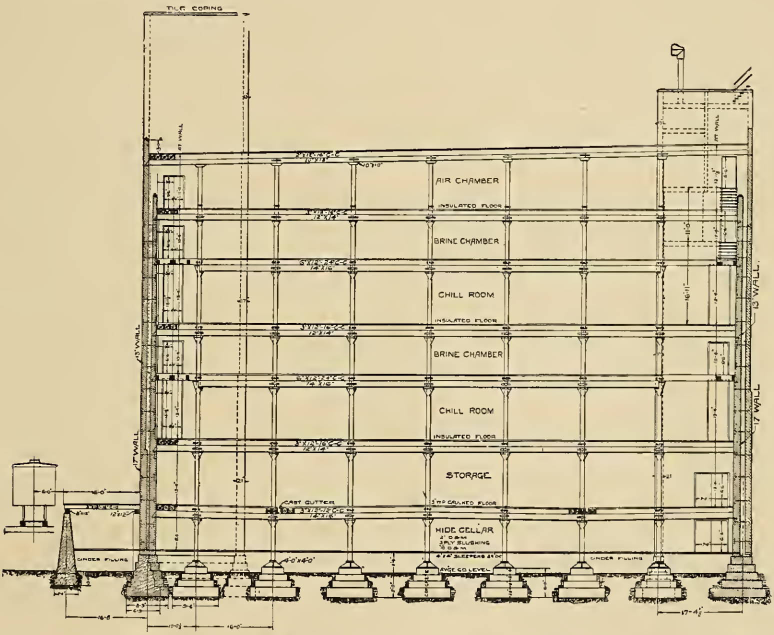


FIG. 6.—CROSS SECTION DOUBLE DECK BEEF COOLER.

Economy is the first consideration of building in this matter. The economy of operation is obvious to any practical packer and while this idea might not be adaptable for a very small business it can be adopted to good advantage in many places where it is not in use today.

The next consideration is to have the buildings in which the by-products are to be handled situated conveniently and at the same time not connected directly so as to increase fire hazard. In constructions of this kind, insurance companies generally require seventy-five feet of space between buildings; less than that means an additional cost of insurance on account of exposure. Even at this distance, however, they require iron doors on openings and either iron shutters or metal frames with wire glass windows on all wall openings.

However, comparatively little need be said on insurance conditions of a packing house, as these vary largely at different points and in the construction of a plant one must be governed very largely by the local requirements.

Another and very important consideration is the locating of the power house nearest to the building which uses the largest amount of steam. For instance, in packing house practice the tank house, bone house and oil house are the largest consumers of live steam, hence it is obvious that the power plant should be situated as near them as possible, with less regard for other buildings, such as killing floors, coolers, etc., using little or no steam.

Another point which is rarely given the consideration it deserves, and in many cases it is impossible to improve it, is the track service. When goods are ready to load and large and expensive load gangs are on the pay-roll, delay in furnishing cars, switching, etc., is very expensive and in planning a plant this is a very vital point. How to secure the greatest economy in shipping out the products should be studied at all times, hence it is advisable to have as many tracks as possible entering the buildings and about the buildings; aiming to classify and load different products on different tracks, so that the shipment of one class of goods will not interfere with that of another. Where plants are being remodeled, the facilities at hand are generally the best to be obtained, but where it is the intention to build anew this is a point that should be studied carefully; it is poor policy to do all the business on one or two tracks where it is possible to obtain more.

CONSTRUCTION OF PACKING HOUSES IN GENERAL.

The author will not attempt to go into extensive details, as space will not permit. The larger plants are always open for inspection by visitors, and people desiring detailed information in this line are generally enabled to obtain it by personal inspection. There are, however, many questions which arise with people who anticipate the necessity of building and it is the author's intention to give, in a general way, some details which may be useful for the guidance of those wishing to build a packing house.

Butchers supply houses, and packing house machinery dealers or manufacturers, are frequently asked, "Where can we get information regarding the best method for building a packing house?" "What is the best plan for construction of a packing house?" This is a hard question to answer, as there are so many different conditions to be met at each local point that it is impracticable to answer the question specifically, and hence only general principles can be laid down and the details must be adapted to the local conditions in order to make the project practical and successful. The author proposes to give general plans, first, for a plant for the killing and curing of hogs only; second, for a house designed for killing cattle mainly, and a few hogs; and third, for a plant designed for killing hogs and a few cattle; and he hopes that the ideas thus submitted may be of such a nature that they can be enlarged upon or curtailed to such a degree as will make them valuable where new buildings or changes are contemplated.

About 75 per cent of the money expended in converting the raw into a finished product in a packing house, is for labor; the other 25 per cent is for interest, insurance, administrative expense, supplies, etc.; hence, a plant that is so designed as to provide for operation in the most economical manner and at the same time provides for economy of construction is apparently the acme of perfection. These two objects the designer of any kind of a plant should have continually before him. There are other points to consider as well, namely, that the plant is laid out so that each department or building can be enlarged to advantage, and that no buildings are in any way hemmed in so that they cannot be enlarged, to care for future growth. In some instances the growth may exceed the expectations of the builder and he may find himself unable to enlarge certain departments, to the great detriment of his business.

INSURANCE.

Another point in the line of economy is to make due provision in the design for the underwriters' requirements. Building in such a manner as to bring the insurance rates to a minimum is certainly desirable. It is an advantage, too, to have the plant divided so that in case of fire the spread of the flames can be retarded and the fire confined to the building where it originated, or if some of the buildings are burned the balance can be saved. Fires invariably represent, to a well managed business, a far greater loss than is collectable on the insurance policies.

PLAN FOR HOG SLAUGHTER HOUSE.

The following plan (Fig. 7) gives the ground floor of a small, compact packing house, with a capacity for handling 800 to 1,000 hogs daily and also the by-products. The main cold storage building, in which are located the hog coolers and three floors of cold storage, is 112 x 80 feet, with a hanging capacity of 2,300 hogs. In general practice it is found that five times the floor space required for a hog cooler is the space required for the

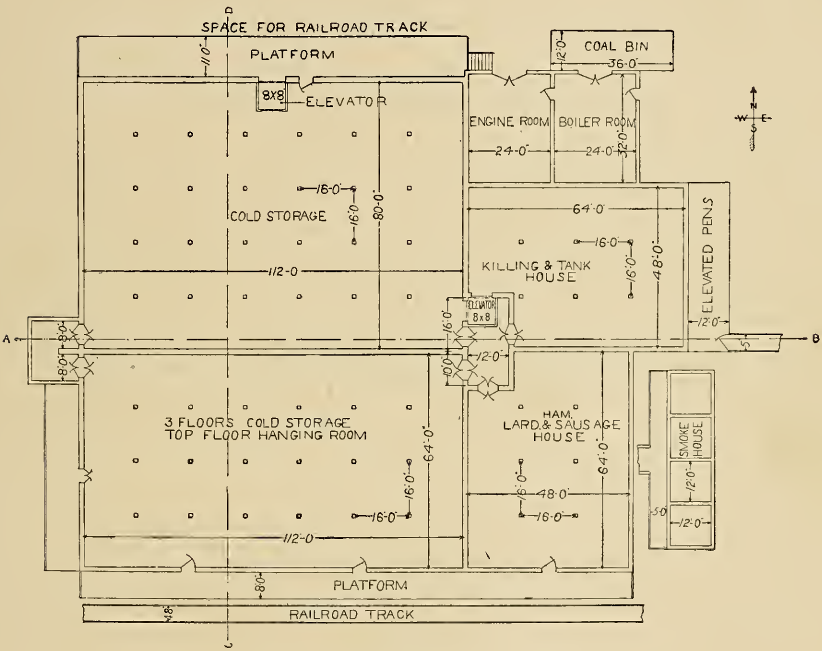


FIG. 7.—GROUND PLAN SMALL HOG KILLING PLANT.

curing of the products, under ordinary conditions. If the product is to be sold promptly there may be excessive cold storage room, but if not, and it is held for any considerable length of time, this ratio will be found to be necessary.

Directly south of the building described is another, which consists of three floors for cold storage, the top floor to be used as a hanging room for air-drying hogs

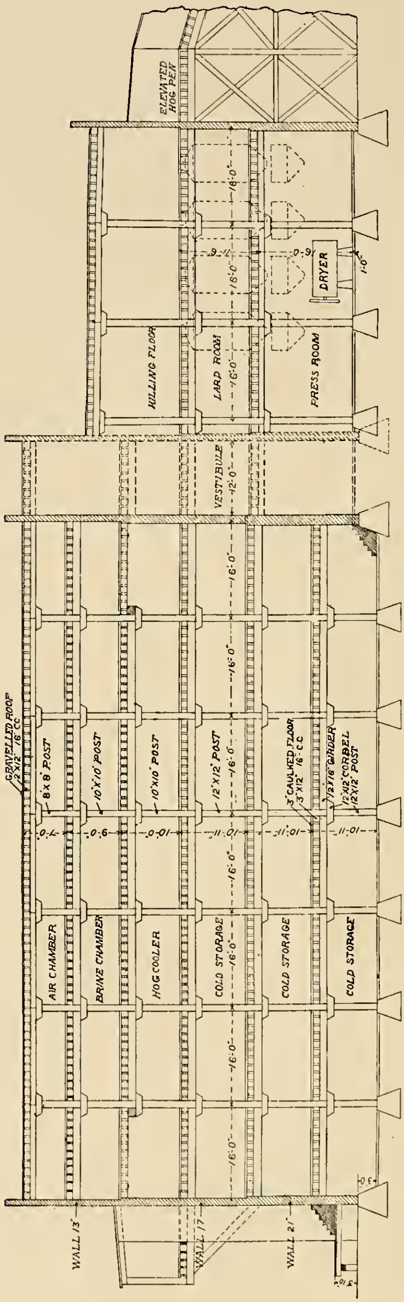


FIG. 8.—LONGITUDINAL SECTION ON LINES A - B OF HOG KILLING PLANT, AS SHOWN IN FIG. 7.

when desired, and for additional cooler space if needed, as one or two bays of this top floor could easily be insulated if additional cooling space were required. Cold storage necessary for the lard or sausage room could also be provided in this building. It will be noted that there is a platform and a railroad track on the north side of the building for the convenience of car and wagon loading. There is also another platform located on the south side of the building.

The next building is the ham, lard and sausage house. This building is located very conveniently to the killing house for the lard, and to the pork house for the sausage trimmings and cured meats, the smoke houses being placed east of this house and at a sufficient distance to leave room for growth. This building should be the same height as the other buildings, giving ample room to handle the product from a plant of this size.

The killing and tank houses as shown are of ample capacity in which to handle all of the slaughtering required.

Next to the tank house is the boiler room, being very convenient for steam, the tank house being the largest steam consuming department of the plant. Adjoining the tank house is the engine room for the ice machine and power plant, handy to the cold storage building for the circulation of the refrigerating medium.

On the west is shown a temporary vestibule which may be of wooden construction if the dividing wall is run out 6 feet from the line of the other walls. This vestibule should be put through on the top floor only, connecting the hog coolers, and consists of a balcony on the side of the building, with supporting brackets, which can, however, be put in on lower floors if desired. The growth of the two main buildings would naturally be

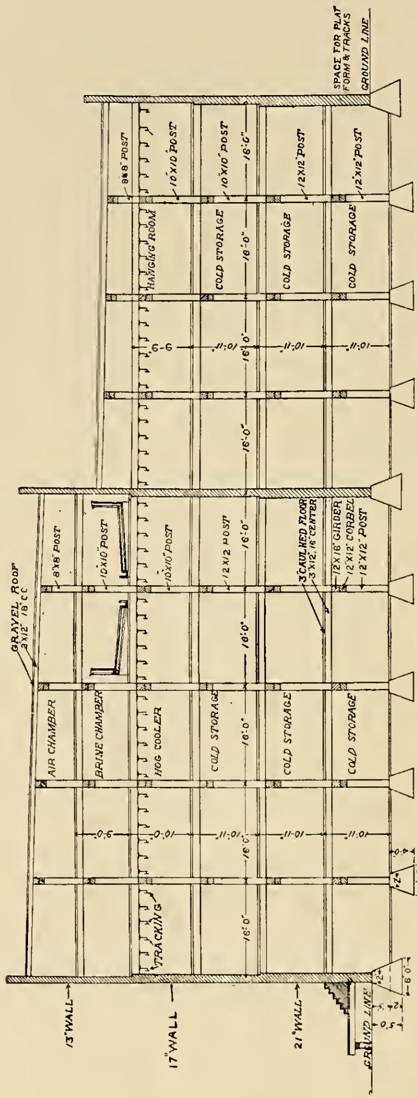


FIG. 9.—CROSS SECTION ON LINES C - D, OF HOG KILLING PLANT, AS SHOWN IN FIG. 7.

west; that for the lard refinery and tank house east; boiler and engine room being built sufficiently large in the first place to accommodate machinery for the full plant.

Fig. 8 represents a cross section through lines A—B, showing the basement lowered three feet below ground level, which brings the killing house and tank house floors on a level, the tank house floor not being lowered. The tank house is of sufficient height so that the vats are high enough to draw the material directly upon the press carriage. In the same room are the fertilizer dryers, the finished product being either stored in this building or removed to a small wooden structure for that purpose. In some instances iron columns and iron girders are used, but are not considered as desirable from an insurance standpoint. In some cases what is known as slow burning construction is used, made by using 6 x 12 inch joists instead of 3 x 12 inch joists, spaced practically twice as far apart as here given. Otherwise construction should be the same.

Fig. 9 represents a cross section through lines C—D. This diagram shows the floors which should be used for cooler, brine chamber, cold storage, as well as the open air hanging floor. Space is left over the ceiling of the brine chamber between that and the roof to aid in protecting the coolers from the sun's rays in hot weather.

Fig. 10 represents the fourth floor, showing arrangement of tracking, killing house, etc. It will be noted that the scalding tub is so located that space is left for a scraping machine if in a house of this size it is deemed advisable to have one. Five tanks are shown convenient to the killing rails. The hogs, as fast as dressed, are run through the vestibule into the outside hanging room. In some climates this would be very desirable; in others, objectionable, hence it is a consideration that must be governed entirely by the location of the plant. After the hogs have hung as long as necessary in the outside hanging room, they are run through the west vestibule, around to the end of the wall into the cold storage rooms; from the cold storage rooms they are run east to the cutting room. No attempt is made here to go into the details of the cutting room. Suffice it to say that the space as given (48 x 32 feet) would be ample for a cut-

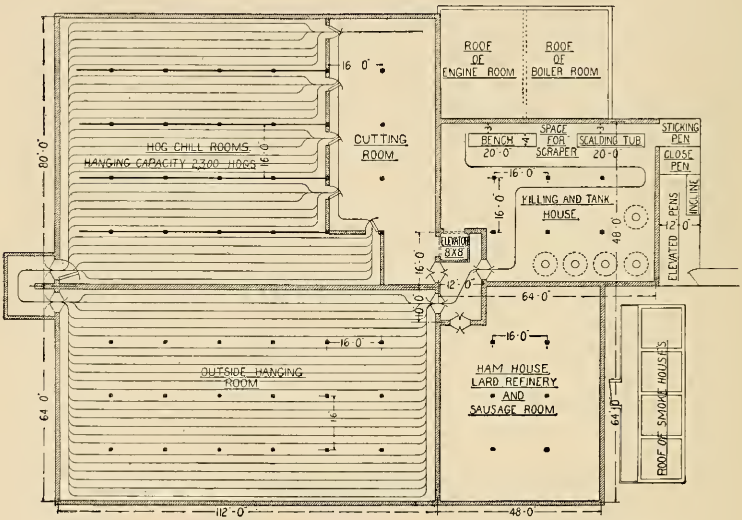


FIG. 10.—PLAN FOURTH FLOOR HOG KILLING PLANT, SHOWN IN FIG. 7.

ting room of this capacity. The meats would go through chutes to the floor below, where they would be graded, sorted, etc.; sausage trimmings could go through the vestibule to the sausage room, all lard trimmings being convenient to the lard tanks.

COST OF PLANT.

Cost is rather an uncertain quantity to arrive at, as the cost of labor and material vary so greatly at differ-

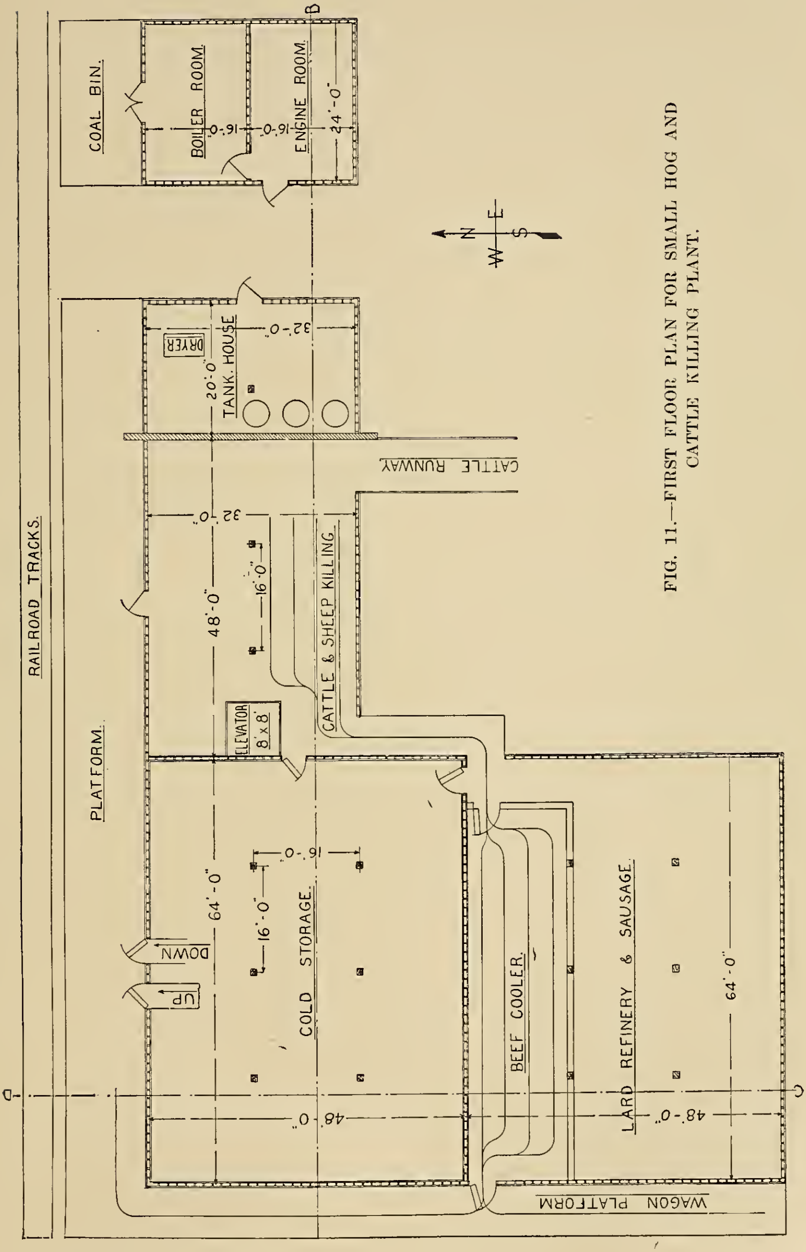


FIG. 11.—FIRST FLOOR PLAN FOR SMALL HOG AND CATTLE KILLING PLANT.

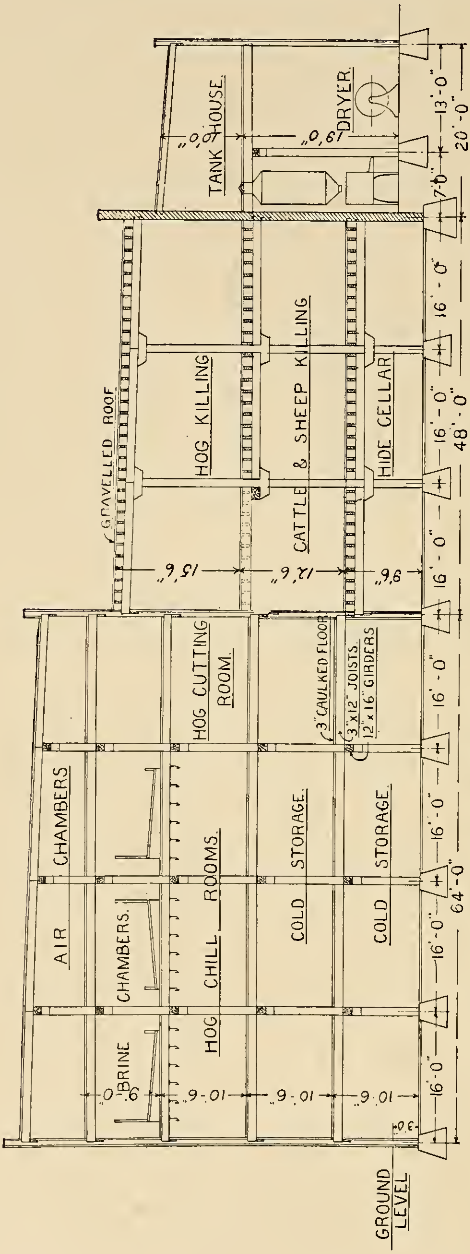


FIG. 12.—LONGITUDINAL SECTION ON LINE A-B, FIG. 11, OF HOG AND CATTLE KILLING PLANT.

ent points. Figuring concrete at $5.50 per cubic yard and brick at $14.00 per 1,000, in the wall; lumber at $24.00 per 1,000 feet and intelligent labor at from 20 cents an hour for common labor to 45 cents an hour for skilled labor, this plant should be built, exclusive of the machinery (but all buildings ready for the installation of machinery), for $65,000.00.

PLAN FOR SMALL SLAUGHTER HOUSE.

In Figs. 11, 12 and 13 are shown plans for a small packing house with a capacity of 250 hogs and twenty-

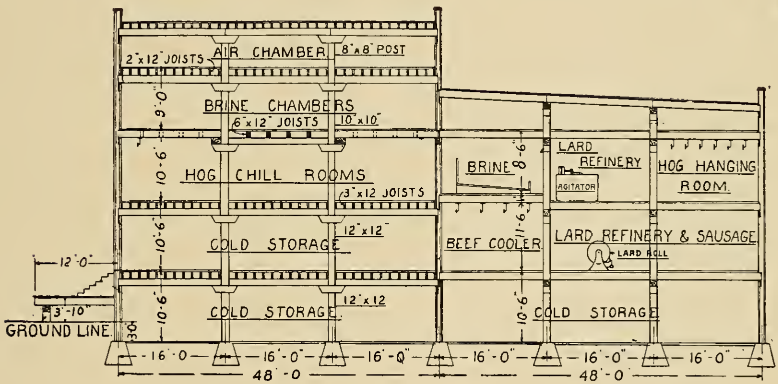


FIG. 13.—CROSS SECTION ON LINE C-D, FIG. 11, HOG AND CATTLE KILLING PLANT.

five cattle per day. These plans contemplate wood construction throughout with a brick fire wall separating the tank house from the other buildings, while the brick smoke houses are set apart from the rest of the buildings, all with a view to reducing the fire risk to a minimum.

On the north side of the plant is shown the railroad track and loading platform. At the extreme east end of track is the power plant; the next building west is the

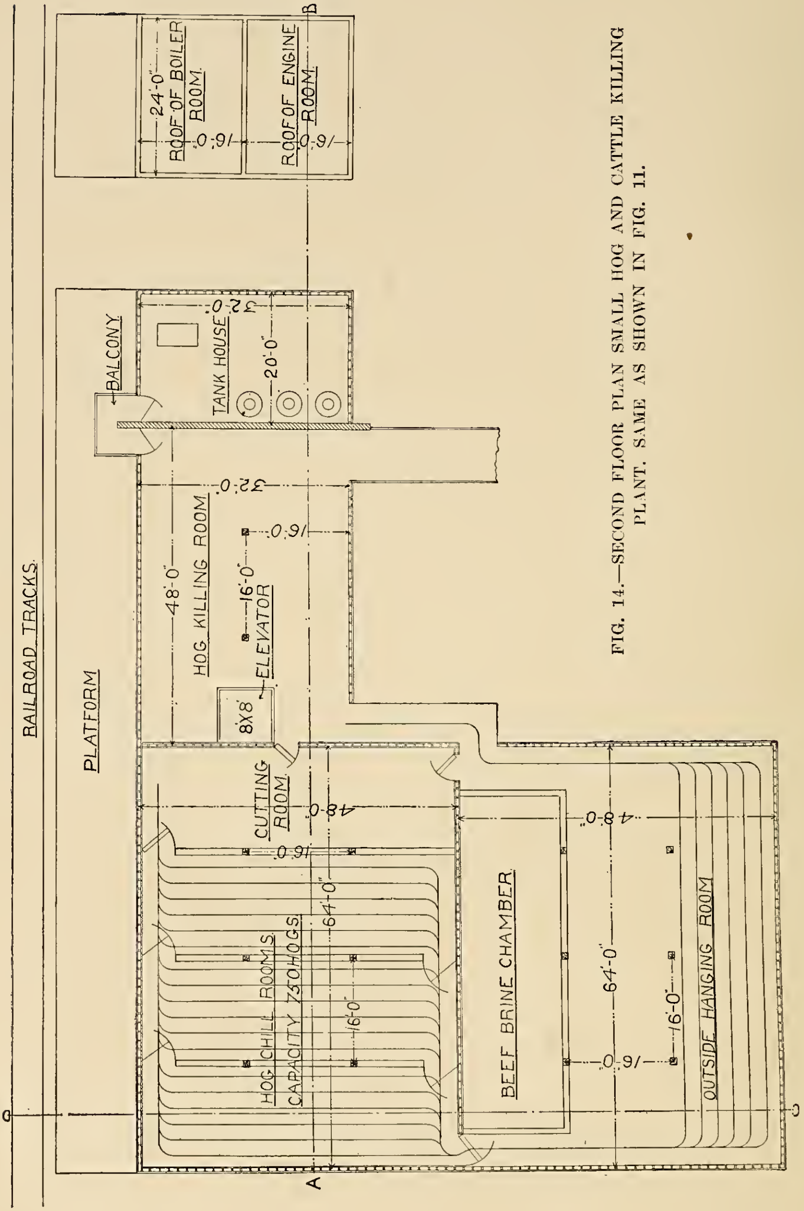


FIG. 14.—SECOND FLOOR PLAN SMALL HOG AND CATTLE KILLING PLANT. SAME AS SHOWN IN FIG. 11.

tank house, in which are located the tanks, presses and dryer for handling of fertilizer. The next building is of two stories and a basement. The basement is used for the salting of hides, sheep pelts, storing of tallow, etc. First floor, slaughtering of sheep and cattle; second floor, slaughtering of hogs, runways reaching both floors. Adjoining building on the west—basement and first floor, cold storage; second floor, hog coolers and pork cutting room. Adjoining building on the south—basement, cold storage; north bay, first floor, beef cooler, hanging capacity sixty cattle; balance of first floor used for lard refinery and sausage room; second floor, hanging room for hogs, storage and agitators for lard refinery, the north bay being used for brine chamber and for beef cooler.

It will be noted that with each one of these buildings allowance is made for growth or additions and that the whole forms a very compact small plant.

Fig. 12 shows cross section A—B. Fig. 13 shows cross section C—D.

Fig. 14 shows the second floor plans. The brick fire wall, cutting off the tank house, has a balcony leading around the end of it on which to truck material going to the tank house, thereby making unnecessary any openings through the fire wall itself. The hog cutting room is convenient to the sausage room, as well as to the tanks for lard products. The pork cuts are passed through an opening in the floor into the cold storage for curing purposes.

The buildings for a plant of this kind, under ordinary conditions, should be erected for approximately $20,000. Cost of machinery for equipment would be additional, the amount being very hard to estimate in advance of exact requirements, which would depend more or less

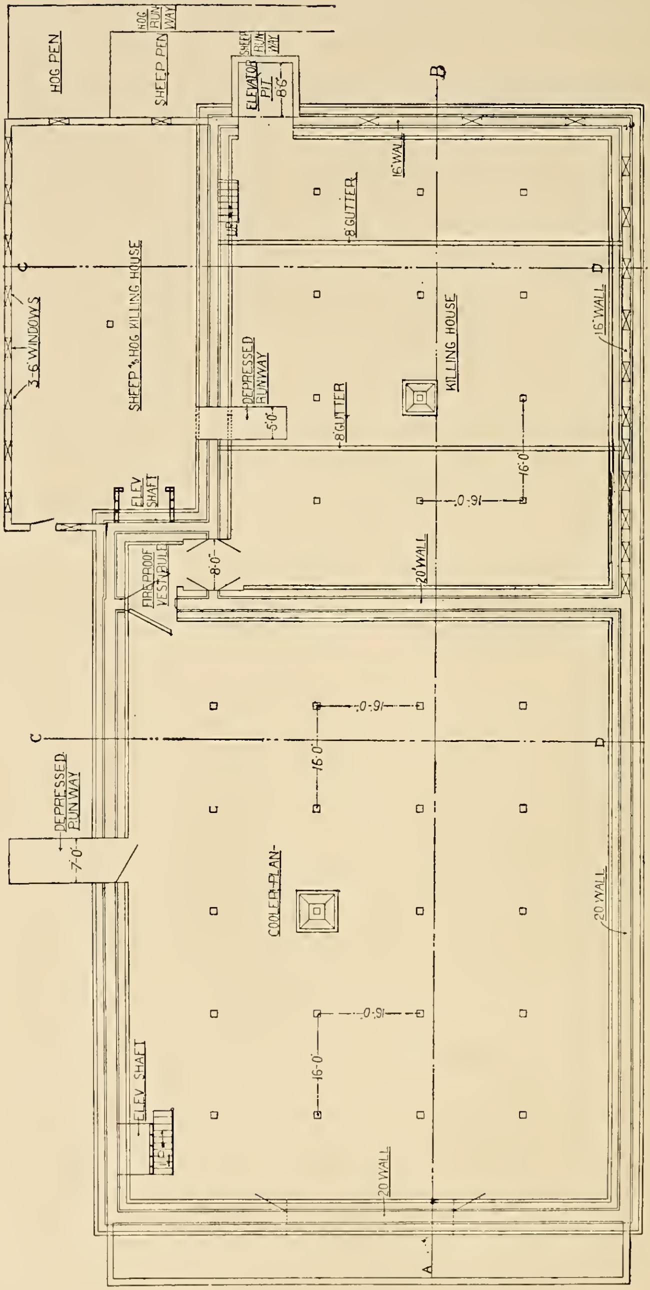


FIG. 15.—FOUNDATION PLAN FOR CATTLE, HOG AND SHEEP SLAUGHTER HOUSE WITH COOLERS.

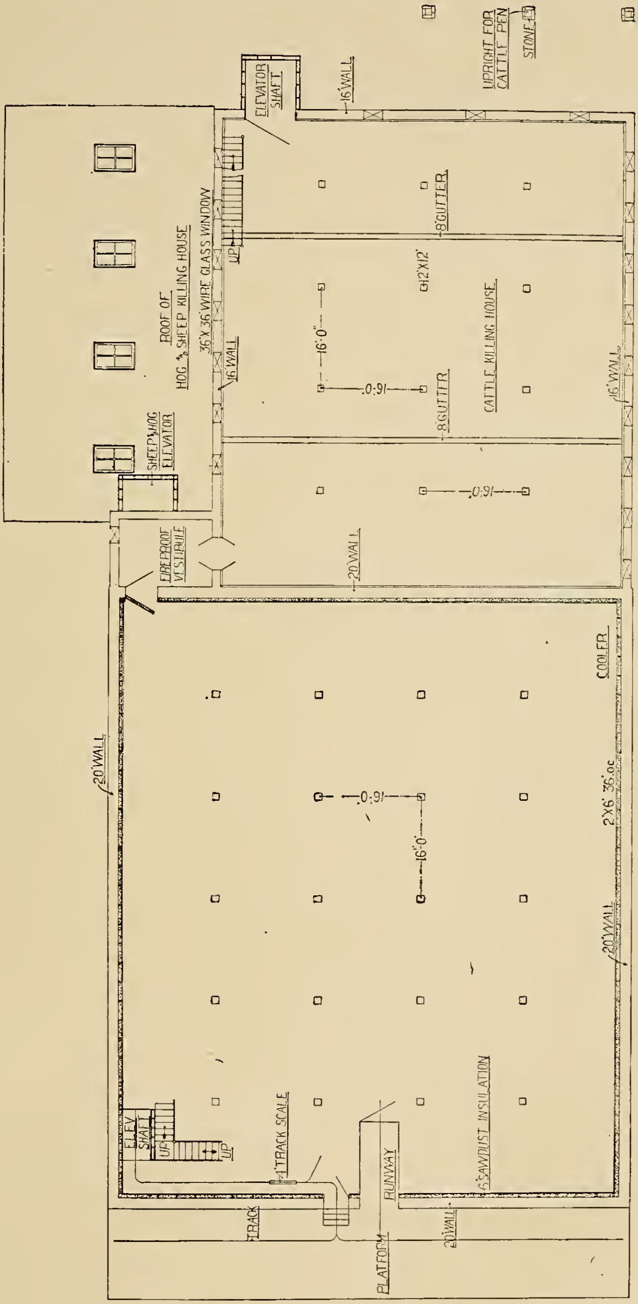


FIG. 16.—PLAN OF FIRST FLOOR CATTLE, HOG AND SHEEP SLAUGHTER HOUSE, SAME AS SHOWN IN FIG. 15.

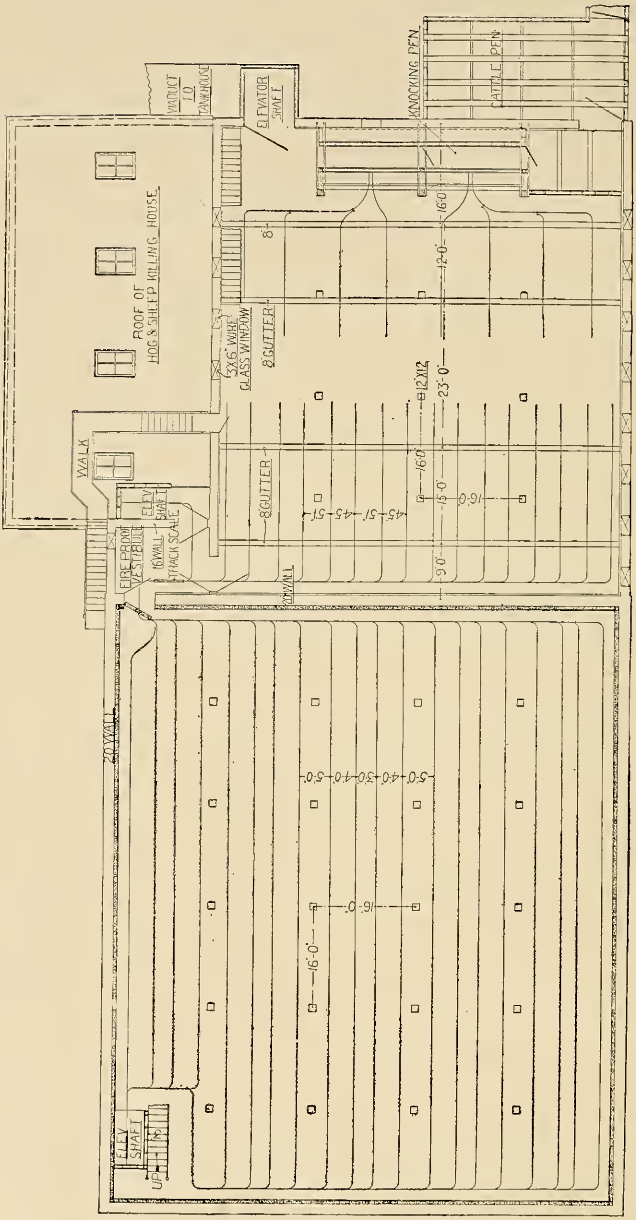


FIG. 17.—PLAN OF CATTLE KILLING FLOOR WITH KILLING BEDS, TRACKING, ETC., CATTLE, HOG AND SHEEP SLAUGHTER HOUSE, SAME AS SHOWN IN FIG. 15.

upon individual choice. A plant built on these lines could be operated very economically and satisfactorily.

CATTLE, HOG AND SHEEP SLAUGHTER HOUSE.

Fig. 15 shows foundation plan for cattle, hog and sheep slaughter house, with coolers. This plant is de-

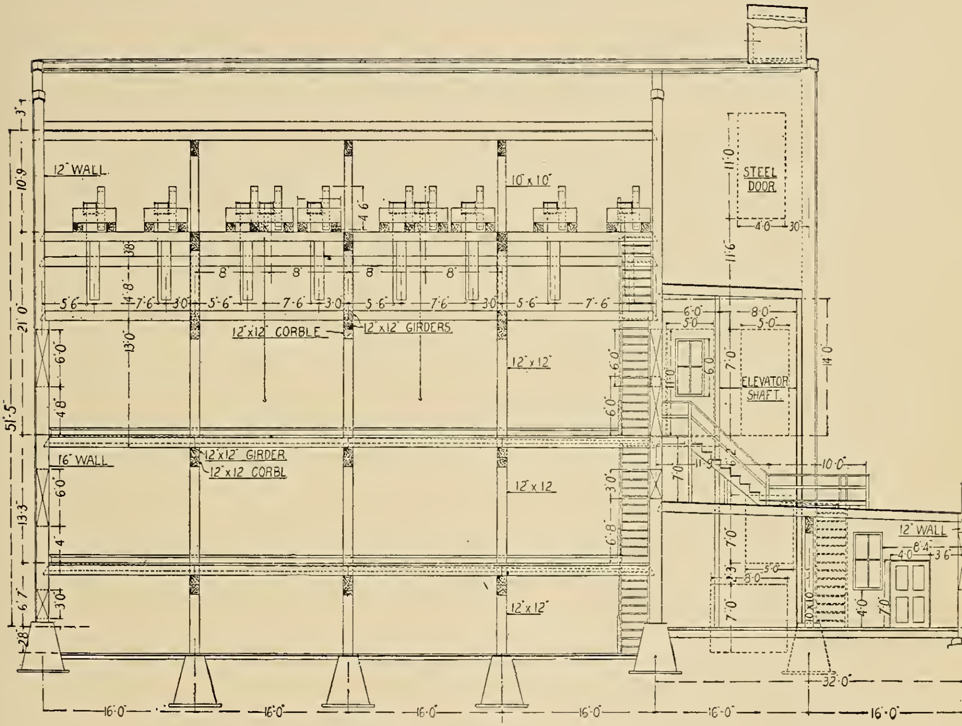


FIG. 18.—CROSS SECTION C - D SLAUGHTER HOUSE, SAME AS SHOWN IN FIG. 15.

signed for a commission slaughter house rather than a regular packing house, there not being sufficient cold storage to accommodate a regular packing business. The cattle-killing beds are on the second floor, the first floor being used for the handling and manipulating of the offal. The basement is used for hides. Sheep and hogs

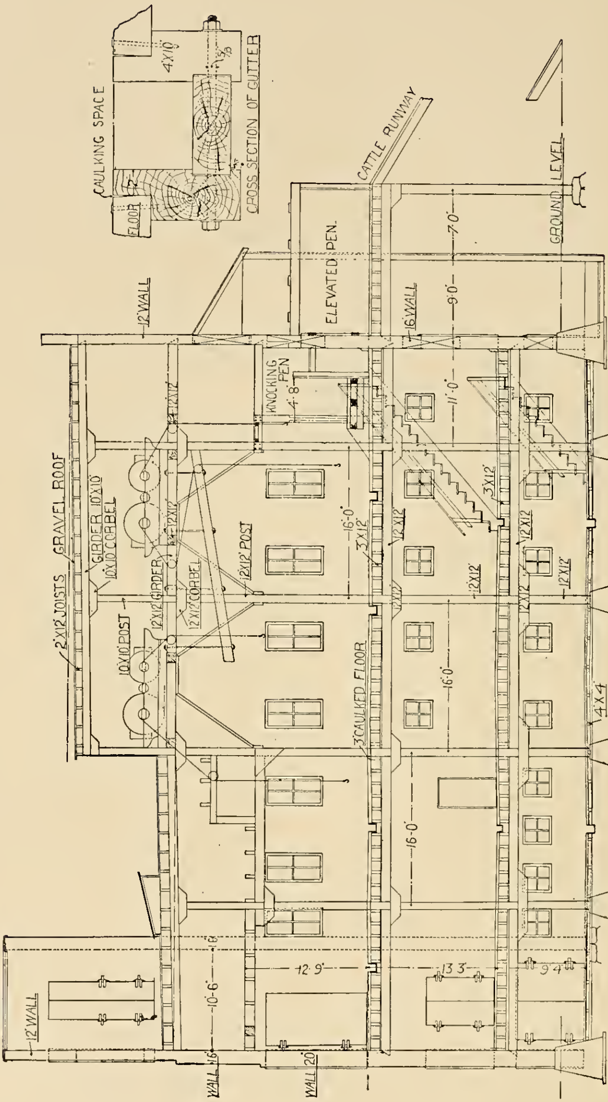


FIG. 19.—LONGITUDINAL SECTION AT LINE A-B OF FIG. 15, CATTLE, HOG AND SHEEP SLAUGHTER HOUSE. ALSO CROSS SECTION OF PRACTICAL GUTTER.

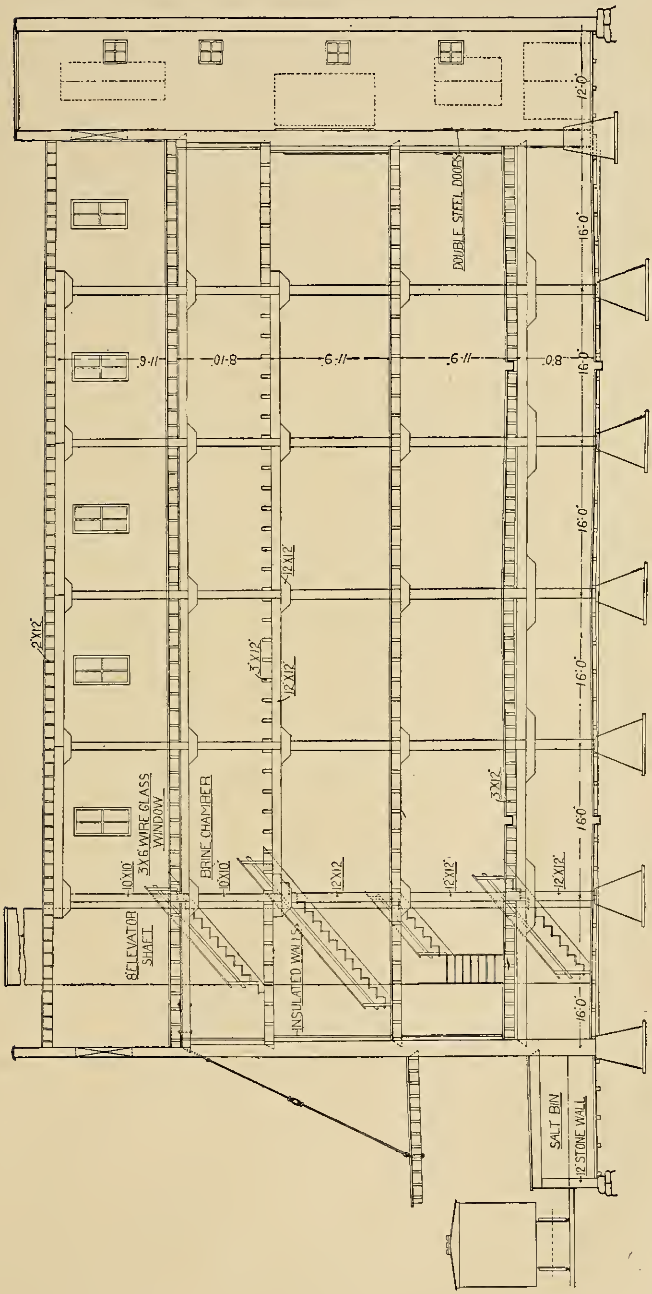


FIG. 20.—LONGITUDINAL SECTION OF COOLERS AT LINE C-D OF FIG. 15, CATTLE, HOG AND SHEEP SLAUGHTER HOUSE.

to be killed outside of the main building in a one-story room built for the purpose. Dressed animals are raised on track elevator to cooling rooms. The killing house has eight beds; capacity, 700 cattle per day. Room for killing 1,000 hogs and 1,500 sheep daily is also provided.

Fig. 16 is a diagram of the first floor, showing details of vestibule, etc. Fig. 17 shows cattle killing floor with killing beds, tracking, etc. Also tracking in cooler.

In this plan the insulation is to consist of 2 x 6 inch studding against a brick wall with double course of insulating paper and 1-inch boards on outside of studding, the space between the studding and boards to be filled with dried sawdust.

Fig. 18 represents a cross section, C—D, of slaughter house, showing detail of killing floors, hoists, etc. Fig. 19, longitudinal section, A—B, showing outline of killing floor, location of killing beds, and detail of vestibule.

Fig. 20, longitudinal section, C—D, of cooler building, the basement to be used for the storage of hides, tallow or any product for which a partially chilled room is necessary. First floor to be used for salesroom or additional beef cooler when needed. Second floor for beef coolers, with a hanging capacity of 800 cattle. Third floor, brine chambers. Fourth floor, open space sufficiently high to store dressed beef, sheep or hogs in cold weather if desired.

No tank house or fertilizer is shown with these plans, as they are given more to show the dimensions and size necessary for volume of business named. The buildings herein mentioned should be built, under ordinary conditions, for $48,000.

CHAPTER II.

REFRIGERATION IN THE PACKING HOUSE.

SYSTEMS OF REFRIGERATION.

There are so many factors which enter into the question of packing house refrigeration, and so many details of construction and application of refrigerating apparatus, that it is almost impossible to cover this subject practically and intelligibly without devoting a separate and complete volume to refrigeration alone. The author would, therefore, recommend that the packer give time and attention to a careful investigation of the details of construction of the various refrigerating plants in use in the leading packing houses of this country, and particularly to the application of refrigeration to the various processes of meat handling; or, as a safer and more satisfactory alternative, to consult an independent refrigerating expert, and have plans and specifications drawn up to cover every possible detail of refrigerating requirements, and secure propositions from the machine manufacturers, based on the plans and specifications submitted. There are a number of such experts available, and their experience and knowledge of refrigeration will, in almost every instance, enable the packer to avoid pitfalls which his inexperience and necessarily imperfect knowledge of refrigeration would lead him into.

To give a fixed rule for packing house refrigeration, applicable to all conditions, would be impossible, as much depends upon conditions and surroundings, and the requirements would vary accordingly, as, for instance, atmospheric conditions, cooling water temperature, construction of insulation, relative exposure to cubical contents of refrigerated space, average tonnage of product to be cooled, time limit for chilling, cooling and storage. These and many other factors affecting the general results must be taken into consideration and provided for, and as these factors vary, so also will the refrigeration requirements vary accordingly.

The theory of refrigeration is based on the heat absorbed by the melting of one pound of ice at 32° F., to water at the same temperature (the latent heat of solidification of water to ice). In freezing one pound of water at 32° F., to ice at 32° F., 142.6 British thermal units of heat must be withdrawn from the water; for convenience in practice the fractional part is ignored, and 142 B. T. U. per pound of water is universally accepted as a standard on which to compute refrigeration. On this basis, if 142 B. T. U. are withdrawn from each pound of water at 32° F. to convert the water into ice at the same temperature, the melting of the pound of ice at the same temperature must re-absorb the latent heat extracted or withdrawn in the process of freezing, consequently the melting of one ton (2,000 pounds) of ice to water at the same temperature would absorb 2,000 x 142 B. T. U., or 284,000 B. T. U., which is the accepted standard for computing the heat absorbed in the performance of one ton of refrigeration. In ice melting this absorption of heat is *latent,* not sensible to the thermometer, as no change is apparent by thermometer test in the temperature of the ice and the water, nevertheless an appreciable *cooling* of surroundings is measurable by thermometer wherever ice melting takes place in an air-tight room, or in contact with solid substances, or with liquids, having a higher initial temperature than 32° F.

Practice has demonstrated that one ton of refrigerating effect for twenty-four hours will cool a space of from 7,000 to 12,000 cubic feet, depending upon conditions of exposure, insulation, temperature required, and other surroundings. This cooling would, however, merely provide against the continuous transmission of heat (or heat leakage) through insulation ranging from good to first-class in quality of construction, and would not provide for the cooling of meats, or other storage products, to be placed in the space, and the cooling of the stored products must be computed and added to the total of refrigeration required.

In figuring for the refrigeration of freshly killed carcasses, for instance, or meat from which the animal heat has not been fully removed, it is customary to figure that one ton of refrigeration for twenty-four hours would be required for either one of the following items:

From fifteen to twenty-two hogs, average weight 225 pounds.
From five to six head of cattle, average weight, 700 pounds.
About fifty-five calves, average weight, 80 pounds.
From fifty to sixty-five sheep, average weight 60 pounds.

Before the application of mechanical refrigeration to packing house purposes, all artificial refrigeration was accomplished by means of ice melting alone, and at that time the packers computed ice melting requirements on a basis of cooling three pounds of meat from 80° F. to as low as the meat could be cooled by ice melting, for each pound of ice melted. While this rule undoubtedly was the result of practical experience with well constructed coolers, and was in no wise based upon theoretical or heat unit formulas, yet it is interesting to note how close this old rule compares with modern formulas of computing refrigeration. For example, the cooling of 100 head of hogs, averaging 250 pounds dressed, by the packer's rule, would require—

$$\frac{100 \times 250}{3} = 8{,}333 \text{ pounds, or } 4.16 \text{ tons ice melting.}$$

And on a heat unit basis, cooling the same number and weight of hogs from 80° to 32° F. would require—

$$\frac{100 \times 250 \times (80-32)}{284{,}000} = 4.22 \text{ tons refrigeration.}$$

The above comparison shows that theory and practice approach very closely to a common line, although in the calculation the factor of specific heat of the meat is ignored, and in practice this may well be left out, as specific heat of meats at varying temperatures has by no means been accurately established.

In lard cooling the rule of three to one appears to check up nearly or quite as close as for meat cooling, and may be taken as a safe basis for calculating refrigerating requirements.

For cold storage rooms, where meats which have already been chilled or cooled are stored and held for a greater or lesser period, the refrigeration requirements are not so great as in chill and cooling rooms, as the animal heat has been removed and the meats cooled down to a low temperature, and consequently but little more refrigeration is required than that necessary to take care of the heat leakage through the insulation, and possibly the recooling of the meat through a range of a few degrees, when the meats may have gained a little in temperature in the cutting rooms.

Where meat freezing is desired the refrigerating requirements are necessarily greater than for either chilling or cooling, and the surroundings must be adapted to the conditions of extra low temperature, by more perfect insulation and by extra pipe surface allowance, as well as extra refrigerating capacity, for it is much more difficult to produce and maintain sharp freezing temperatures than either chilling or cooling temperatures.

Pickle cooling requires consideration, as pickle should always be cooled down to within four degrees of the temperature of the meats before the meats are put into the pickle.

All of the above factors must be considered in the calculations for refrigerating requirements, and it is best to make allowances for a considerable factor of safety over and above the actual maximum, as well for the economical operation of the plant (it never pays to crowd a plant to its limit of capacity) as to guard against emergencies and possible abnormal demand for refrigeration. The plant should be constructed as far as possible in duplicate, not only as regards the machinery but also in the apparatus, as a safeguard against accidents and total cessation of refrigeration. With two machines and duplicate apparatus one-half the maximum refrigeration is always available, and the preservation of the product in storage is assured, even if it be found necessary to stop killing for a sufficient period to make the repairs on the broken machinery and apparatus, while with one machine only available, a breakdown might result in very serious loss and considerable damage to the stored products.

With regard to insulation, it may be said that the best is the most economical in the long run. There is no such thing as absolute insulation—some heat leakage must occur through the very best insulation, and the reduction of this heat leakage to the minimum should be the chief object or factor for consideration. First-class insulation costs high in original investment, but as it creates a continuous saving and economy in refrigeration, while poor insulation creates a continuous waste of refrigeration through constant maximum heat leakage, the *best* will always pay a good dividend on the investment, while the *poor* will prove a constant drain in cost of refrigeration. First-class insulation should be, first, as nearly air-tight as possible; second, impervious to moisture; third, as near as possible fireproof; fourth, stable and permanent in character of construction, avoiding possibility of insulating fillers settling and leaving unfilled space (all fillers should be both light in weight and elastic in character), and fillers should never be of a character subject to decomposition or fermentation.

Air circulation, particularly in chill rooms, should receive proper attention. Where freshly slaughtered meats, containing animal heat, are exposed to a cool temperature, rapid evaporation of moisture from the meat results, especially when the meats have first been washed with comparatively warm water, and this rapid evaporation produces heavy vapors, which, if not quickly removed from the chill rooms, will condense on the walls and ceilings, and eventually on the surface of the meats, when the animal heat has been withdrawn.

This condensation on the surface of the meats produces a slimy appearance and lowers the quality of the product, as the vapors contain foul gases which promote decomposition, and also have in themselves a most disagreeable smell and taste. Chill rooms should, therefore, be so constructed as to facilitate the removal of the vapors as rapidly as they are formed by the evaporation from the meats.

This may best be accomplished by constructing lofts or chambers above the chill rooms and connected to them, by means of warm air ducts leading from the highest point in the chill room to a level above the refrigerating surfaces located in the lofts or chambers, with cold air openings leading from the lowest level of the lofts or chambers to the chill rooms below.

With such construction a difference of a few degrees in temperature between the refrigerated lofts or chambers and the warm meat in the chill rooms will produce a natural gravity circulation of the air in the latter. The heavier cold air will fall through the cold air openings down to the chill rooms, spreading entirely over the floor surface and below the warm meats, and gradually filling upward. On the other hand the warmer, vapor-laden air will pass upward through the warm air ducts to the highest level of the lofts or chambers, above the top of the refrigerating surfaces, and coming in contact with the cold surfaces of the refrigerators the contained moisture is condensed on these cold surfaces, leaving the air practically free from moisture and foul gases. This air thus purified and cooled and which has become more dense in cooling, will again fall downward by gravity, through the cold air openings to the floor line of the chill room, producing and maintaining a constant regular circulation by the force of natural gravity alone, at the same time insuring a pure, dry air.

Forced circulation is sometimes employed in connection with chill rooms, but this means of air circulation is by no means as desirable or efficient as natural gravity circulation. The fan circulation directs the air currents in straight lines, the currents are deflected by every obstacle which they encounter, and are thrown upward, downward or sidewise, in every case to the points of least resistance, consequently the moisture and foul gas thrown off by one carcass may be forced directly upon the surface of the next carcass, and there condensed to remain and contaminate the product. Again as fan currents are deflected, one carcass may receive the direct effect of a cold current of air and the adjoining carcasses be protected from the cold current by its deflection through meeting with obstruction of the first carcass. In this manner uniformity of circulation is prevented, and there is no regularity of conditions of temperature and air currents, while with the natural gravity circulation the conditions, and consequent results, are uniform and regular throughout the rooms.

Meat chilling must be done intelligently, opportunity must be afforded for the gradual withdrawal of the animal heat from the carcasses, without any stiffening or solidification of the outside surfaces. Too rapid chilling of meats containing animal heat results in hardening the outside surfaces, forming an insulation at the surface, and locking in the animal heat, which produces eventual souring of the product. The chilling process should be sufficiently graduated to permit of the absolute withdrawal of *all* animal heat before any attempt is made to attain low temperature chilling. The meats should never be subjected to sudden, contracting, low temperature effects, but a gradual, regular, tempering effect should be attained, that will carry the meat through the range from blood heat down to the desired ultimate temperature, without abnormal shocks in temperature graduation. This effect can only be attained through scientific construction and operation of the chill rooms.

A visit of inspection to the various packing plants throughout America will impress one with the fact of the existence of a wide variation of opinion and practice with regard to the methods of applying refrigeration for packing house purposes; not only does the size of pipe used vary materially, but a variation would also be found in both the system and the application; some plants being equipped with piping for direct ammonia expansion, with size of pipe varying from 1 inch to 2 inches in diameter; others being equipped for brine circulation, with variation in pipe size from 1 to 1½ inch diameter; still others equipped for exposed brine circulation, with either trough or curtain arrangement. An equally varying practice seems to prevail with regard to the amount of surface adapted or required in various packing house rooms, particularly in reference to pipe surface, the chill rooms of one house being equipped with 1 square foot of pipe surface for each 3 cubic feet of space to be cooled, while others may be found which contain an average of 12½ cubic feet of chill room space for each square foot of pipe surface exposed.

That there must be a variation in pipe surface requirements, based upon the varying conditions as to insulation, climatic influences, and other conditions or surroundings, the author will freely admit, but that such variation should be apparent under practically the same conditions cannot be other than the result of want of knowledge of the requirements, or of a misconception of the economies in refrigeration, and the packer may well give these matters mature consideration and study before jumping at, or being led into, an investment along these lines that may cause him both annoyance and expense.

Because of his long experience with the various applications of refrigeration to packing house chill rooms the author feels warranted in expressing a preference for the system of exposed brine circulation, equipped with the curtain arrangement, patented by Mr. H. C. Gardner, of Chicago. Fig. 21 represents this system as put in operation in one of the large plants in Chicago. It recommends itself for three reasons, first, economy of

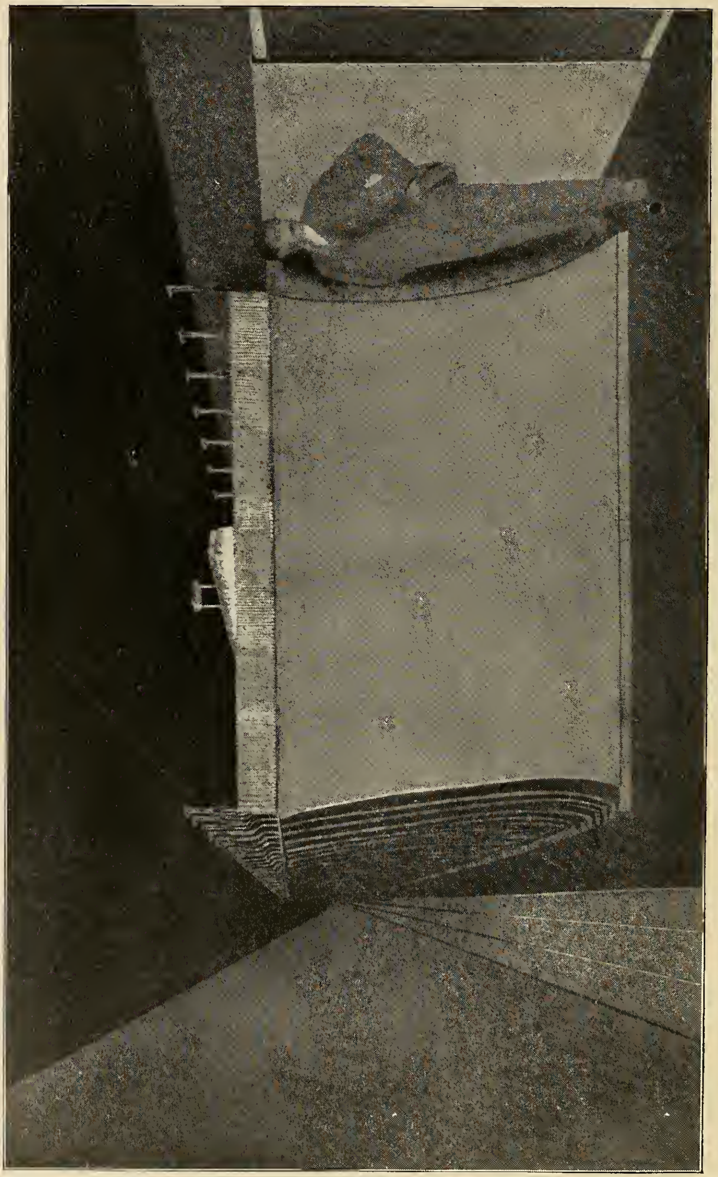


FIG. 21.—GARDNER'S "CURTAIN" SYSTEM FOR BRINE CIRCULATION.

installation; second, perfect distribution of the brine, thereby insuring good results in the chill rooms, and third, the slight cost of maintenance.

Another feature of this system which will commend itself to the engineer as well as the proprietor is the fact

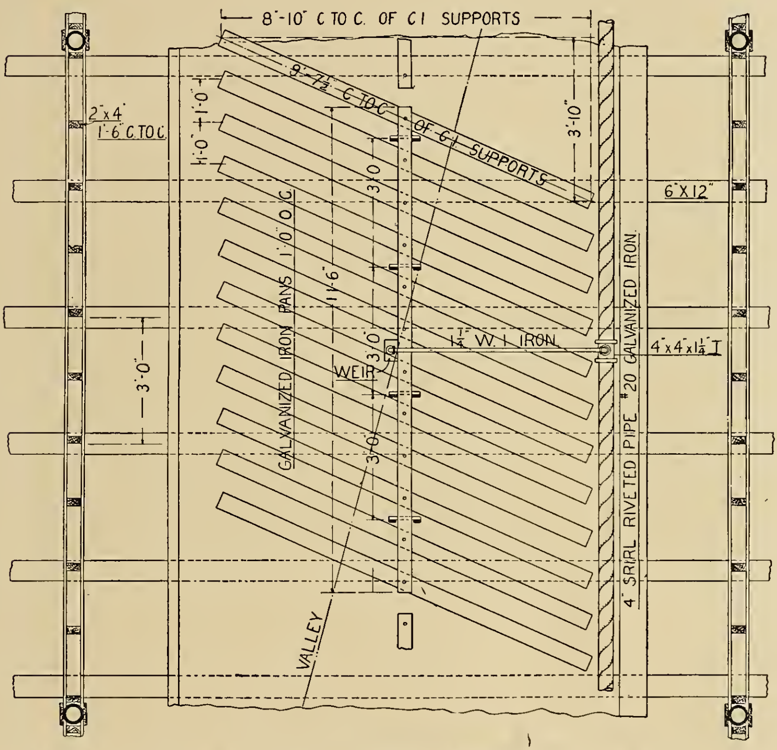


FIG. 22.—PLAN OF "CURTAIN" SYSTEM OF REFRIGERATION SHOWING TROUGHS IN COOLER.

that if at any time repairs are necessary in the expansion tank, one needs simply to close the return valve from the cooler and pump the entire contents directly into the bunker pans. Whenever it is necessary to do this it can be done very quickly, and it is often advisable to do it for the sake of getting the extra amount of refrigerating forces into the cooler at once, when it is desired to shut down the plant for repairs or over holidays or Sundays.

CURTAIN SYSTEM OF REFRIGERATION.

For this system a refrigerator or curtain room is provided, directly above the meat coolers, and of same length and width, in which is fixed an open pan or brine

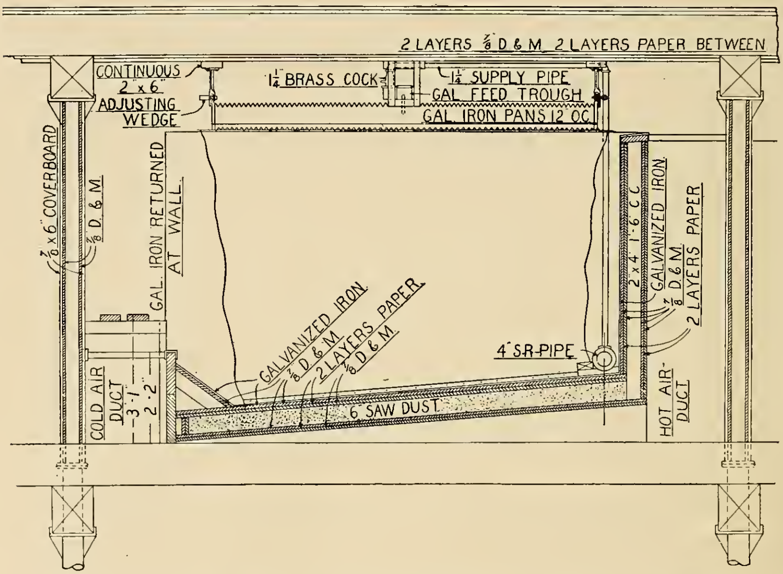


FIG. 23.—CROSS SECTION COOLER BUNKER "CURTAIN" SYSTEM OF REFRIGERATION.

distributing trough, located directly beneath the ceiling and fed with chilled brine by means of 1¼-inch pipe. This distributing trough feeds twelve other troughs located immediately below the feed trough and running laterally (see Fig. 22) across the cooler, from each of which is suspended a cloth or curtain, extending from the lateral troughs to the floor, as shown in Fig. 23, which presents a cross section of cooler bunker. The brine fed into these lateral troughs overflows through the saw-tooth front, trickling down over the cloths to the bunker pans below, thereby giving an excellent exposure of the cold brine to the warm air coming up from the meat cooler. The moisture, as well as the foreign gases in the air, readily condenses and is taken up in the flowing brine, thus returning a very dry and pure as well as chilled air to the coolers. The cloths suspended from the troughs are drawn out to an angle of about thirty degrees, so that all brine which overflows from the troughs comes in contact with the cloth and finds its way to the bottom of the bunker pan. The cloth should extend 6 inches on either side beyond the ends of the distributing pans, so that there is no possible chance for the brine to overflow and not come in contact with the cloth, for if it should fall directly to the bunker pan, it would cause a spatter and the spray would find its way down through the cold air chute to the beef or product below.

It is very essential that there should be good insulation between the bottom of the bunker pan and the top where the pan is exposed to the cold brine; without this insulation moisture will condense on the under side of the pan, as it rises from the hot meat in the chill room below, causing a condensation on the chill room ceiling, and eventually the formation of mould, which would prove very detrimental to the quality of the meat in the chill room.

Another feature that is always desirable is to have the bunker pans inclined so that there are no pockets or places to hold the warm air as it rises, or to prevent its free passage and access to the warm air ducts without meeting with any obstruction whatever, and so that the warm air will pass readily and rapidly up through the warm air ducts to the top of the refrigerator, where it will fall over the refrigerating surfaces. It may be noted in the illustration that the brine headers lie on the floor. The author believes that this is a great advantage over the former methods of having the brine header on the ceiling, as the condensation on the header forms an ever increasing accumulation of frost, which, if not removed, becomes so burdensome that the pipes are sometimes broken down, causing damage and inconvenience. Pipes located as shown in this view are always spattered more or less from the falling brine, keeping the header entirely free from ice. The pipes rising from this header feed the main supply trough, which in turn feeds the twelve distributing pans and the cloths, as above indicated, the brine being discharged into a weir on the side of the pan. From this weir it runs into the main pan and finds its way through the different holes into the distributing pans. In each one of these holes an adjustable nipple should be located, the one nearest the weir, or brine supply, being the highest, and each succeeding nipple decreasing in height gradually toward the end of the pan, in this manner equalizing the flow of the brine into the distributing pans. The distributing pans are set diagonally so that the flow of the warm air toward the cold air duct necessarily brings the air in contact with the exposed brine flowing down over the cloth curtains, and it does not pass between the different curtains without being somewhat retarded, thereby giving ample opportunity for the moisture in the air to be deposited on the refrigerated surfaces.

In using the curtain system it is advisable to adopt galvanized iron pipes throughout. There being an excessive accumulation of brine from the constant condensation of the moisture in the air, this accumulation, which would otherwise be lost, can be utilized (provided the brine is not colored by rusty pipe) by drawing off the excess brine from the system and boiling it, thereby purifying it, adding salt to bring it to the desired strength and using it for pickling purposes throughout the plant. It will therefore be seen that it is possible to overcome the objection that is often raised to the exposed brine system.

In order to get the best results from this system it is necessary to have at least a 7-foot space in the brine chamber. Where old buildings are being remodeled and the required space is not available, probably the next best system is brine piping. When installing this kind of a refrigerating system, the author would suggest the use of galvanized spiral riveted pipes, 3 inches in diameter. These pipes will cost about the same per lineal foot as 1¼-inch black iron pipe; but having twice the area, only one-half as much of this pipe is required for the same refrigerating duty, hence the economy. The pipe is bought in lengths, generally of 10 feet each, and these are slipped together like stove pipe and soldered, putting on the number of lengths for the required length of the cooler. The brine header is connected into the bottom pipe through hose connections into each line of pipe, and finds its way into the return header from the top pipe. This pipe, being so thin, absorbs heat very rapidly. The life of this pipe is much longer than that of the 1¼-inch black iron pipe. A case came under the author's own observation where this pipe has been in use for upward of fourteen years, while the 1¼-inch iron pipe that was installed at the same time was completely eaten out and replaced with the 3-inch galvanized spiral riveted pipe. The iron pipe lasted approximately

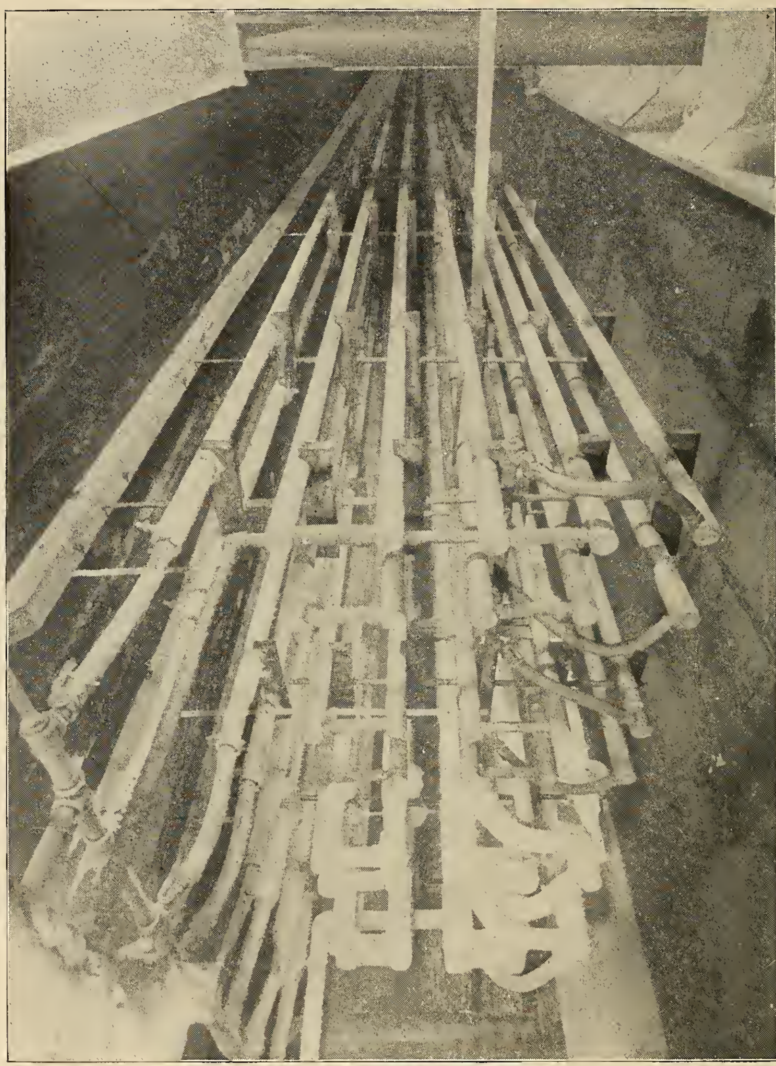


FIG. 24.—END VIEW OF BAY SHOWING REFRIGERATING PIPE HUNG TO CEILING.

about eight years. Fig. 24 shows the end view of one bay with the pipe located and connected. Fig. 25 shows the end view of the cooler with the detail of the hangers on which the pipe rests.

This same system is applicable to cold storage buildings, where two pipes to each 16-foot bay is found ample to hold the temperature to from 36° to 40° F. for curing cellars; note refrigerating pipe in Fig. 24, hung to the ceiling of the room with wooden supports, the supports

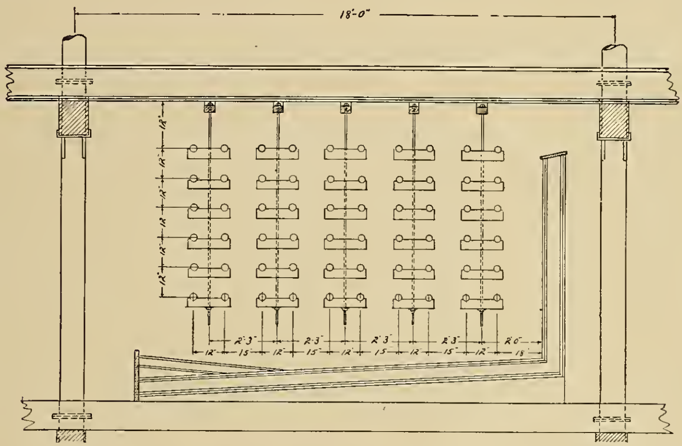


FIG. 25.—END VIEW OF COOLER, SHOWING DETAIL OF THE HANGERS ON WHICH PIPE RESTS.

being so constructed that a drip pan can be hung directly under the pipes to prevent the drip from falling upon the meats in process of curing, when the refrigerating agent is shut off.

In brine pipe refrigeration for cattle the author would recommend to each 16-foot bay eight series of 3-inch galvanized spiral riveted pipes, with six pipes in each series, making a total of forty-eight pipes, for the fore-cooler, or the first cooler into which the cattle are run, and where the largest amount of refrigeration is needed to take up the animal heat. For the next, or second cooler, forty-two pipes, or seven series of six pipes each, are ample, for same sized room. It is always advisable in piping brine chambers for warm material to arrange them so as to have one or two sets of pipes from which the brine can be kept turned off, in order that the frost may melt off the pipes. In the cold storage buildings, such as curing cellars, etc., where there is good insulation, two 3-inch pipes will be found ample in each 16-foot bay, as above stated. In freezing rooms, where direct expansion is used, one lineal foot of 2-inch pipe to each 5 cubic feet of space will be required to hold a proper temperature for sharp freezing. Where brine circulation is used in freezing rooms, one lineal foot of 2-inch pipe to each 3 cubic feet of space to be held at freezing temperature is required. These suggestions will be found useful in ordinary packing house practice.

The usual practice of construction for a refrigerator or beef cooler is a 16-foot construction each way, viz., bays of 16 feet and posts 16 feet centers. The height of chill room or coolers should be 11 feet 9 inches in the clear and for the curtain system, or exposed brine circulation, the lofts or chambers above the chill rooms should be 10 feet in the clear without considering the insulation of the bunker pans.

It is sometimes preferable to use pipe for circulation of brine in the air cooler rather than the curtain system. Whenever pipes are to be used the use of 3-inch galvanized iron spiral riveted pipe, as described heretofore in this chapter, is strongly recommended, or where this is not readily obtainable 3-inch galvanized iron crimp-joint and soldered seam pipe may be substituted, which, while not quite so substantial as the spiral riveted pipe, will, with ordinary care and attention, last a long time, and furthermore can be replaced at an extremely low cost. This galvanized pipe is recommended for the following reasons: First, for its economy, as it costs about the same per lineal foot as $1\frac{1}{4}$-inch black iron pipe, but only requires about one-half as many feet. Second, for its lasting qualities, it lasting, as proved by experience, fully twice as long as the ordinary black iron pipe. This would hardly seem possible when first considered by anyone not having had the experience, and would naturally seem contrary to his judgment. To the author's personal knowledge there was installed in 1890 over 100,000 lineal feet of this light galvanized pipe in a Chicago plant, all of which, if it has not been removed by alterations, is still in use with practically no expense connected with it for maintenance. Iron pipe which was put in at the same time was nearly all rusted out eight years afterwards.

Samples of the galvanized pipe that had been in use for upward of ten years were found to have a very slight coating or deposit of rust on the inside of the pipe, less than $\frac{1}{32}$d-inch thick, and adhering very tightly to the surface; by removing this rust with a sharp instrument it was found that the galvanizing was as clear and bright as when originally put on. Ten different pieces of this pipe 10 feet long were capped on either end and submitted to a hydrostatic pressure test; the bursting pressure average of the ten pieces was found to be 146 pounds to the square inch, some of the samples standing a pressure of over 180 pounds to the square inch. In actual practice the pipe used for this purpose is never subjected to a pressure exceeding forty pounds to the square inch.

The pipes are put together with rubber hose, using a three-ply cheap grade of hose for this purpose. (See

Fig. 26 for detail of the end pipes with fittings for the hose connections.) The pipes are usually furnished in 10-foot lengths, riveted and soldered, and are slipped together like an ordinary stove-pipe joint, all of these slip joints being carefully soldered, perfectly brine tight, and a sufficient number are slipped and soldered together

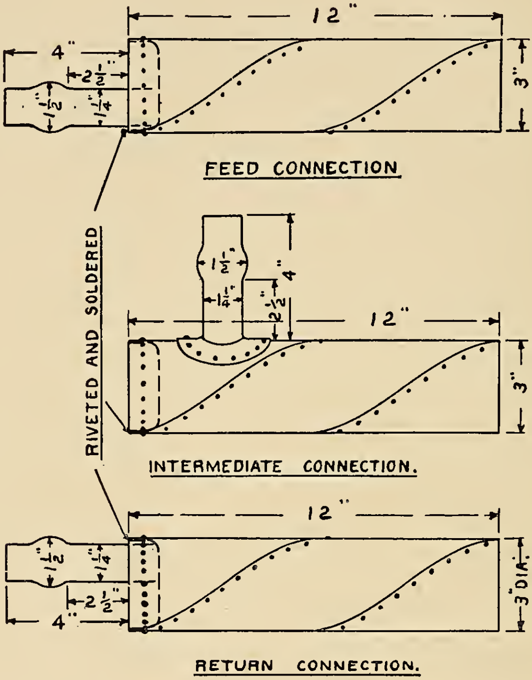


FIG. 26.—DETAIL OF END PIPES SHOWING THE DIFFERENT FITTINGS FOR HOSE CONNECTIONS.

in this manner to make runs of the required length to suit the length of the pipe chamber. At the end of the runs one of the three hose connection fittings shown in Fig. 26 (viz.: feed connection, intermediate connection and return connection) is put on for the purpose of connecting the runs together by means of the rubber hose.

For making this hose connection a composition is used made according to the following formula:

Stockholm tar	5 pounds
Rosin	6 pounds
Gutta percha chips	9 pounds

The above is put over a fire and melted, and after it is all melted and mixed together and sufficiently cool to handle, it is taken in small handfuls and put into water to chill. It is then rolled into sticks and used in this form for the above-mentioned work. While a like material can be purchased, it is very much more expensive and does not do the work any better than the above preparation.

This composition is put on the nipple of the fitting connection quite warm, the hose being slipped over at once and a wire clamp then put around the hose very tightly, when the connection is complete. On the top of the outlet of the return pipe an 1/8-inch pet cock should be inserted, which can be opened when necessary in order to let out the air from the coils, as the coils will sometimes become air-bound, the air rising to the top of the coil and preventing a free circulation of the brine. If, however, the pet cock is opened, allowing the air to escape, the brine will circulate freely. In putting up this kind of pipe for brine service, it is very essential that the pipe should rest on wooden hangers or bearings; if iron supports are put in, the pipe very soon rusts through at the point of contact with the support, and is ruined. However, if put up on wooden supports, as shown in Fig. 25, the life of the pipe will be greatly increased.

In Fig. 27 is shown a very simple, inexpensive and effective method of supporting brine pipes in cold storage rooms, or in rooms used as curing cellars, etc. In these places it is always necessary to put some kind of a protection under the brine pipes, so that when the frost is melted off, the water therefrom will not drip down upon the meats. Many make the mistake of putting in galvanized iron drip pans, in which case the condensation of moisture on the bottom of the pans produces as bad a result as the dripping from the pipes. In Fig. 27 is shown a dripboard trough which is nailed together in sections and slushed with tar on the inside.

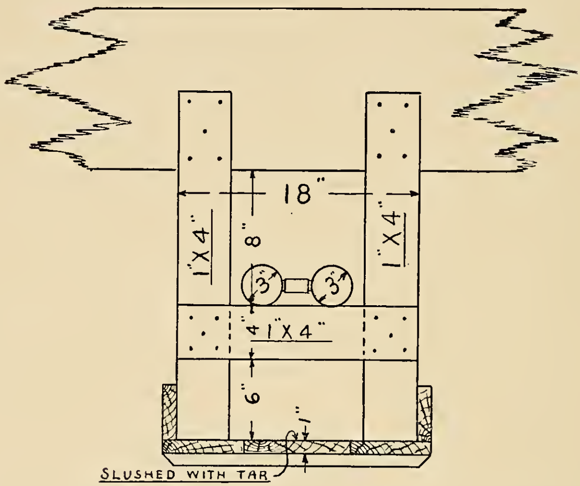


FIG. 27.—SIMPLE METHOD FOR SUPPORTING BRINE PIPES AND DRIP BOARD TROUGH.

After the tar has had time to thoroughly chill and all the odor has evaporated, the trough can be taken into the warehouse in sections and nailed to the supports, slanting in the desired direction, and connected with a downspout to a gutter, making a very economical as well as effective protection against the dripping of the pipes.

In Fig. 28 is shown a type of cooler that is sometimes used, and those using it wonder why they cannot get good results. There may be the same amount of refrigeration applied in this cooler as there is in one properly designed and built, but the one here illustrated is absolutely wrong in principle. The warm, moist air arising from the fresh meat put in a cooler of this kind naturally rises to the top of the room. Not meeting with any refrigerant to remove the heat and moisture, the latter

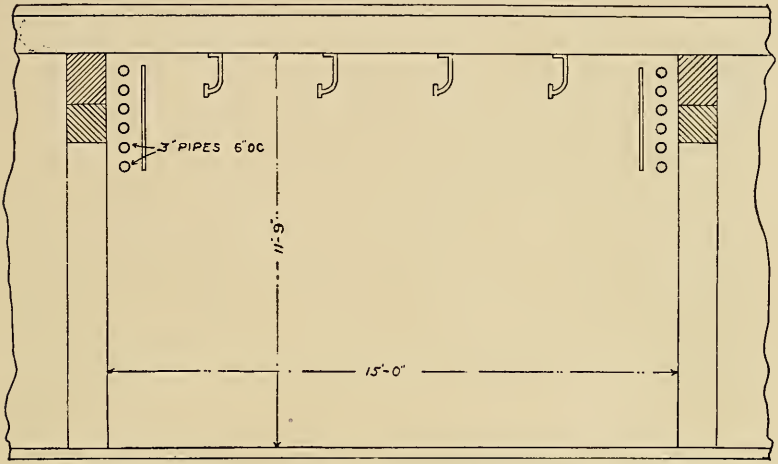


FIG. 28.—TYPE OF COOLER ARRANGEMENT TO BE AVOIDED.

condenses on the ceiling and on the sides or walls, thus making an ineffective and unsatisfactory cooler; and while it might work with a fair degree of satisfaction where the meats require but two days of chilling, and are then immediately sold, if that meat is subjected to any great change in temperature, it will quickly become mouldy and out of condition. This type of cooler should always be avoided.

CHAPTER III.

CATTLE HANDLING, SLAUGHTERING AND CHILLING.

HOW TO HANDLE CATTLE BEFORE SLAUGHTER.

In this chapter practical detailed suggestions for the handling of cattle will be considered. Before animals are slaughtered the first essential point is to see to it that they are in condition to be slaughtered, namely, that they are not over-excited, fevered, out of condition, under fed, or, in other words, that they are as near their normal condition as possible. Cattle should be allowed to rest over night before they are slaughtered, if they have been driven or "carred" any distance; for if the animal is tired or excited it will not bleed properly when slaughtered, and if killed in this condition the meat has a red, fiery appearance and is generally unwholesome. It is a condition which the practical eye of the tradesman will take cognizance of very readily, and he will not be slow to use it to his advantage. Fig. 29 is a view of suitable resting pens at a Chicago packing house plant, After the animals have rested a sufficient length of time to be in normal condition they should be driven to the killing pens carefully, and without undue violence, such as striking them across the back, or with heavy sticks, or prodding them unnecessarily while in the pens, as this abuse shows on the meat very readily when the hide is removed. The damage thus inflicted by careless handling is invariably done on the loin and rump of the animal, and as this is the high-priced part of the meat, it will readily be seen that the loss is quite considerable. With stubborn or wild cattle it is often necessary to be quite severe, but a practiced handler of live stock will do it in such a manner as to avoid injuring the carcass at all.

FIG. 29.—CATTLE RESTING IN PENS BEFORE BEING DRIVEN INTO SLAUGHTER HOUSE.

In this connection attention is called to Fig. 30, illustrating a wooden knob for the end of a prod pole which will prevent a great deal of bruising and consequent discoloration of the meat. When penning cattle from overhead, the penner invariably prods the animal in the loin, oftentimes using his pole as a harpoon, the force of the blow thus inflicted, coming on so small a part of the back, invariably making a bloodshot spot, whereas, if the force of the blow were distributed over a portion three times that diameter no ill effect would be noticed, hence the use of the knobs on these poles will do away with the bruising of loins in handling and penning

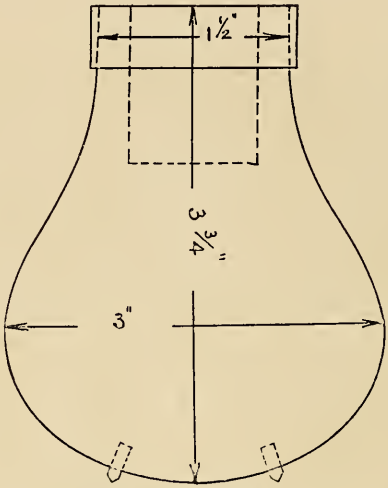


FIG. 30.—DIAGRAM FOR WOODEN KNOB ON END OF PROD POLE.

cattle. Care should also be taken that the pens are not overcrowded, especially in hot weather.

KNOCKING OR STUNNING CATTLE.

This represents really the first act in the slaughtering of cattle. After they have been driven into the narrow pens provided for the purpose, as shown in Fig. 31, the knocker follows and with a four-pound hammer strikes the animal a stunning blow in the middle of the forehead.

In former times cattle were speared, which was accomplished by walking over the top of the runways and with a long, sharp-pointed spear, severing the spinal cord. This method of killing, however, had the effect of preventing the free bleeding of the animal and another bad feature was that the blood settled in the neck, necessitating trimming of each neck. This old method, however, has now been superseded in all the large abattoirs of the United States by the method of knocking as shown in the view.

FIG. 31.—VIEW ILLUSTRATING THE MODERN METHOD OF KNOCKING OR STUNNING CATTLE.

Immediately after the stunning a sliding door is hoisted and the stunned animal rolled out to be hoisted for sticking, heading, etc., as shown in Figs. 32 and 33.

STICKING AND HEADING.

In sticking great care should be taken that the throat is well opened, thereby giving the blood a free flow. Furthermore, that the man who does the sticking severs both arteries and veins otherwise the beef will purge on the back and look discolored when finished. He should also be careful not to stick cattle through, for if this is done, when the bullock is thrown on its back, the blood flows

FIG. 32.—STUNNED CATTLE BEING HOISTED FOR STICKER.

onto the chime bones, causing a bad discoloration. In heading, great care should be used to see that all the fat possible is left on the tongue, leaving it perfectly smooth on the outer surface. Also see that as little hide as possible is left around the horns. Further, that the header, in cutting around the side of the head, leaves all the fat he can on the hide, and that he keeps as close to the side of the tongue as he can without injury to same; when this is done, the hide dropper can leave a full shaped neck, otherwise considerable weight which should be left on the beef comes onto the head, where it is afterward

FIG. 33.—HEADING AND SKINNING CATTLE.

trimmed and only worth tallow price. In taking the tongue from the head the trimmer should cut close to the jaw-bone, so that all the meat possible may be left on the tongue.

For convenience in handling the carcasses on the beds, a pritch is used (shown in Fig. 34). This is simply an ordinary stick with a spike in one end and a ferrule on the other, used to hold the animal when rolled on its back. Formerly pritches were made with spikes at both ends. At present there is no spike used on the end of the pritch coming in contact with the beef, as such spike often has the effect of puncturing the hide. The end of the pritch, which is to rest upon the floor without

FIG. 34.—PRITCH TO SUPPORT ANIMAL WHEN TURNED ON BACK.

slipping, should have a spike inserted. The other end, which is to support the carcass, should simply have a ferrule of 1½-inch pipe, the end being roughened like a saw tooth, which is sufficient to prevent it from slipping and at the same time does not injure the hide.

FOOT SKINNING.

Foot skinning is the term applied to taking off the front feet. In doing this the workmen should cut around the hoofs closely so as to give all the weight possible to the hide. They should not open the hide any further back than is absolutely necessary to unjoint the feet, for, if the shank is uncovered more than necessary, it is likely to become bloody, and it is impossible to get it clean again, as the tissue becomes stained. They should also be careful to see that none of the cords from the front part of the shin-bone are left on the hide. The same men doing this work also raise the gullet. In doing this they must be careful to open the neck straight from where the sticker left off. They must also guard against cutting the weasand. Great care should also be taken that the gullet is not raised too high with the knife when clearing, for if this is done, it allows the blood to run back on the

FIG. 35.—DOUBLE-BED KILLING FLOOR IN MODERN SLAUGHTER HOUSE.

ribs, producing the same effect as if the bullock had been stuck through.

RIPPING OPEN AND LEG BREAKING.

In this particular operation, care should be exercised to see that the first cut is made exactly where the sticker left off, opening the breast and hide in the center the full length of the animal. Leg-breaking consists in taking off the hind feet. Great care should be used to uncover the gam only sufficiently to get at the joint, leaving the hide over balance of shank to protect it. If this is done it will be possible to get very much better shanks than if skinned too low.

Care should be taken to see that all hide possible comes off around the feet, but that none of the cords are left on the hide.

Part of a modern killing floor is illustrated in Fig. 35. Fully one-half of the work in slaughtering cattle is done while they are lying on the floor and the other half while they are hung upon the hoists, consequently it is feasible and economical to work double beds. Fig. 35 is a view representing the work as it is done in a modern double-bed house. On sixteen double beds 150 cattle can be handled per hour.

FLOORING CATTLE.

This work consists of rimming over and siding the bullock. The special object of this operation is to attain: First, a smooth hide without scores or cuts, and next, smooth work done on the bullock, which consists in saving the fell very carefully throughout, clearing the rose on shoulder fully, also the saving of the fell back of the elbow and the forward shoulder. The latter part is a very particular point, as no fat is there, and if the fell is not left it shows black when coming from the cooler.

BREAST SAWING AND CAUL PULLING.

In sawing the breast, care should be taken to see that it is sawed in the center, holding saw at same angle as that at which the animal is lying, otherwise saw works from under side, and makes a very bad-looking brisket on one side of the beef. Care should also be taken to saw where marked, otherwise it will become necessary to trim off meat from the neck, if the right marks have not been followed.

Caul pulling consists in taking out the caul in a tidy, cleanly condition, keeping same off the floor, and getting

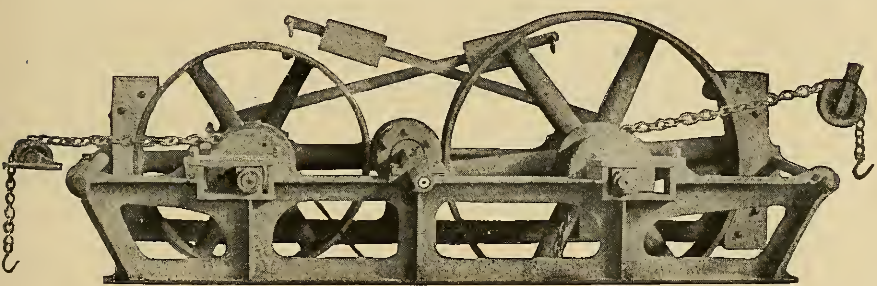


FIG. 36.—DOUBLE HOIST FOR LIFTING CATTLE FROM THE KILLING BEDS.

it into the box, as this is the best part of the fat for the oil house. Care should also be taken not to cut or tear the intestines, and if so, that they are immediately skewered up.

For hoisting the killed animal either a double or single hoisting apparatus may be used. A double hoist is shown in Fig. 36, and a single hoist in Fig. 37. In the double hoist shown, size of paper friction is 12x12 inches; speed of shaft, 250 revolutions. Larger pulley 52 inches in diameter, with 10 x 18 inch drum. Smaller pulley, 40 inches in diameter, 10 x 18 inch drum. The smaller pulley is used for hoisting the gates of the knocking pens when used on heading bed hoists, and is used for lowering cattle from the heading rail when used on cattle bed hoists.

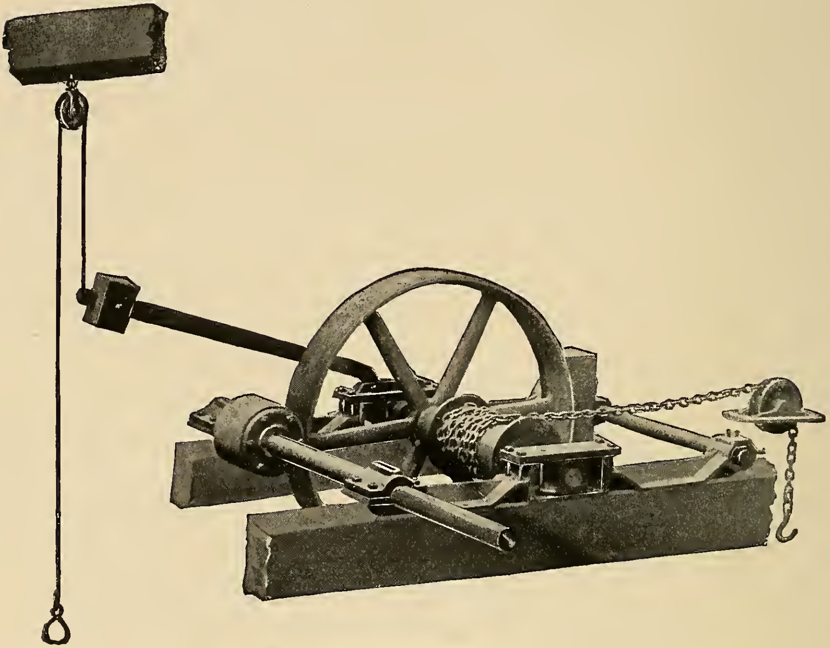


FIG. 37.—SINGLE BEEF HOIST.

The single hoist is a type of the kind of apparatus generally used in the smaller plants.

FELL CUTTING.

Fell cutting consists in skinning the hide off the hind legs when animal is on the first hoist. The points to be carefully looked after in this work is to see that smooth work is done both on the hides and on the beef itself.

BEEF SPREADERS.

In slaughtering cattle it was formerly the custom to use an ordinary spreader as shown in Fig. 38, which spread all carcasses, large or small, a certain distance and kept them spread from the time they were hung until finished splitting. The spring beef spreader, illus-

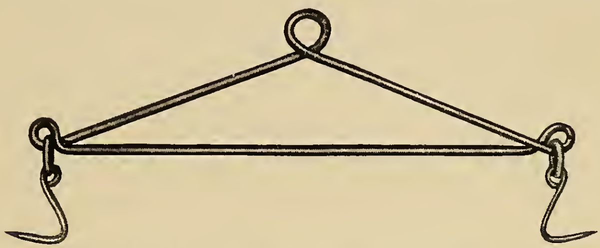


FIG. 38.—ORDINARY BEEF SPREADER.

trated in Fig. 39, is a great improvement over this old spreader. When the cattle are first hung on this appliance the center piece is raised up, allowing the hooks to

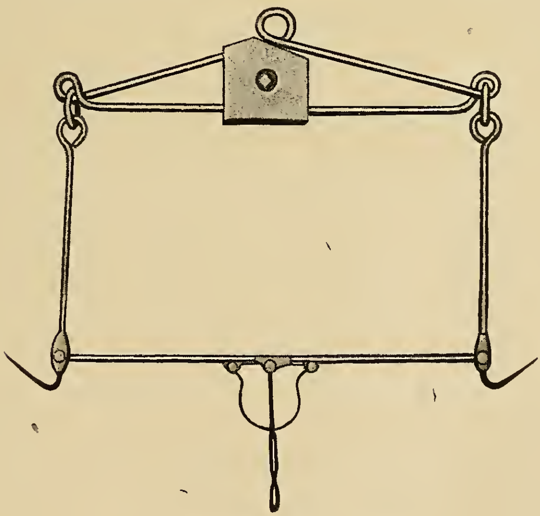


FIG. 39.—SPRING BEEF SPREADER.

hang in a normal condition proportionate to the size of the animal which is hung on them. Hanging in this shape, the rumper is given a chance to do his work when the bullock is held hanging in a normal position and is not spread so far as to be wrinkled and pulled out of its natural form.

Tail sawing is also improved by the use of this apparatus. If the carcass is spread unnecessarily the bone will break before being sawed, leaving the bone on one side or the other of the carcass, not being sawed in the center as it should be. In splitting the loins, if the bullock is spread more than it should be, the bones part and break ahead of the chopper, instead of being split. With the spring spreader, however, the carcass hangs in a normal condition and is spread out regularly as the beef is parted.

When splitting the chuck it is customary to pull down the lever between the two hooks, spreading it to its maximum distance. It also holds the animal in that condition while being hung over upon the rails with trolleys.

RUMPING.

This operation requires very skillful work, and calls for a great deal of attention. Points to be attained are: First, a smooth hide free from scores or cuts, and next, smooth work on the beef. Care must be used in this work to see that the rumper keeps very close to the hide on outside of the leg, in order that the fell-beater may do a good job. If the rumper is careless and breaks through the fell, it is impossible to curry this down smoothly. In working around the tail, great care must be taken not to get into the lean meat, especially on thin cattle, where there is comparatively little covering.

FELL BEATING.

If the floorman and rumper do their work properly, it is comparatively easy to do a good job at fell beating. These two workmen should be followed closely, however, to insure a smooth, even job. The fell-beaters should then use extra care to see that they do not tear through, and, in marking with the chopper, to mark in such a way that they tear back instead of cutting off.

GUTTING.

The objects sought for in this particular work are: First, cleanliness, and next, to save the fat smooth and without tearing it around the edge-bones. The liver should be taken out smoothly without tearing, and thrown into the truck. Special care should be taken in opening kidneys, to open in the center without cutting tenderloin. Also be very careful to leave all tenderloin in the bullock, for, if any comes out with the "pluck" it is wasted. The workmen should also be careful about cutting intestines or weasands.

BACKING.

The objects to be attained in this particular work, are: First, smooth hides, free from scores or cuts, at the same time leaving no fat on the hide, and next, particular care should be taken in the work required in the dropping of the hide to see that the fat is not removed from the loins.

TAIL SAWING.

The point in this work is to see that the saw is absolutely in the center, and that the first bone is sawed centrally. Better work can doubtless be done by sawing the tail from the rear, "popping" it twice.

SPLITTING.

Great care should be exercised in this particular work, especially on western and "hard-bone" cattle. As

FIG. 40.—VIEW SHOWING BEEF CARCASSES BEING SPLIT AND HUNG ON TROLLEY.

the house grinds and furnishes choppers, great care should be exercised to see that these are in the very best condition to do the work. They should be ground as thin as possible and have them hold, and if the splitters do not break a chopper once in a while, it is evidence that these are not ground as thin as they should be, and, unless they are, it is impossible to do good work in splitting. The workmen should, however, have choppers ground different thicknesses for different boned cattle, and never use thin-ground choppers on cows or hard-boned steers. The men look out for this themselves, generally speaking. They should split the bone down centrally, the entire length of the carcass. Great care should be taken to see that they split the short fin-bone in the neck, thereby giving the neck-splitter a chance to start centrally with his work. Fig. 40 is a view in same house as indicated in Fig. 35, showing the cattle after having been split, hung on trolleys and run back ready to be finished. It will be noted that the carcasses are now separated into two pieces and are being thoroughly washed and scrubbed with fountain brushes to insure absolute cleanliness in every part. The fountain brush in general use is illustrated and described on page 89.

CLEARING OUT AND HIDE DROPPING.

In clearing the shanks the workmen should look carefully to see that they do not score the hide, or make any miscuts in the meat. They should also save the veins in the under side of forward shoulder, for when these are cut they continue to purge, making bad-looking shanks. In hide dropping care should be used to see that the workmen do not score or cut hides, make miscuts in the neck, or leave any unnecessary fat on the hide. They should also skin hides as low down as possible on the necks, which is regulated altogether by the manner in which the heading is done, as first described.

NECK SPLITTING.

This should be done carefully, splitting the neck fairly in the center. The last bone, or " deacon " joint, in the neck should be broken centrally, in order to give equal weights and appearance to the beef.

BRUISE TRIMMING.

This is a very essential feature in the dressing of cattle, and one in which good judgment must be exercised. It is, therefore, very hard to lay down any set rules further than the following: The object of trimming bruises is to take off all blood accumulations, and at the same time leave all the fat possible on the hips, etc., to be bleached out by using hot water and thorough wiping. The great danger, generally speaking, is that they are trimmed too much and scrubbed too little. These are points which require very careful attention.

SKIRT TRIMMING.

Skirt trimming consists in cutting off the edge of the skirts evenly on native cattle without exposing the lean meat. On western cattle and thin stock, the skirts should be trimmed high enough so that they will expose the lean meat, which gives a chance for all moisture which has gathered under the film to escape, making the beef dryer than if otherwise trimmed.

BEEF WASHING.

In the washing of beef the work should start at the hind legs, the step-ladder men being the first to use water on the beef after it is split. Next come the back washers and wipers; after these come the neck and rib washers, the policy being to start at the top and clean the beef as they go along. The washers should be kept close up, handling the beef promptly, running it into the cooler as fast as it is dressed.

A convenient apparatus for washing carcasses is the fountain brush, already referred to under the heading of "Splitting." It consists of an ordinary brush with a spray attachment on the front of it, as shown in Fig. 41. To this is attached a hose which supplies hot water from the vat above. When the men are ready to scrub the beef a valve is turned on, the water gravitating through the hose to the meat. In wetting it continuously

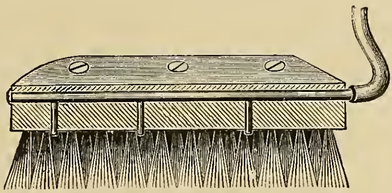


FIG. 41.—THE FOUNTAIN BRUSH.

the blood or discoloration which may be gathered on the meat is rapidly taken off, leaving it in a bright, clean condition. The beef is then wiped with a cloth made of ten or twelve thicknesses of very coarse cheese cloth which rapidly absorbs the moisture.

COOLERS.

Beef should be run into the coolers just as fast as finished. It is desirable to maintain the temperature in the preliminary or fore cooler at about 40° to 45° F., and it should not go above 50° F. These conditions can be controlled by the length of time beef is kept in the fore cooler, ordinarily, but in extremely hot weather, when there is heavy killing, coolers are liable to go as high as 48° to 50° F. and it does not necessarily follow that there will be bad results, providing the coolers are at a temperature of 38° F. twelve hours after being filled. The following day after beef is killed, it is pushed along into the main coolers, leaving room for the day's killing in the

FIG. 42.—VIEW IN BEEF COOLER.

rear. The temperature of main coolers should be from 34° to 36° F. In extremely cold weather the temperatures are quite often lower than those, or in extremely hot weather somewhat higher, but those given are preferable and safe.

The necks are trimmed in the coolers and great care should be taken not to cut off any more than is absolutely necessary to give the neck a neat, square appearance. An interior view of a typical beef cooler in a Chicago packing house is shown in Fig. 42.

CARE OF COOLERS.

That it is necessary to keep coolers sweet and clean is self-evident from the conditions, and it is always advisable to use a liberal amount of sawdust on the floors, so that the drippings from the meats may be rapidly absorbed; the sawdust should be changed at least once a week, keeping the coolers sweet and clean.

The workmen's clothes should never be allowed to hang around the coolers, nor anything else that in any way might litter them up.

Doors where beef comes in and goes out should be washed daily, as they get more or less grease and blood on them, and if this is allowed to stand it will soon become sour and to an extent decomposed.

In all packing house plants where a comparatively large volume of business is done there should be one man whose sole duty it is to look after the refrigerators. As soon as the filling of the coolers is begun he turns on a little brine, just enough to keep the temperature in the coolers at the desired point and not more than enough to keep them at that point. This is a matter which necessarily needs constant attention and care. When the cooler is filled with warm meat and the doors are shut it is his duty to turn on the refrigeration and see that the meat is brought down to the required temperature in the required time. While this man is attending to the refrigeration of the coolers it is advisable to have the temperature taken by someone else at least every three hours, partly that the attendant may know that close tab is kept on his work and partly to serve as a record for the superintendent or owner. Such a record is a great protection. From the above it is apparent that the position of the man attending to the refrigerators is one that should receive careful consideration, and in which only a man of intelligence, and one who is known to be reliable, is placed.

TEMPERATURE IN COOLERS.

This is a point that cannot be watched too closely, and lack of experience in this particular has been very expensive in many cases.

When beef is run into the cooler, it should first be held in what is called the fore cooler (by some, the back cooler), which consists of one-third of the length of the cooler cut off by a partition. As fast as this cooler is filled the beef should be pushed through into the front or main cooler, but as they are left in the fore cooler for an hour or two, a chance is given for the quick evaporation of a very large amount of the moisture and animal heat that is left in the carcass. When killing choice cattle it is advisable to have the temperature of the fore cooler as near 45° F. as possible; above 48° F. is not detrimental. Heavy cattle, however, should hang at least 18 inches apart in order that the cool air may circulate freely around the carcasses; lighter cattle can be hung much closer.

When the cooler is being filled the refrigeration should be partly shut off in order to allow the temperature to run up to 45° to 48° F. As soon as they have finished filling the cooler the refrigeration should be turned on full force with a view to having the temperature brought down to 38° F. in twelve to fifteen hours after the cooler is shut up. While it might be possible to bring it down in much less time it is not advisable; neither should it be longer than this. The reason for this is to avoid what is called " bone-sour " beef, which it is impossible to prevent at all times, but 99 per cent of it can be avoided if handled in the coolers judiciously. The explanation for this particular trouble lies in the fact that when the animal is put into a cooler where it is cooled quickly it chills on the outside, which practically forms an insulation, holding the heat next to the bones. If the beef is in a cooler where the temperature is too high, decomposition starts in before the animal heat is all taken away. This particular trouble, " bone-sour," is always found, however, in the hip-joint and is due to the decomposition of the joint water. If some joint water is taken from a freshly killed animal and put in an open bottle and set in the sun for two hours, it will be found to be thoroughly decomposed and have an offensive odor, the chemical properties being such that decomposition sets in immediately when it is exposed to the air. As there is a large amount of this water in the hip-joint, failure to remove the animal heat quickly enough, or refrigerating too quickly so that the animal heat is retained, causes decomposition of the joint water to set in, hence the trouble.

A great deal of difficulty has been experienced in Australia and South America in trying to slaughter cattle and freeze them immediately. They were successful in freezing them but when the beef was thawed out ready for use it was found unfit to eat in many cases. The above will readily explain the conditions they complain of. If the beef was thoroughly chilled for forty-eight hours before freezing they would have no trouble with bone-sour or " bone-stink " as it is sometimes termed.

As stated before, the coolers should be brought to a temperature of 38° F. in twelve hours after they are filled, and from that point be brought down gradually to 34° or

35° F., never allowing the temperature to drop to 32° F., as this is too low a temperature for shipping purposes. It is true that in extremely cold weather it cannot always be avoided, and oftentimes in transit it gets much lower than that in the cars, but it is not well to permit beef to reach that temperature if it can be avoided. If coolers are properly handled and have a good dry circulation, and beef is put in at the above temperature and allowed to remain forty-eight to seventy-two hours, it will be found to be in excellent condition and the chances of "bone-sour" will be practically eliminated, although it is impossible to always prevent it; but, as stated above, the proportionate amount affected should be small—less than 1 per cent.

All export beef which is shipped to England is handled in accordance with these instructions, and the fact that it arrives there in good condition certainly corroborates the correctness of the statement.

Beef should always be run into the cooler immediately after it is killed and never allowed to hang outside any longer than necessary. While it may take a little more refrigeration to handle it this way than to have it partially chilled by the outside air, the general appearance of the beef will more than repay for the additional cost of refrigeration

EFFECT OF COOLERS IN PRESERVING MEATS.

Decomposition of meats is only possible where there is moisture: For instance, in the mountainous regions of the west, where it is extremely dry and the air is pure, beef can be hung up out of doors and dried as hard as though house-dried. This is on account of the extreme dryness of the atmosphere. Meat at the sea level, however, where the air contains a large amount of humidity, will quickly decompose, showing that the moisture aids decomposition. Such being the case it will be readily seen that the cooler giving the best results must necessarily be the one which is the dryest and if the moisture which arises from the beef on account of being run into a low temperature is immediately taken up and carried away, the meat will necessarily become dry. If, however, it is a cooler which is damp, and the moisture instead of being carried off is simply deposited, it will dry the beef only so long as the air, or cooler, is in a condition to take up moisture. When it will take no further moisture the balance remains in the meats and as soon as this meat, which is not thoroughly dried in the coolers, is exposed to the air it becomes slippery and slimy and is at once considered out of condition, hence the appearance of the meat long after it has left the cooler is attributable to the treatment it received when first slaughtered and put in the cooler.

SUGGESTIONS FOR HANDLING BEEF IN COOLERS.

When the beef is ready to go into the coolers it is supposedly well dressed and absolutely clean. Such being the case, care should be taken to see that the carcasses, as they are moved along the rails, are kept bone to bone, or back to back, for if they are thrown in promiscuously (as more or less blood will run out of the kidneys if run together, one front against another back of beef) they will certainly become discolored. Furthermore, the beef should be handled as speedily and with as little yanking and throwing around as possible, as the veins when handled this way will purge more or less and the beef, even though clean, will be highly colored.

The carcasses should be placed at least a foot apart in the preliminary or fore cooler where they are allowed to stand until partially chilled, and then run into the main cooler, where the temperature is somewhat lower. They should be placed so that under no condition one side of beef touches another, for if put in this way it always shows an unchilled and scalded spot on the beef, which greatly disfigures it.

Beef should always, if possible, be hung a foot apart the first twenty-four hours; later it can be hung closer without detriment, although it should not be allowed to touch.

After beef has hung in the proper temperature for forty-eight hours it is ready to be ribbed. It should not be ribbed prior to that time, unless absolutely necessary, as it has not sufficiently set or hardened, and hence the outer layers of beef will slip and give the beef a bad appearance.

Beef can be held in coolers for months before it will decompose if the temperature is kept near 33° or 34° F., but of course in actual practice it is never necessary to keep it in to exceed four or five, or at the outside six days before it is taken from the cooler and started on its way to destination.

Meat which is intended for freezing purposes should be thoroughly chilled before being sent to the freezers, as it not only aids in the freezing of the beef, but it has a much better appearance when it comes from the freezer if it is properly chilled before being frozen.

TRIMMING OF BEEF.

While this is an item of which little can be said, it is one which merits consideration where one is doing a large volume of business. Nearly all butchers will trim the necks of cattle before they are sent out in order to make them look smooth and even, trimming off the ragged, jagged ends. On large cattle there are two or three pounds of brisket fat in each animal. When oleo oil is high and beef is low it is advisable to cut this fat out; when the conditions are different it is profitable to leave it in.

On export beef it is advisable to trim out at least part of the skirts and in some cases all of them, as usually the skirt in the beef is the first place where moisture will accumulate. If the skirt is removed entirely, this accumulation is prevented, and if it is left in the English buyer invariably tests the condition of the beef by running his hands along the skirt to see if it is mouldy.

Hanging tenderloin is supposed to be cut out on export beef, and if the man cutting it out cuts it from the kidneys, slanting toward the backbone, on a hundred cattle he can easily leave in quite an amount of weight which sells at beef price; if cut out it would be worth only sausage price.

These are points and suggestions which are well worth consideration.

RIBBING OF BEEF.

Probably no other work about the packing house is more important, or needs more attention, than ribbing of beef. If the beef is ribbed properly it shows up to the best advantage; if improperly ribbed it does not, and the buyer's opinion of its value depends largely upon its appearance. Ribbing shows the quality of the beef to a large extent, hence it is very essential that it should be done properly. The secret of ribbing is to follow close, without uncovering the top part of the lower rib on the plate, following down gradually between the two ribs to the point in the backbone where the vertebra is the thinnest, bringing the knife across perfectly level, the object being to show as much meat as possible when the beef is ribbed and as little backbone. The exact place to go probably is not to exceed ½ inch wide, hence it will be seen that it requires skilled work to do it rapidly and do it properly.

LOADING BEEF.

In common practice about the packing house there is a certain department which requires a great deal of attention, not only to see that the work is done properly but to see that the conditions existing are favorable; namely, the loading and shipping department. For instance, the cars must be properly iced prior to loading and the temperature in the cars brought down to the right point. It is generally customary to ice the cars one day before loading, as a car should never be loaded that is not 38° F. or lower when the doors are opened. In the loading, if it is a warm day, the temperature will creep up much higher, but the beef coming out of a temperature of 34° or 35° F. carries a great deal of cold with it, so to speak, and even though the cars may be 50° to 60° F. the refrigeration given off by the beef, combined with the refrigeration from the ice compartments of the car, will bring the temperature down very rapidly. Cars, of course, should be all thoroughly cleaned and aired out prior to the icing, so that when they are open they are perfectly sweet and clean as well as of the proper temperature. Beef should be put into the cars as fast as it comes from the coolers, not allowing it to hang on the rails and be exposed more than is absolutely necessary before being placed in the refrigerator car. Great care should be used in hanging the beef—that it is hung perfectly solid and wedged in tight, otherwise with the swing and motion of the car the beef will become chafed and a bone from one quarter of meat will mangle and tear the meat on the quarter

FIG. 43.—LOADING INTO REFRIGERATOR CAR.

hanging next to it, often very seriously injuring its appearance. Fig. 43 illustrates a typical beef loading scene at a large American packing plant.

WEIGHING AND TAGGING BY LOTS.

In order to keep a close watch on the business and to know exactly what each and every purchase realizes it is necessary to keep an account of each purchase separately, and this is invariably done in up-to-date establishments. Cattle are killed in lots in which they are purchased, whether there be one or 500 in the lot; everything in a particular purchase is kept absolutely separate, the weight of the beef, hide and tallow being kept separate and turned into the office in the evening as soon as through with killing. Night clerks usually figure these tests, as against the cost of the live cattle, and when the day force comes on in the morning, the actual cost of all the live stock killed the day previous is before them for their guidance in the day's shipments. As fast as the cattle are dressed the beef is run over a track scale going to the cooler. Here the weight of each individual carcass is caught and tagged, showing the lot to which it belongs for guidance in shipping, the tag also having the grading of the particular carcass. Any lot of cattle will run uneven, or in other words there are some that are better than others. As they go to the scale an experienced man looks them over and grades them as No. 1, No. 2 or No. 3, considering only this particular lot of cattle, as a No. 2 of one lot may be much better than a No. 1 of another lot; but they are graded by taking into consideration the whole of this particular bunch of cattle, as purchased. They are graded according to weights and quality. Any cattle that are badly bruised or damaged or discolored are thrown out and sent to some other department where they are cut up and trimmed out, or treated to the best advantage possible. As fast as the cattle are graded and tagged they are put into the cooler, each special grade going on a rail by itself, irrespective of the lot to which it belongs, so that when the shipping clerk in the office gives his orders to the loading gang to have the beef taken out of the coolers, he will order so many No. 1 cattle off such and such a rail, lot, etc. As all cattle of that particular grade are on this rail it greatly facilitates getting the beef out of the cooler and avoids running around promiscuously to get the particular carcass wanted. A great deal depends, in the expense of loading as well as the speed at which it is possible to be done, upon having the beef put into the cooler in such a way that it comes out readily and without a great deal of handling and overhauling to get odd cattle.

CHAPTER IV.

DRESSING YIELDS OF CATTLE.

TESTS SHOWING YIELD OF MEATS AND BY-PRODUCTS.

The following are carefully prepared calculations made from data obtained in practical operation, showing yields of the different products on several different bunches of cattle slaughtered. The reader will readily see that these were choice cattle in each instance and that the average yield of the products is generally larger than would be the case with the ordinary run of cattle slaughtered. A careful perusal of the different tests given in the following pages, however, will give the reader the average yield in different lines from the cattle handled, together with the value of the different items at time tests were made.

YIELD OF A BUNCH OF TWENTY-TWO NATIVE CATTLE.

The following tables show the yield in beef, hides and tallow and the value of offal of twenty-two native cattle, the first one in each test showing the weight and percentage of yield of beef, hides and tallow:

Product	Weight, lbs.	Averages	Weight, lbs.	Per cent
Live weight ..	23,700	Average	1,077.00	....
Dressed " ..	14,239	"	646.00	60.08
Shipping " ..	14,162	Shrinkage	......	0.54
Hides " ..	1,755	Average	......	7.40
Total fat " ..	1,391	Average per head	63.25	5.80

The following table shows the yield in trimmings of twenty-two native cattle:

Product	Pounds	Value	Total Value
22 tongues	149	$0.55 each	$12.10
22 livers	248	.35 "	7.70
22 hearts	56	.07 "	1.54
22 tails	40	.03½ "	.77
Cheek meat	88	.03 per lb.	2.64
Head meat	16	.03 "	.48
Fine meat	7	.03 "	.21
Head trimmings	11	.03 "	.33
Total value	....	....	$25.77

The following table shows the yield in casings of twenty-two native cattle:

Product	Per cent used	Value	Total Value
20 sets round guts	91	$0.14 set	$2.80
8 sets middles	36	.50 "	4.00
22 pcs. bungs	100	.11 each	2.42
20 pcs. bung gut skins	91	.01¼ "	.25
19 pcs. weasands	86	.05 per pce.	.95
8 pcs. bladders	36	.30 per doz.	.22
14 lbs. weasand meat	...	.01 per lb.	.14
Total value	....	....	$10.78

The yield in sweetbreads of twenty-two native cattle was twenty-two pieces, weighing 6 pounds, valued at 20c per pound, total value, $1.20. The yield in tripe was twenty-two pieces, weighing 420 pounds, valued at ½c per pound, total value, $2.10. Total value of sweetbreads and green tripe, $3.30.

The yield in the tank room of twenty-two native cattle was 1,675 pounds green weight to tanks, the average per head being 76.14 pounds.

In figuring the value of the offal in the different tests the materials sent to the tank room are not taken into consideration.

The following table shows the yield in heads and feet of twenty-two native cattle:

Product	Total Wt. lbs.	Wt. per head, lbs.	Price		Amount	Value per head
Skulls	88	4.00	$18.00	per ton	$ 0.79	$0.03590
Jaws	43	1.95	18.00	"	.39	.01772
Knuckles	63	2.86	18.00	"	.56	.02545
Dark hoofs	39	1.77	22.00	"	.43	.01954
No. 1 r'nd shins	26	1.18	42.00	"	.54	.02454
Flat shins	19	.86	30.00	"	.29	.01318
No. 1 tallow....	145	6.59	.06¾	per lb.	9.78	.44454
Neatsfoot oil..	23	1.05	.64	per gal.	1.93	.08773
Tankage	110	5.00	16.00	per ton	.88	.04000
Total.......	....	....	....		$15.59	$0.70860

The yield in blood of the above twenty-two native cattle was as follows: 8 pounds per head of dry blood; total, 176 pounds; value, at the rate of $33.00 per ton, equals $2.90.

The yield in sinews of the above twenty-two native cattle was as follows: 1.93 pounds per head; total weight, 42 pounds; value, at the rate of $19.00 per ton, equals 40c.

The fat from these twenty-two native cattle showed the following yield in stock:

1,391 lbs. tallow =	1,122 lbs. No. 1 stock	= 80.00	per cent.
	193 lbs. scrap tallow	= 13.88	"
	76 lbs. waste	= 5.46	"
		100.00	per cent.

The above 1,122 pounds of stock showed the following yield in oleo oil and stearine:

Product	Per cent	Weight, lbs.	Price per lb.	Value
No. 1 oil	79.77	895	$0.10½	$94.37
No. 1 stearine........	19.52	219	.13½	29.56
Waste in pressing....	.71	8	......	......
Totals............	100.00	1,122	......	$123.93

The total value of the offal of twenty-two native cattle, including the tallow, was $182.67, an average per head of $8.30.

YIELD OF A BUNCH OF FIFTY-NINE TEXAS CATTLE.

The following table shows the yield in beef, hides and tallow and the value of offal of fifty-nine fed Texas cattle:

Product	Weight, lbs.	Averages	Weight, lbs.	Per cent
Live weight......	64,260	Average	1080.	......
Dressed weight...	39,609	"	671.	61.64
Shipping weight..	39,365	Shrinkage	......	.62
Total fat.........	3,896	Average per head	66.03	6.00
Hides	4,946	" "	83.92	7.70

The following table shows the yield in trimmings of fifty-nine Texas cattle:

Product	Weight, lbs.	Value	Total value
59 tongues...	418	$0.55 each	$32.45
59 livers	744	.35 "	20.65
59 hearts	160	.07 "	4.13
59 tails	88	.03½ "	2.06
Cheek meat	227	.03 per lb.	6.81
Head meat,..................	37	.03 "	1.01
Fine meat..	18	.03 "	.54
Head trimmings..............	24	.03 "	.72
Total value...........	...	....	$68.37

The following table shows the yield in casings of fifty-nine Texas cattle:

Product	Per cent used	Value	Total value
52 sets round guts	88	$0.14 per set	$ 7.28
20 sets middles	34	.50 "	10.00
59 pcs. bungs...............	100	.11 per pce.	6.49
46 pcs. bung gut skins	78	.01¼ "	.57
50 pcs. weasands	85	.05 "	2.50
43 pcs. bladders	73	.30 per doz.	1.07
24 lbs. weasand meat	...	.01 per lb.	.24
Total value............	...	....	$28.15

The yield in sweetbreads of fifty-nine Texas cattle was as follows: 59 pieces, weighing 20 pounds, valued at 20c per pound; total value, $4. The yield in tripe was 59 pieces, weighing 1,080 pounds, valued at ½c per pound; total value, $5.40. Total value of sweetbreads and green tripe, $9.40.

The yield in the tank room of fifty-nine Texas cattle was as follows: 4,466 pounds green weight to tanks, the average per head being 75.70 pounds.

The following table shows the yield in heads and feet of fifty-nine Texas cattle:

Product	Total Wt. lbs.	Wt. per head lbs	Price		Amount	Value per head
Skulls	247	4.19	$18.00	per ton	$ 2.22	$0.0377
Jaws	130	2.20	18.00	"	1.17	.0198
Knuckles	161	2.73	18.00	"	1.49	.0245
Dark hoofs......	112	1.90	22.00	"	1.23	.0189
Piths	73	1.24	20.00	"	.73	.0124
No. 1 r'nd shins.	61	1.04	42.00	"	1.28	.0218
Flat shins	43	.73	30.00	"	.65	.0109
No. 1 tallow	527	8.93	.06¾	per lb.	35.56	.6027
No. 1 horns.....	57	.97	200.00	per ton	5.70	.0970
Neatsfoot oil....	55	.93	.64	per gal.	4.69	.0793
Tankage........	215	3.64	16.00	per ton	1.72	.0291
Total amount	....	....	....		$56.44	$0.9566

The yield in blood of fifty-nine Texas cattle was as follows: 8 pounds per head of dry blood; total 472 pounds; value, at the rate of $33 per ton, equals $7.78.

The yield in sinews of fifty-nine Texas cattle was as follows: 1.87 pounds per head; total weight 110 pounds; value, at the rate of $19 per ton, equals $1.04.

The fat from the fifty-nine Texas cattle showed the following yield in stock:

$$3{,}896 \text{ lbs. tallow} = \begin{cases} 3{,}169 \text{ lbs. No. 1 stock} & = 81.34 \text{ per cent.} \\ 539 \text{ lbs. scrap tallow} & = 13.84 \quad " \\ 188 \text{ lbs. waste} & = \underline{\ 4.82} \quad " \end{cases}$$

$$100.00 \text{ per cent.}$$

The above 3,169 pounds of stock showed the following yield in oleo oil and stearine:

Product	Per cent	Weight, lbs.	Price per lb.	Value
No. 1 oil	80.75	2,559	$0.11	$281.49
No. 1 stearine	18.49	586	.13½	79.11
Waste in pressing	.76	24	......	......
Totals	100.00	3,169	......	$360.60

The total value of the offal of fifty-nine Texas cattle, including tallow, was $531.78; average per head, $9.103.

YIELD OF A BUNCH OF TWENTY CATTLE (EIGHT NATIVE HIDES AND TWELVE "SPREADIES").

The following table shows the yield in beef, hides and tallow, and the value of offal, of twenty cattle, eight hides classified as natives and twelve as spreadies:

Product	Weight, lbs.	Averages	Weight, lbs.	Per cent
Live weight	24,650	Average	1,232	....
Dressed "	15,894	"	758	61.64
Shipping "	14,914	Shrinkage	.....	1.84
Hides " (eight natives and twelve spreadies)	1,731	"	86.5	7.10
Total fat	1,552	Average per head	77.6	6.20

The following table shows the yield in trimmings of same twenty cattle:

Product	Pounds	Value	Total Value
20 tongues	173	$0.55 each	$11.00
20 livers	261	.30 "	7.00
20 hearts	64	.07 "	1.40
20 tails	33	.03½ "	.70
Cheek meat	95	.03 per lb.	2.85
Head meat	16	.03 "	.48
Fine meat	10	.03 "	.30
Head trimmings	15	.03 "	.45
Total value	....	....	$24.18

The following table shows the yield in casings of same twenty cattle:

Product	Per cent used	Value		Total Value
19 sets rounds	95	$0.14	per set	$2.66
7 sets middles................	35	.50	"	3.50
20 pcs. bungs.................	100	.11	each	2.20
15 " bung gut skins...... ..	75	.01¼	"	.19
8 " weasands..	40	.05	"	.40
9 " bladders	45	.30	per doz.	.22
11 lbs. weasand meat...... ...	....	.01	per lb.	.11
Total value..............	....	....		$9.28

The yield in sweetbreads of above twenty cattle was as follows: 20 pieces weighing 7 pounds, valued at 20c per pound; total value $1.40. The yield in tripe was 20 pieces weighing 420 pounds valued at ½c per pound; total value $2.10. Total value of sweetbreads and green tripe, $3.50.

The yield in the tank room of above twenty cattle was 1,626 pounds green weight to tanks, the average per head being 81.3 pounds.

The following table shows the yield in heads and feet of same twenty cattle:

Product	Total wt., lbs	Wt. per head, lbs.	Price		Amount	Value per head
Skulls	84	4.20	$18.00	per ton	$0.75	$0.0375
Jaws..........	46	2.30	18.00	"	.41	.0205
Knuckles......	69	3.45	18.00	"	.62	.0310
Hoofs	43	2.15	22.00	"	.47	.0235
No. 1 r'nd shins	25	1.25	42.00	"	.53	.0245
Flat shins.....	20	1.00	30.00	"	.30	.0150
No. 1 tallow...	165	8.25	.06¾	per lb.	11.13	.5568
Neatsfoot oil..	32	1.60	.64	per gal.	2.72	.1360
Tankage	72	3.60	16.00	per ton	.58	.0290
Totals	....	....	....		$17.52	$0.8760

The yield in blood of same twenty cattle was as follows: 8.35 pounds per head of dry blood; total 167 pounds; value at the rate of $33 per ton, equals $2.75.

The yield in sinews of same twenty cattle was as follows: 2 pounds per head, total weight 40 pounds; value at the rate of $19 per ton, equals 38c.

The fat from these same twenty cattle showed the following yield in stock:

1,552 lbs. tallow =	1,265 lbs. No. 1 stock	= 81.51	per cent.
	215 lbs. scrap tallow	= 13.85	"
	72 lbs. waste	= 4.64	"
		100.00	per cent.

FIG. 44.—SIRLOIN BUTT.

The above 1,265 pounds of stock showed the following yield in oleo oil and stearine:

Product	Per cent	Weight, lbs.	Price per lb.	Value
No. 1 oil	79.37	1,004	$0.11	$110.44
No. 1 stearine	20.08	254	.14	35.56
Waste in pressing	.55	....	....	.....
Totals	100.00	1,258	....	$146.00

The total value of the offal of above twenty cattle, including the tallow, was $203.61, an average per head of $10.1805.

YIELD OF A BUNCH OF THIRTY-FOUR CATTLE.

The following table shows the yield in beef, hides and tallow and the value of offal of thirty-four cattle:

Product	Weight, lbs.	Averages	Weight, lbs.	Per cent
Live weight......	42,350	Average......	1259	.....
Dressed "	25,563	"	751	60.36
Shipping "	25,067	Shrinkage....	......	1.98
Hides "	3,027	....	89.00	7.10
Total fat..........	2,666	Fat per head	78.41	6.30

FIG. 45.—SIRLOIN STRIP.

The following table shows the yield in trimmings of same thirty-four cattle:

Product	Weight, lbs.	Value	Total Value
34 tongues	263	$0.55 each	$18.70
34 livers	425	.35 "	11.90
34 hearts	173	.07 "	2.38
34 tails	49	.03½ "	1.19
Cheek meat	185	.03 per lb.	5.55
Head meat	32	.03 "	.96
Fine meat	19	.03 "	.57
Head trimmings	26	.03 "	.78
Total value	...	....	$42.03

The following table shows the yield in casings of same thirty-four cattle:

Product	Per cent used	Value		Total Value
34 sets rounds	100	$0.14	set	$4.76
13 " middles	38	.50	"	6.50
34 pcs. bungs	100	.11	each	3.74
32 " bung gut skins	94	.01¼	"	.40
30 " weasands	88	.05	"	1.50
25 " bladders	74	.30	per doz	.63
10 lbs. weasand meat	20	.01	per lb.	.20
Total value	....	....		$17.73

FIG. 46.—BEEF RIB.

The yield in sweetbreads of same thirty-four cattle was 29 pieces weighing 9 pounds, valued at 20c per pound; total value $1.80. The yield in tripe was 34 pieces weighing 710 pounds valued at ½c per pound; total value $3.55. Total value of sweetbreads and green tripe, $5.35.

The yield in tank room of same thirty-four cattle was 2,665 pounds green weight to tanks, the average per head being 78.38 pounds.

The following table shows the yield in heads and feet of same thirty-four cattle:

Product	Total weight	Wt. per head lbs.	Price		Amount	Value per head
Skulls	119	3.50	$18.00	per ton	$1.07	$0.0315
Jaws	71	2.09	18.00	"	.64	.0188
Knuckles	100	2.94	18.00	"	.90	.0264
Hoofs	73	2.15	22.00	"	.80	.0236
No. 1 r'nd shins	37	1.09	42.00	"	.78	.0228
Flat shins......	31	.91	30.00	"	.47	.0136
No. 1 tallow...	371	10.94	.06¾	per lb.	25.04	.7384
Neatsfoot oil ..	33	.98	.64	per gal.	2.82	.0836
Tankage	184	5.41	16.00	per ton	1.47	.0432
Totals......	....	....	....		$33.99	$1.0019

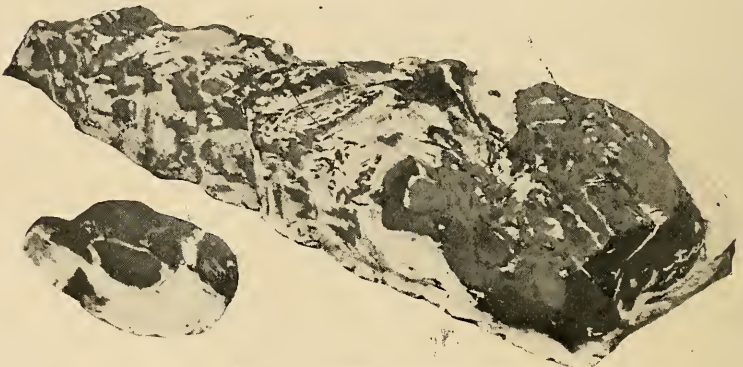


FIG. 47.—BEEF TENDERLOIN.

Yield in blood of same thirty-four cattle was as follows: 8.6 pounds per head of dry blood; total 292 pounds; value at the rate of $33 per ton, equals $4.82.

The yield in sinews of same thirty-four cattle was as follows: 1.44 pounds per head; total weight 49 pounds; value at the rate of $19 per ton, equals 46c.

The fat from these thirty-four cattle showed the following yield in stock:

2,666 lbs. tallow =	2,189 lbs. No. 1 stock	= 82.11	per cent.
	383 lbs. scrap tallow	= 14 37	"
	94 lbs. waste	= 3.52	"
		100 00	per cent.

The above 2,189 pounds of stock showed the following yield in oleo oil and stearine:

Product	Per cent	Weight, pounds	Price per lb.	Value
No. 1 oil	78.04	1,708	$0.11	$187.88
No. 1 stearine.............	21.06	461	.14	64.54
Waste in pressing..........	.90	20	....	......
Totals	100.00	2,189	....	$252.42

The total value of the offal of these thirty-four cattle, including the tallow, was $356.80; an average per head of $10.497.

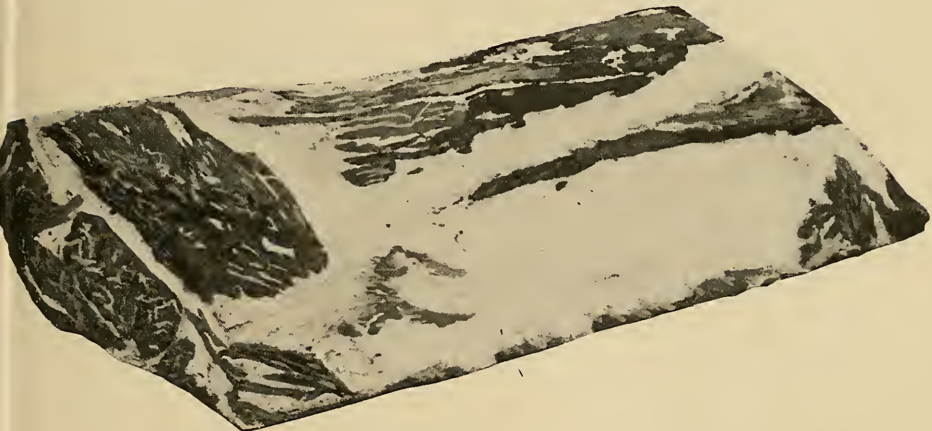


FIG. 48.—BEEF ROLL.

The foregoing records of tests will show the reader the actual value of the by-products figured at the time these tests were made. Owing to changes in the market conditions, of course, these figures are more or less valueless, but the percentage of yield and different items are absolutely correct, and the reader can take one of these tests and by substituting the market prices of today find out what the offal is worth from different lots of cattle killed.

These tests also give the percentage of the hide and tallow. The latter as will be noted is quite high, as it will be seen that the tests were made on a fairly fat grade of cattle.

PERCENTAGE ON DIFFERENT CUTS OF BEEF.

Nearly every large city has its special ways and peculiarities of cutting meats, consequently the percentage of the different cuts varies largely. The following table is

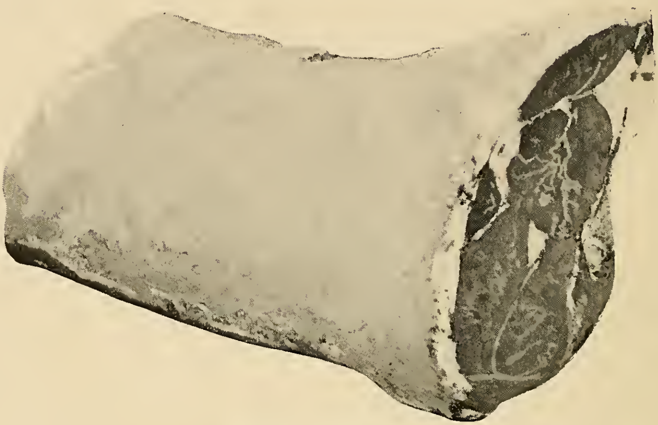


FIG. 49.—BEEF LOIN.

a record of results from a cutting test and shows the percentage of " Chicago cut " meat with square cut chucks:

Chicago Cuts—	Per Cent.
Chucks	28.00
Rounds	23.00
Navels	8.00
Flanks	2.00
Flank steaks	.50
Kidney	.25
Ribs	10.00
Loins	15.00
No. 2 suet	.50
No. 1 suet	3.00
Shanks	4.00
Brisket	5.00
Necks	.75
	100.00

The following table shows percentage on cattle cut Chicago style, with the exception of a " Kosher chuck," the latter consisting of five-rib, four-quarter cut-off from the side of the beef:

New York Cuts (Natives)—	Per Cent.
Ribs	9.55
Loins	15.74
Flanks	5.55
Navels	8.61
Suet	3.62
Rounds	23.27
New York chucks	33.66
	100.00

The following table shows the percentage on cattle cut Philadelphia style:

Philadelphia Cuts—	Per Cent.
Rump and round	34.00
Rattler (chuck, plate, brisket and shank)	44.00
Ribs and loins	22.00
	100.00

The following table gives the result of tests and shows in detail the percentages in cutting canner cattle. As will be understood, for canning purposes, a light grade of animals is always used, cattle that are too light or too thin to be used for other purposes. In such cases the meats are always boned-out and the different cuts of the meat are here enumerated, showing their percentages:

Packing House Cuts—	Per Cent.
Sirloin butts	3.903
Strips	4.204
Tenderloins	2.552
Boneless chucks	13.813
Rolls	2.552
Plates	12.162
Insides	7.957
Outsides	5.555
Knuckles	5.555
Clods	5.105
Rump butts	2.402
Flank steak	.600
Hanging tenderloin	.450
Front shanks	7.207
Hind shanks	4.650
Soft bones	6.906
Trimmings	8.108
Tallow	1.200
Kidneys	.600
	99.980

The illustrations presented herewith (Figs. 44 to 49) show the principal packing house cuts.

CHAPTER V.

LABOR IN CATTLE KILLING.

LISTS OF MEN EMPLOYED AND WAGES PAID.

The number of men necessary in different sized beef killing gangs and the wages paid are given in the following tables. While these lists would not always be applicable to the exact number of men required in every house, owing to local conditions, it conveys accurately to the reader the number of men necessary to handle the given number of cattle per hour. The wages as quoted are those that were paid in all of the principal American packing centers at the time these lists were compiled. There have been some changes, some have been advanced and others lowered, but on the average they are very close to those in actual practice.

CATTLE KILLING DEPARTMENT FOR SIXTY CATTLE PER HOUR.

		Wages per hour.
1 man knocking and helping drive up		$0.22½
2 men shackling, hoisting and helping drive up	each	.20
2 headers	each	.30
1 sticker		.30
1 man pulling heads and squilgeeing floor		.16
1 man dropping down and pritching up cattle		.17½
1 man taking off and carrying over shackles		.16
2 front leggers, raising gullets and cut out sweetbreads	each	.20
3 hind leggers and rip open their own cattle	each	.22½
1 boy picking up feet and letting down cattle		.16
4 floor men	each	.47½
1 caul puller		.25
1 breast sawer		.25
1 crotch splitter and wash bellies		.16
1 hooking on		.16
3 fell cutters and cut off cords	each	.25
1 rumper and drop bungs		.37½
1 shank washer		.16

CATTLE KILLING DEPARTMENT FOR SIXTY CATTLE PER HOUR (*continued*).

	Wages per hour.
1 tail puller and cut off tails	.20
1 fell puller	.17½
1 fell beater	.20
1 backer	.42½
1 man working between backer and rumper	.42½
1 gutter	.25
1 man working between gutter and caul puller	.25
2 tail sawers ....each	.25
2 splitters ....each	.47½
1 man splitting two, backing one, dropping one hide on each run	.47½
1 man hanging off	.22½
1 man pushing over to hide dropper	.16
1 man putting up hooks	.17½
1 man squilgeeing fat	.16
1 shank turner and cut off cords	.20
1 paunch puller	.17½
2 hide droppers ....each	.30
1 chuck splitter	.27½
1 bruise trimmer	.20
1 skirt trimmer	.20
1 scribe sawer and pull spines	.20
1 ladder man	.22½
2 back washers ....each	.16
1 rib washer	.16
1 shank washer	.16
2 hide truckers and spread their own hides ....each	.16
1 man scraping	.16
1 kidney washer	.16
2 wipers ....each	.16
1 man putting in neck rags and skewering up necks	.16
1 man putting on hind shank cloths	.10
1 boy running wringer	.10
1 man pumping shoulders	.16

CATTLE KILLING DEPARTMENT FOR SEVENTY CATTLE PER HOUR.

1 knocker	$0.22½
1 penner	.17½
2 men hoisting and shackling ....each	.20
1 sticker and help header	.30
2 headers ....each	.30
1 man dragging heads	.16
1 boy squilgeeing blood	.10
1 man dropping and pritching up cattle	.17½
1 taking off and carrying over shackles	.16
3 on front feet, raise gullets, cut out sweetbreads and cut open breasts ....each	.20
3 hind leggers and rip open their own cattle ....each	.22½
1 foot trucker	.16
5 floormen and back three cattle on each run ....each	.47½
1 caul puller	.25
1 breast sawer	.25
1 crotch burster	.16
1 man hooking on	.16
3 fell cutters ....each	.25
1 tail burster, cut off one cord and drop bungs	.25

CATTLE KILLING DEPARTMENT FOR SEVENTY CATTLE PER HOUR (*continued*).

		Wages per hour.
1 tail puller, cut off one cord		.20
1 rumper		.37½
1 shank washer		.16
1 back washer		.10
1 fell puller		.17½
1 fell beater		.20
1 backer		.42½
1 man working between backer and rumper		.42½
1 gutter		.25
1 man working between gutter and caul puller		.25
3 tail sawers and beat out six fells per run	each	.25
3 splitters and back nine cattle per hour	each	.47½
1 man hanging off		.22½
1 man pushing over		.16
1 hook hanger		.17½
1 paunch puller		.17½
1 man squilgeeing fat		.16
3 hide droppers and cut off cords	each	.30
1 chuck splitter		.30
1 scribe and split twelve chucks per hour		.30
1 bruise trimmer and trim two on ladder on each run		.22½
1 skirt trimmer		.20
1 ladder man		.22½
1 front shank washer		.16
3 back washers	each	.16
1 rib washer		.16
1 hide spreader		.16
2 hide truckers and pull spines	each	.16
1 man scraping		.16
1 kidney washer		.16
2 wipers	each	.16
1 shoulder pumper and push over cattle to washers		.16
1 man putting in rags and skewering up necks		.16
1 boy running wringer		.10
1 boy putting on shank cloths		.10

CATTLE KILLING DEPARTMENT FOR EIGHTY-FOUR CATTLE PER HOUR.

1 knocker		$0.22½
1 penner		.17½
1 hoister		.20
1 shackler		.20
2 headers	each	.30
1 sticker, and helps head		.30
1 boy squilgeeing blood and setting cattle		.10
1 man dragging heads		.16
1 man picking up feet		.16
1 man pritching up cattle		.17½
1 man dropping cattle		.17½
1 man taking off and carrying over shackles		.16
3 front leggers raise gullets and cut out sweetbreads	each	.20
4 hind leggers and rip open their own cattle	each	.22½
6 floor men and split nine cattle per hour	each	.47½
2 caul pullers	each	.25
1 breast sawer		.25
1 man bursting crotches		.16

CATTLE KILLING DEPARTMENT FOR EIGHTY-FOUR CATTLE PER HOUR (*continued*).

	Wages per hour.
1 man hooking on cattle	.16
3 fell cutters ... each	.25
1 tail burster and cut off cords	.25
1 tail puller and dropping bungs	.20
2 rumpers ... each	.37½
2 backers ... each	.42½
1 end man, backs nine cattle, saws twelve breasts and cuts fells on nine cattle per hour	.42½
2 fell beaters ... each	.20
1 fell puller	.17½
1 paunch puller	.17½
1 shank washer	.16
1 back washer	.10
3 tail sawers ... each	.25
3 splitters ... each	.47½
1 man hoisting cattle for the hang off	.16
1 man hanging off	.22½
1 man pulling over	.16
4 hide droppers, turning shanks and cut off cords ... each	.30
1 chuck splitter	.30
1 scriber splits twenty-four chucks and scribes sixty cattle per hour	.30
1 bruise trimmer	.20
1 skirt trimmer	.20
2 ladder men trim eighty-four and scribe twenty-four cattle per hour ... each	.22½
1 man pulling up hooks	.17½
1 man squilgeeing fat	.16
1 man spreading hides	.16
2 men picking up hides ... each	.16
1 man pumping shoulders	.16
1 man pulling spines and pushing cattle back to washers	.16
4 back washers ... each	.16
1 man scraping cattle	.16
1 man wiping forequarters	.16
1 front shank washer	.16
1 kidney washer and wetting ribs	.16
1 rib washer	.16
1 boy rinsing inside of cattle	.10
1 man wiping hind quarters	.16
1 boy putting rags on hind shanks	.10
1 man wiping beef on floor	.16
1 man putting in neck rags and skewering up necks	.16
1 boy putting in kidney rags and skirt skewers	.10

BACK COOLER GANG FOR SIXTY CATTLE PER HOUR.

1 switching on beds and pushing on scales	$0.17½
1 taking off scales and running elevator	.17½
1 running hot line	.17½
1 switching in cooler	.15
1 pushing back in cooler	.15
1 setting and wiping in cooler	.15
1 skewering backs	.07½
2 rag boys ... each	.07½

BACK COOLER GANG FOR SEVENTY CATTLE PER HOUR.

		Wages per hour.
1 switching on beds		$0.17½
1 pushing on scales		.17½
1 running elevator		.15
1 running hot line		.17½
1 switching in cooler		.15
1 setting and wiping		.15
1 skewering backs		.07½
2 rag boys	each	.07½
1 pushing back		.17½

BACK COOLER GANG FOR EIGHTY-FOUR CATTLE PER HOUR.

1 switching on beds		$0.17½
1 pushing on scales		.17½
1 running elevator		.15
1 running hot line		.17½
1 switching in cooler		.15
1 pushing back		.15
1 setting cattle		.15
1 wiping cattle		.15
1 skewering backs		.15
2 rag boys	each	.07½

TALLOW TRIMMERS AND HEAD BONERS FOR SIXTY CATTLE PER HOUR.

1 livers and hearts		$0.17½
4 tripe men	each	.20
1 pecks and reeds		.20
1 plucks		.22½
1 short guts		.20
1 dumping paunches		.20
3 truckers	each	.15
1 trimming bed fat and gut ends		.17½
1 scaler		.15
1 tongueing and sawing off horns		.20
1 pulling jaws		.22½
1 cheeking		.30
1 trimming cheeks		.17½
1 washing tongues		.15
1 trimming jawbones		.12½

For seventy cattle per hour the same as sixty, with the exception of there being one extra trucker at 15c per hour.

TALLOW TRIMMERS AND HEAD BONERS FOR EIGHTY-FOUR CATTLE PER HOUR.

1 livers and hearts		$0.17½
4 tripe men and helping paunch dumper	each	.20
2 pecks and reeds	each	.20
2 plucks	each	.20
1 short guts		.20
1 boy helping short guts		.15
1 dumping paunches		.20

TALLOW TRIMMERS AND HEAD BONERS FOR EIGHTY-FOUR CATTLE PER HOUR (*continued*).

		Wages per hour.
1 trimming bed fat and gut ends		.17½
4 truckers	each	.15
1 scaler		.15
1 picking up fat		.10
1 taking out tongues and sawing off horns		.20
1 pulling jaws		.22½
1 cheeking		.30
1 trimming cheeks		.17½
1 washing tongues		.15
1 trimming fat		.12½
1 trimming jaws		.12½

CASING DEPARTMENT FOR SIXTY CATTLE PER HOUR.

2 gut runners and cutting out bungs	each	$0.25
1 ruffle puller and help strip middles		.25
1 stripping middles		.25
4 fatting middles (2c per set)	each	.30
1 turning middles		.15
2 turning rounds	each	.15
5 machine men and take from fatter	each	.20
1 fatting and skinning bungs		.22½
1 stripping rounds		.15
2 measurers and salters	each	.20
2 bung gut slimers, turn and carry over their guts	each	.20
2 round gut inspectors	each	.15
1 middle gut and bung inspector		.12½
1 weasand man		.25
1 bladder man		.17½

CASING DEPARTMENT FOR SEVENTY CATTLE PER HOUR.

2 gut runners	each	$0.25
1 cutting out bungs and help pull ruffle		.22½
1 ruffle puller and help strip		.25
1 stripping middles and throwing up to fatter		.25
5 fatting middles and bungs (2c per set for middles) each 28c; (40c per 100 for bungs) each 5c		.33
1 fatting and skinning bungs		.22½
1 turning middles		.12½
3 turning rounds	each	.15
5 machine men and take from fatter	each	.20
2 measurers	each	.20
2 bung gut slimers, turn and carry over their guts	each	.20
2 round gut inspectors	each	.15
1 middle gut inspector and inspecting bungs		.12½
1 weasand man		.25
1 bladder man		.17½

CASING DEPARTMENT FOR EIGHTY-FOUR CATTLE PER HOUR.

2 gut runners	each	$0.25
1 bung cutter		.22½
1 ruffle puller		.25
2 stripping middles and handing up to fatter	each	.20
5 middle gut fatters (2c per set) about		.32
1 fatting bungs		.22½
1 skinning bungs		.15
2 turning middles	each	.12½

CASING DEPARTMENT FOR EIGHTY-FOUR CATTLE PER HOUR (*continued*).

		Wages per hour.
3 turning rounds	each	.15
1 helping machine man		.15
1 stripping rounds		.15
5 machine men and taking from fatter	each	.20
2 measurers	each	.20
2 bung gut slimers	each	.20
2 round gut inspectors	each	.15
1 middle gut inspector		.12½
1 weasand man		.25
1 bladder man		.17½
1 bung gut inspector		.10
1 salter		.15

CHAPTER VI.

HIDES.

GENERAL HANDLING OF HIDES ON KILLING FLOOR.

In slaughtering cattle, next in value to the beef comes the hides, and the handling, curing, etc., of this particular part of the animal, until it is ready to be delivered to the tanner, is a department in which a great deal of careful attention is required to obtain the best results. For con-

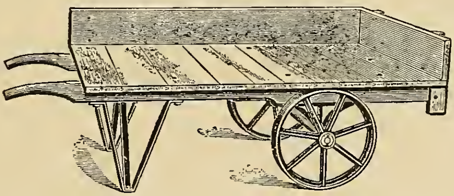


FIG. 50.—HIDE TRUCK FOR CARTING BEEF HIDES.

venience in handling, a special hide truck, as shown in Fig. 50, is usually employed. The platform of the truck is $3\frac{1}{2} \times 5\frac{1}{2}$ feet, with a $1\frac{1}{4}$-inch hardwood plank 8 inches high on one side and on front end. The wheels are about 18 inches in diameter. The weight of the truck is about 260 pounds.

The first consideration, of course, is the condition of the hide and in no branch of the packing house industry is there more marked improvement of recent years than is shown in the handling of hides. Formerly where unskilled workmen were killing only a few cattle daily, or weekly, they did not become proficient in the removal of hides and, as cattle dressing requires skilled workmanship, the hide was more or less damaged by scores and cuts. But when cattle are killed at one central point, in large numbers, it is necessary to make a division of labor, and instead of one man doing many parts of the work, he simply does one small part continuously, and hence becomes very skilful; the " take-off " of the hide, particularly, is improved. That this condition is appreciated by tanners is evidenced by the difference in price paid for country and packers hides; the tanners paying from ¾c to 1c more per pound for packers hides for no other reason than that the hide has been properly taken off in the packing house, whereas a country hide, which has been taken off by unskilled workmen, has been cut and scored, the scores being particularly objectionable.

A score in a hide is made by cutting into the hide, when removing it, far enough to damage the grain of the leather, and when it comes from the tannery, scores show very plainly and in many cases one-half of the thickness of the leather is lost by this defect. Hides taken off properly should show none of these imperfections whatever and, in fact, should be as smooth as though taken off the animal with a plane instead of a knife, and with skilled workmanship such is the case. By a division of labor, one man doing one particular operation continuously, the " take-off " of hides has been so improved that less than ten hides out of a thousand are found to be No. 2 hides when taken out of the cellar in a well-regulated house.

The " take-off " of the hides particularly should be watched by the killing foreman and the men's attention called to the slightest defects continuously, if found, as a great deal depends upon the reputation which a house may have for its general workmanship. Many of the small scores which are found to materially damage the hide when coming from the tannery are invisible when the hide is taken out of the packers' cellar, as owing to the discoloration, salt, etc., it is impossible to see many of them, but they are all visible when the leather is turned out. Consequently, if a house has the name for bad "take-off," buyers usually aim to buy the hides coming from that plant on a basis that will make them whole, taking into consideration the damaged ones which they are likely to find. Hence it will be seen that in this particular department it means a great deal to have a good reputation for the product.

Outside of the "take-off" there are several other points which should be watched carefully on the killing floor in the handling of this particular article. First, that the hides should not be damaged with the prod pole by the men handling the cattle in the pens. This is fully explained in a former chapter. Second, the floor should be kept as clean as possible, especially on the heading beds where the cattle are thrown out of the knocking pens, as it is very objectionable to have blood on the hides, especially in the summer time. It is liable to cause a rotting or decomposing when the hide is in pack, and if it does so sufficiently for the hair to slip on the hides, it forms a No. 2. Another bad feature is that a bloody hide will discolor the flesh side of the skin next to it in the pack, and it is always advisable to get the hides out as bright and clean as possible, as the buyers prefer them that way.

Another reason why they should be kept as dry as possible is that the hides, as stated in a previous chapter, are weighed as fast as taken off and the report of the weight of the different lots of hides taken from their respective lots of cattle is turned into the office, not only for general record, but also that the test clerk can arrive at the cost of the beef. If the hides are allowed to get wet they will take up four or five pounds per hide, which if figured with the beef will represent a false credit of 40c or 50c per head on the cattle. It is true that a general shrinkage could be allowed that might work in the opposite direction in the figuring of the beef, making it cost really more than it should if the hides had not taken up the water, but it is always best to keep them as dry as possible, so that the weights used for figuring and record purposes may be accurate. Another point is that if the hides go into the packs wet, with this amount of water in them, when they are shipped out they will necessarily show an excess shrinkage from green to cured weights, causing confusion as to actual shrinkage.

While it is advisable to have the hides carry as much moisture as is acceptable to the buyer, it is not profitable to have them too wet, as the buyers are necessarily close figurers, and if a lot of hides from a certain house do not show the yield in leather at the tannery which they should, purchases made after that from such a house, credited with an excess moisture in their hides, are made proportionate to the yield, hence the additional weight that may be gained is more than lost in the price realized. The reader, therefore, will see that there is a happy medium to be sought in this matter, where the seller gets all that he is entitled to and the buyer is satisfied with the yield he obtains.

PROPER STORAGE FOR HIDES.

This is a point which is not given the consideration that is its due, in many cases some packers reasoning that as long as their hides are in a building, little else is to be considered; excess shrinkage, also, is not taken into consideration as it should be. The following figures, which are accurate, will give the reader an idea of the loss that lack of attention in this particular matter may represent. It will be noted that the test extends over a period of one year, representing a test on a total of 198,341 hides.

SHRINKAGE OF HIDES FOR YEAR ENDING AUG. 1, 1903, IN HOUSE NO. 1.

Kind	Number	Green weight	Cured weight	Shrinkage, lbs.	Shrinkage, per cent
Free of brands.	41,870	3,328,133	2,842,542	485,591	15.59
Butt "	6,087	507,684	432,722	74,962	14.77
Side "	13,190	1,078,959	927,835	151,124	14.06
Spreadies......	2,376	215,676	190,286	25,390	11.79
Texas.........	11,285	871,573	731,165	140,408	16.11
H'y native cows	8,029	592,338	500,935	91,403	15.43
Light " "	2,759	150,995	127,108	23,887	15.82
Branded "	1,991	128,269	107,563	20,706	16.14
Totals......	87,587	6,873,627	5,860,156	1,013,471	14.74

SHRINKAGE OF HIDES FOR YEAR ENDING AUG. 1, 1903, IN HOUSE NO. 2.

Kind	Number	Green weight	Cured weight	Shrinkage, lbs.	Shrinkage, per cent
Free of brands.	34,192	2,692,615	2,262,426	430,189	15.98
Butt "	14,279	1,174,093	977,943	196,150	16.71
Side "	17,302	1,451,850	1,198,925	252,925	17.42
Spreadies......	3,969	363,233	307,410	55,823	15.37
Native bulls..	1,362	127,910	103,263	24,627	19.27
Branded " ..	252	25,885	21,761	4,124	15.93
H'y native cows	8,222	576,313	472,938	103,375	17.94
Texas.........	5,247	395,620	324,100	71,520	18.08
L't native cows	14,895	841,481	709,181	132,300	15.72
Branded "	11,034	694,503	574,669	119,834	17.25
Totals......	110,754	8,343,503	6,952,616	1,390,867	16.67

A total of 87,587 hides were cured in house No. 1, which consists of a cellar under refrigerated rooms. While no attempt was made to refrigerate this room there was a natural radiation to the floor above which held the temperature at from 55° to 60° F. in the hottest weather.

There being but two openings in the cellar there was naturally little circulation of outside air, hence the moisture of the cellar was retained and the hides show a shrinkage of 14.74 per cent from the green weight on bed to the shipping weight.

A total of 110,754 of these hides were cured in house No. 2. This was on the first floor of the building and no refrigeration was used in any of the departments. There were several openings into this room, permitting the outside air to circulate through the building and a great deal of moisture naturally absorbed. It will be noted by comparing the reports that the shrinkage in this cellar was 16.67 per cent from the green weight to the shipping weight, showing an excess of 1.83 per cent, which would show a loss of 154,686 pounds. This, at an average price of 10c a pound, would indicate a loss of $15,468.60 sustained by having this number of hides in this particular cellar, as against what would have been realized had they shown no more shrinkage than those in house No. 1, so that it will be readily seen that it is of vital importance to the owner to see that the hides are stored in suitable storage, that there is as little circulation as possible of outside air through this department, and that all doors and openings are kept closed as much as possible.

GRADING OF HIDES.

This is a question which must be governed largely by the local conditions. Many comparatively small killers find it profitable to sell their hides flat, that is, without making any selections, irrespective of grade, rather than to try to make the different selections with a comparatively limited number to select from, whereas, where cattle are killed in large numbers it is advisable to make just as many selections as is profitable to the seller, being governed, of course, at all times by the market quotations and demands. The usual grades of hides are termed as follows:

Natives.—Native steer hides are hides from native steers which are free of brands. Another selection of natives is what is called "spreadies," which are hides taken from native cattle free of brands, cuts, scores, or grubs and must be 6 feet 4 inches wide at the shoulders.

Texas.—This is the term used to designate all hides taken off southern cattle where the hide is very thick and heavy. Brands are not taken into consideration on these selections.

Butt Brands.—These are either natives or western hides which are branded on the butts.

Colorados.—These are hides from the western cattle, which are too thin for Texas and are branded on the sides.

A distinction is also made in all these hides as to weights, sixty-one pounds and up being heavy, sixty pounds and below being light and fifty pounds and below being extra light.

Cow hides are selected as natives and branded cows; bull hides as natives and branded bulls. While all bull hides are not sold as such, hides with a thick neck or pate are sold under this term.

GRUBS IN HIDES.

There are two cattle "bot-flies" or "warble-flies," as they are often termed. One of these (*Hypoderma lineata*) is found in the United States, being found more frequently in the southern part of the country. The adult is about the size of a honey bee. The female deposits her eggs in summer in the region of the heel of the animal, causing very much discomfort. In licking the irritated spot the eggs are taken into the mouth of the animal and are there hatched, the larvae entering the esophagus or gullet and finally working their way into the cellular tissue beneath the skin of the back. In early spring they develop, forming lumps known as "warbles," and become what are known as "grubs." After working their way out through the skin they drop to the ground, into which they burrow and pupate, finally emerging as adult flies. The damage caused by these insects to the hides amounts to millions of dollars per year, as in general practice five grub holes constitute a No. 2 hide, on which there is a deduction of one cent per pound.

According to the rules of the trade, Texas and branded cows are grubbed from November 1 to June 1, Colorados are grubbed from December 1 to June 1, native steers, native bulls and native cows are grubbed from January 1 to June 1. No allowance is made after June 1 for grubs in hides taken off after that date.

SALT TO BE USED IN SALTING OF HIDES.

The general appearance and shrinkage of hides is largely determined by the salt used. The kind of salt generally used in large plants for this purpose is a rock salt, which is a mined product run through crushers and screens. Large lumps are more or less objectionable and if allowed to be used will injure the looks of the hide. Hides in a pack weigh very heavily per cubic foot and the lower hides are subject to a considerable pressure, or weight. Large lumps of salt between the hides in the pack make bad looking indentations, although they do not necessarily injure the hides for tanning purposes.

Three parts of rock salt and one part of fine salt make a very good combination. The fine salt quickly forms a moisture which the hides will absorb, preventing quite a perceptible shrinkage, as shown by careful tests.

When a pack of hides is taken up the "second salt" is thrown to one side and by mixing one-third new with two-thirds of old salt it can be used again, until it is entirely gone. It will be found that this addition of new salt about makes up for the loss in salt that is dissolved in the pack during the curing process.

Salt for the hides should be kept as clean as possible, for if there is a great deal of manure and dirt mixed with the salt, it discolors the hides, injuring their appearance in the eyes of the buyer. When the salt is found to be dirty and out of condition it is always advisable to screen it, using a screen same as is used for screening sand, placed at an angle. The salt is thrown up against the screen, when the finer salt will sift through and the coarser salt, dirt, etc., will gather at the bottom of the screen. Salt that has been through the screen will be found comparatively clean and ready for use; that which has not gone through the screen should be thrown in a pile and washed with a stream of water. While this will dissolve a considerable amount of it, it will, at the same time, wash out most of the impurities.

If handled in the above manner, a careful workman should be able to salt hides with from thirty-one to thirty-five pounds of salt per hide, on an average.

BUILDING OF PACKS OF HIDES.

Packing hides is an operation which should receive very close and careful attention. In the building of the pack, the outer edges should be kept the highest all the way round, so that the center of the pack will hold the liquor and moisture, and when the pack is finished it should be leveled off at the top so that it will be as near even as possible. The natural moisture in the hides, together with the dissolving salt, will form a liquor which the hides readily absorb, and if the pack is built slanting, so as to shed water like the roof of a house, it will be found that the hides are continuously seeping on the sides, and when they are taken up the shrinkage from green weights will be considerably in excess of those from packs properly built.

TRIMMING OF GREEN HIDES.

Before the hides go into the pack they should be examined for brands, etc., and be distributed to their proper packs, according to assortment made at this point. The switch is cut off from the tail, any loose ends of the hides are trimmed off and the butt of the ears split. This is necessary, for if the hides go into the pack without this being done, it makes the pack very uneven on account of the thickness of the ears; furthermore the salt does not have a chance to penetrate the ears and they are liable to spoil. Any loose pieces of meat that the butchers have carelessly left on the hide should be taken off, as well as any excess amount of fat. The hides after being trimmed should be allowed to lie for three to five hours simply folded, in order to give the animal heat a chance to escape. If the hides are put into the pack before this is done, it is likely that, when the pack is taken up, some hides will be found on which the hair has slipped; these necessarily are No. 2 hides, and as the uniform rule is 1c per pound less for No. 2's than for No. 1's, it will show a loss of approximately 50c to 60c per hide on the average, an item well worth saving. Another bad feature of having " slip-hides " is the fact that if the buyer finds them at all, he is always suspicious that there are others in the pack which are out of condition, that he has not seen, and that they will come out of the tannery with unsatisfactory results.

When hides are put in the pack, extreme care should be used to see that every part of the hide is exposed to the salt. All the leggings should be straightened out flat and the pates thoroughly spread, so that the salt may reach every part. Hides should lie in pack and salt for from twenty-five to thirty days before they are fully cured. At the expiration of this time they are ready for shipment, and are then taken out of the salt, inspected and each one rolled into a bundle and tied.

The switches should be spread out on the floor and given a thorough chance to cool off, when they are thrown into a pack by themselves and heavily salted. They should be watched closely, as there is unavoidably considerable blood and moisture in them, and if any sign of heating is found they should be overhauled and resalted.

The average cost in the hide cellar for the labor, where it is done on a large scale, should be from 5c to 5½c per hide for the trimming and salting and about 6c per hide for the taking up, loading and shipping. Other expenses, such as steam, power, electric lights, etc., are not included in these figures.

AVERAGE SHRINKAGE OF HIDES.

No set rule can be made as to how much hides will actually shrink, but if the foregoing directions are followed closely and intelligently the shrinkage may be kept at the minimum, which will usually range from 12 to 15 per cent. This is governed largely, as before stated, by the amount of water which the hides take up on the killing floor, which if weighed with the hide will nearly all seep out when put into the packs and cause an excess shrinkage from the original green weights. Further the storage has a great deal to do with it, but if proper care is taken the shrinkage should be kept within the figures given.

CHAPTER VII.

TALLOW, OLEO OIL AND STEARINE.

TALLOW.

As is readily understood the largest item of value in slaughtered cattle is the beef. As already stated, the second largest item is hides. The third item in value is tallow, and owing to its many uses it is one worthy of a great deal of careful consideration. It has been one of the world's staple articles of trade for centuries and is made use of in the manufacture of edibles and toilet articles too numerous to mention, hence a great deal of importance in the ordinary handling of a packing house is attached to this particular department.

Prior to 1871 tallow was used almost exclusively for soap making and other manufacturing purposes, comparatively little of it being used for food purposes. During the siege of Paris by the Germans, a large reward was offered to anyone who would find a substitute for butter. An eminent French scientist reasoned as follows: Careful observation teaches that a cow that is fat and in good health makes better butter and more butter than one of the same quality that is poor and emaciated, hence it must follow the cream of the milk, or the "butter fat," is in reality nothing more or less than Nature's surplus fat in the animal, and that in all beef cattle, whether steers or cows, that are fed each day more than the requirements to build up the broken down tissues, a surplus fat is deposited. This fat, the chemist decided, was as much a natural butter as though it had been skimmed from milk, and starting on this theory, worked out a plan, which has meant millions of dollars to this country in returns that have been made from the sale of fats that have been treated for this purpose, instead of being rendered for tallow purposes only.

Hereafter to designate the difference between tallow and oleo oil, we will use the terms, "rendered tallow," and "melted oleo," as these terms describe the difference between two distinct articles.

In the rendering of tallow it is put into a tank and there subjected to about forty pounds pressure of steam, which is equivalent to a temperature of about 280° F. Being thus cooked for eight or nine hours, the tissues which hold the fat cells, which look very much like honeycomb under a microscope, are thoroughly disintegrated and burned, thereby giving the oil which is extracted from them a high color, as well as a strong taste, thereby making it practically unfit to use for edible products.

Melted oleo is the product of the fat which is put through the oleo house and is used in making oleomargarine, or imitation butter. In this case the fat is first put through a hasher, which thoroughly disintegrates it, mangling as much as possible all the little cells and tissues, so that the heat readily gets at the oil cells. It is then dropped into an open kettle, around which is a jacket containing hot water. The temperature of the kettle is brought up to 150° to 155° F., the mass being agitated during the process, and the oil is thus released from the cells. This temperature is not sufficient, however, to burn the tissues, consequently there is no bad flavor developed and the oil, when properly treated, has a rich creamy flavor, and is very palatable. The foregoing remarks are inserted in a general way, so that the reader may readily understand the difference between tallow, as commercially quoted, and oleo oil, although both products are made from the same original material.

OLEO FAT.

Under this heading is designated all the fat that comes out of the animal when slaughtered which is saved in a

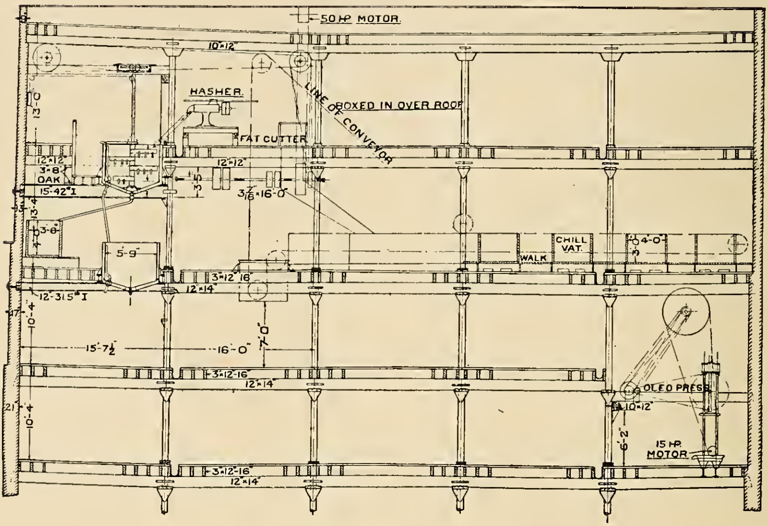


FIG. 51.—CROSS SECTION OF OLEO OIL HOUSE.

clean and wholesome condition. It is reasonable to suppose that all the fat in the animal, when killed, is absolutely of the same quality, but in the handling of this during the course of slaughtering and treatment thereof, some of it necessarily becomes unfit for oleo oil purposes, and is therefore run into the rendered tallow. The amount which goes to the rendered tallow, or to the oleo fat, is regulated by the care and intelligence of the men having this operation in charge, and if properly handled a very small percentage of the fat in the animal should find its way to the tank house, as it nets much better results when put into oleo oil, as will be noted from the tests hereafter submitted.

Fig. 51 represents a cross section of the top floors of an oil house, showing the location of hashers, melting and settling kettles, together with vats for chilling fats, and

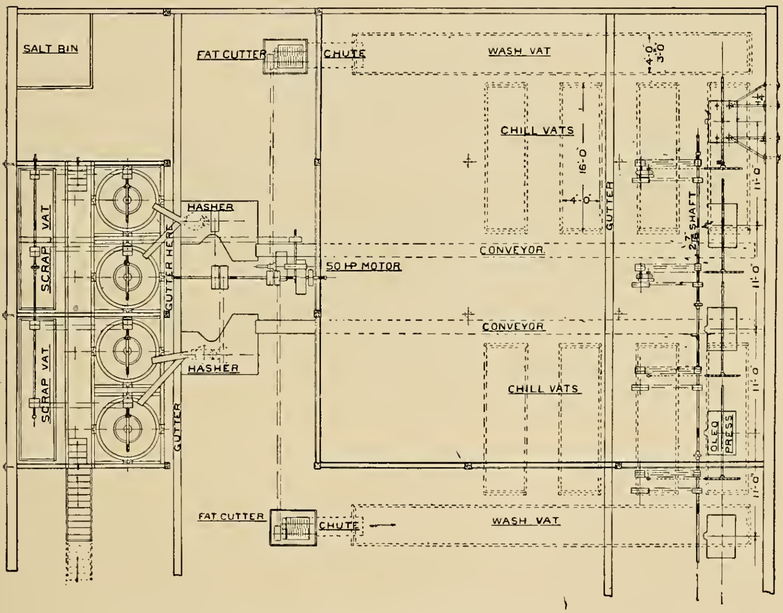


FIG. 52.—LOCATION OF HASHERS, ETC., IN OIL HOUSE.

oleo presses. Fig. 52 shows plan of location of hashers and kettles, the dotted lines indicating location of chill vats on floor below for the reception of fresh fat after it has been run through the fat cutter where the fat is held until the animal heat is entirely taken out.

The fat, as fast as taken from the animal, should be handled with care and cleanliness and put into cold water, where it is thoroughly washed before going to the ice water to be chilled. Thorough chilling of the fat is a very essential feature in making oleo oil. In order that this may be done it is necessary that the fat be cut up so that the ice water can get at every part of it. The machine illustrated in Fig. 53 is used for cutting the fat while it is still warm, before it goes to the ice water. It is the most economical plan to have the chilling vats for the fat as close to the melting department of the oil house as pos-

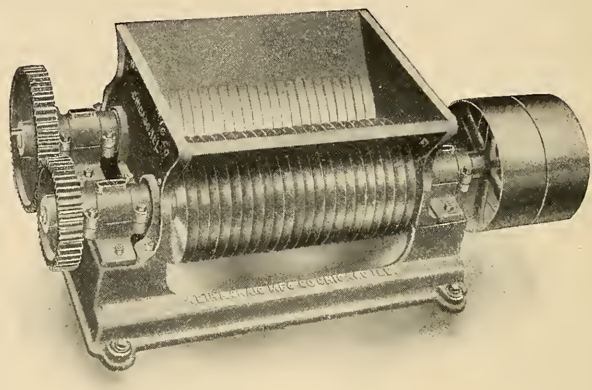


FIG. 53.—OLEO FAT CUTTER.

sible. There are a number of these vats used generally, according to the requirements of each particular plant, and they are set up side by side. Along the end of these vats should be placed the washing vat, or vat into which the fat first comes from the killing floors. The fat goes into this water, where it is thoroughly washed by continually immersing it in the water, when it is forked across to one of the permanent vats, which is either equipped with brine coils on the inside, or contains ice. Here the fat is graded, according to the quality of the different oils it is to be used for, and is allowed to stand for at least five hours, or until it has become thoroughly chilled. Every precaution should be taken to see that no fat goes to the hasher, or melting kettle, until all the animal heat is thoroughly removed. Failure to do this is not particularly noticeable in the oleo oil when made, but very soon afterward results in a deterioration of the oil. It is never objectionable to hold the fat from twelve to twenty hours, if necessary, in the iced or cold water, although five hours is all that is necessary to remove the animal heat.

As the different kinds of fat have more or less different flavors, it is wise to make careful selections in order to get the best results, it being impossible to make a grade of all No. 1 oil, 10 or 15 per cent of the total being No. 2. The balance of the product, eliminating the 10 or 15 per cent, should be strictly No. 1 oil, but if the whole output is made into one grade, it would not be acceptable as No. 1. Hence it will be seen that it is the better part of wisdom to make two and sometimes three grades of this product, as indicated above.

GRADING FOR OLEO OIL.

Of all the oleo oil made in this country, 75 to 90 per cent is shipped to Holland, where it is made into butterine and distributed throughout the continent and England. The requirements of these consumers seem to have changed within the last few years and the melters of oleo oil strive to get the oils in the condition to best suit the Hollanders' demands. What they seem to require is, first of all, a very neutral oil, or in other words an oil with as little flavor and smell as possible, whereas only a few years ago just the opposite was the case, and the whole endeavor at that time was to get an oil with as much flavor as could be made. In grading the fats a neutral or No. 1 oil is obtained from the following parts:

Caul fat.
Ruffle fat.
Caul piece of gut end.
Briskets trimmed from the bed pickings.
Crotch trimming from the bed pickings.
Paunch trimmings.
Pluck trimmings.
Reed trimmings.
Heart casing fats.

For a No. 2, or second grade, which, though it may realize nearly as high a price as the first oil, is an oil of high flavor, the following parts are used:

Gut ends—small fat.
Chipped fat, which is taken off of the middle guts.
Machine fat, which is fat taken off of round guts by the fatting machines.
Heart trimmings.
Pluck trimmings.
Miscellaneous bed pickings of the second grade.
Kidney fat.
Clean trimmings from cattle which are being cut up for canning or sausage purposes.
Skimmings from scrap vat of No. 1 oil.

A third grade of oleo oil, which will be quite inferior to either of the other two named, but for which at times there is a good demand, often netting more than the same product would, if made into rendered tallow, is made from the following trimmings:

Head fat.
Fat trimmed from cattle heads when cheeking.
Plucked sweetbreads trimming.
Liver trimmings.
Bladder trimmings.
Fat from chilled beef tongues, when they are trimmed.
Miscellaneous fats from other departments, which is kept clean.
The first washings from the oleo press cloths before soda has been used.
Scrap vat skimmings from the second grade of oil.

If fat is graded as above suggested, and handled properly in the different departments in the oleo house, satisfactory grades of oil should be made.

The accompanying illustration (Fig. 54) shows the kind of kettles originally used for the making of oleo oil, and their arrangement. These kettles are made of cast-iron, one kettle placed inside of another, and the space between filled with boiling water. Owing to the thickness of the metal the radiation from the jacket is more or less sluggish and is easily controlled.

The hasher most generally used, as per accompanying view (Fig. 55) is what is known as the "Enterprise" hasher. It is the same style of machine as is used in the manufacture of sausage, but is of a special pattern to the

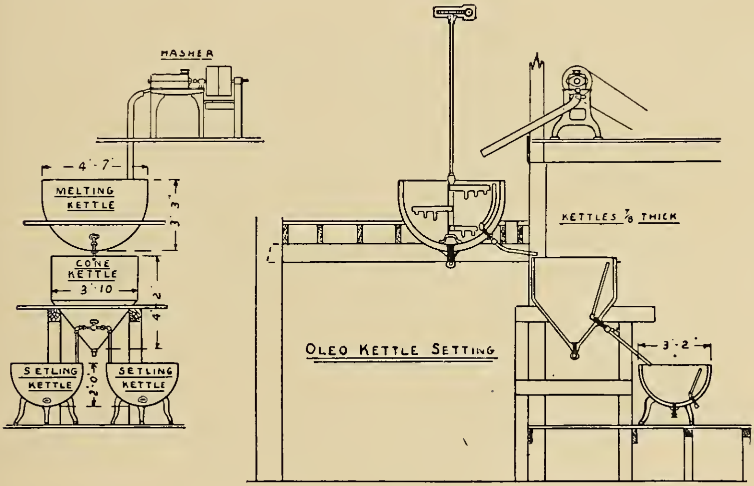


FIG. 54.—DIAGRAM OF OLEO OIL KETTLE.

extent that it is jacketed on the outside, it being necessary to use steam in the jacket in hashing cold tallow, otherwise the hasher would be clogged up and the tallow would not go through.

The first kettle is called the "melting kettle," the middle kettle the "clarifier," and the other kettles the "small kettles." It will be noted that in this method of handling, the two small kettles are required to hold the contents of one clarifier. As stated before, this is the first type of kettle put into practice and is still in operation in many plants, and although the author does not recommend this particular type he considered it advisable to describe it in detail.

A LATER STYLE OF OLEO KETTLE.

A more modern style of oleo kettle very extensively used in all the large melting establishments, is illustrated in Fig. 56. The advantage of this kettle over the other is its economy of operation as it takes no more of the man's

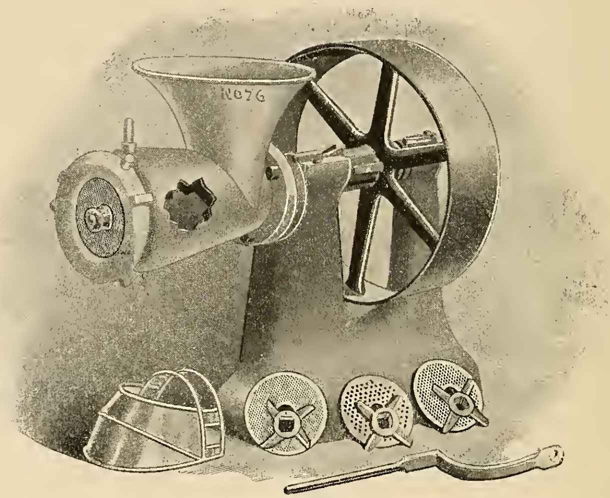


FIG. 55.—"ENTERPRISE" HASHER FOR OLEO OIL MAKING.

time to melt a kettle holding 5,500 pounds of stock than it does the old style kettle shown in Fig. 54, holding 1,500 pounds. Further, the kettles known as the clarifiers and the small kettles are, by this method, combined into one settling kettle, shown in Fig. 57, the settling kettle being practically the same size as the melter, and is placed directly under it. When the fat is melted it is siphoned into the settling kettle, the same as in the other method described, but is held in this kettle longer, and is thor-

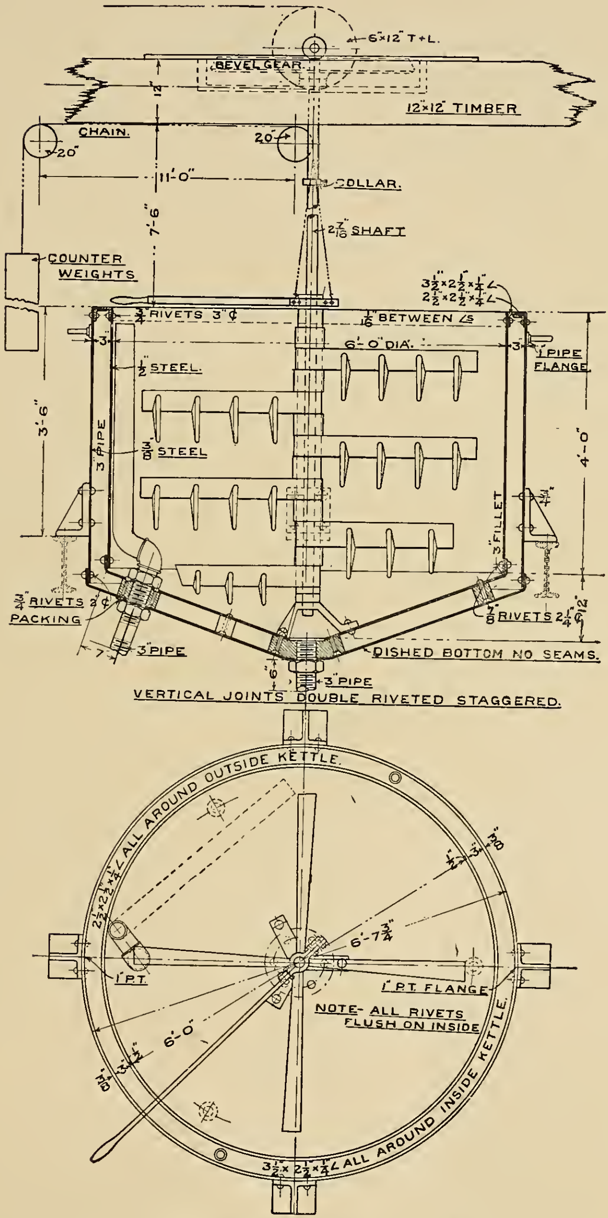


FIG. 56.—MODERN KETTLE FOR MELTING FATS FOR OLEO OIL.

oughly settled before being drawn into the seeding trucks. In this operation the melted fat passes through a pipe

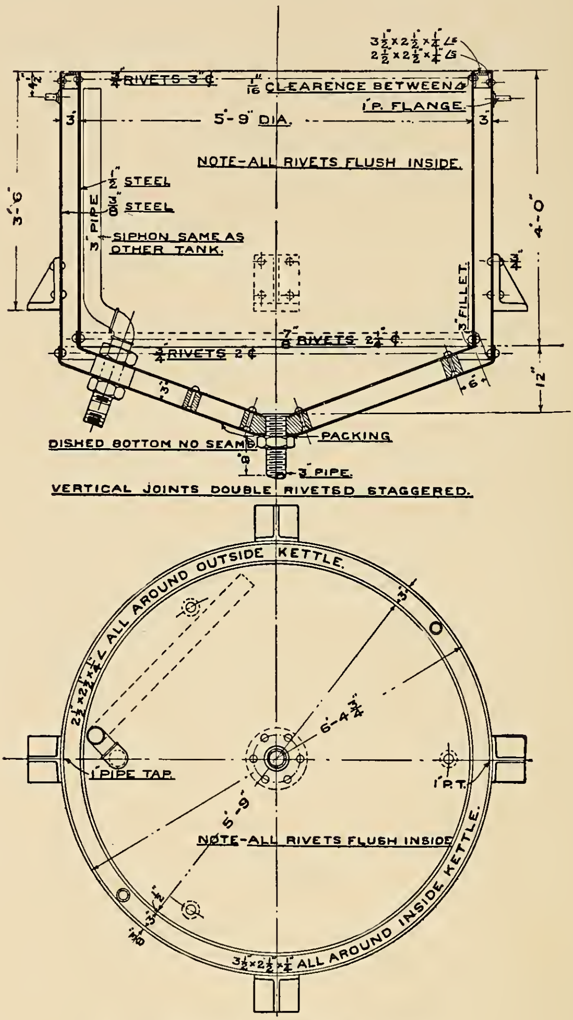


FIG. 57.—SETTLING KETTLE FOR OLEO OILS.

which is somewhat enlarged or funnel-shaped, and over the end of which is fastened a screen consisting of three or four thicknesses of bags made from canton flannel.

The stock, when drawn into the truck, has to pass through this flannel, which strains it, taking out a great deal of tissue or other foreign matter which may be in the oil.

In the general handling of these kettles, it requires about thirty-five minutes to hash a kettle of oil weighing about 5,500 pounds. It takes about one hour to melt (the temperature at the time of melting should be about 150° F.), about one hour to settle in the melting kettle, and two hours and thirty minutes to settle in the receiving kettle, drawing off same at a temperature of about 120° F., into the seeding trucks. This particular style of kettle is not only more economical in operation but also to install. The results in yield are the same with either style of kettle.

No. 2, or flavored oil, is handled in the same manner, except that it should be melted at 155° F.

No. 3, or the low grade oil, is handled the same as above, except that it is melted at 165° F.

OIL HOUSE INSTRUCTIONS.

First.—See that the fat comes to the house in good condition, properly trimmed, all pieces of meat, lungs, guts, etc., being completely removed, and that the fat is handled promptly, without allowing it to lie around and become partially stale and sour before it is received at the department.

Second.—When it is received, don't allow the fat to pile up in the vats; see to it that the ice water has come in contact with all parts of it and thoroughly chilled it. When caul fat is extra heavy it is well to examine all the largest pieces closely and see that they are all thoroughly chilled through.

Third.—Arrange to have no ice or cooling pipes in the vat where the fat is received, it simply being thrown in here to give it a thorough washing. The next vat to which it is thrown, however, should have cooler pipes. The reason for this is to save refrigeration. The water in the vats into which the fat is first thrown must be changed daily, but in the vat in which the fat is chilled, the water need not be changed more than twice a week, if kept cold continuously.

Fourth.—Do not begin hashing until the fat is properly cooled, and the animal heat all removed. It will take from three to five hours to accomplish this, under ordinary conditions.

Fifth.—It is wise never to begin hashing until there is fat enough ahead to either finish the day's work, or at least to keep the house running and to hash a kettle full regularly, as it is impracticable to stop in the middle of the operation of hashing a kettle of fat, for when once commenced it must be continuous.

Sixth.—In the beginning turn sufficient steam on the hasher to facilitate the cutting, having the material come through as cold as possible. If too much steam is used it partially melts the fat in the hasher and disintegration is not perfect.

Seventh.—For melting kettles which hold about 1,400 pounds of hashed fat about half an hour should be required to do the hashing. While the capacity of the hasher might be much greater it is well to have the fat partially melted during the course of hashing, so as not to have too large a body of unmelted fat in the melters.

Eighth.—The time for melting, settling and letting down the stock into the clarifiers from the melting kettles should not exceed two hours and twenty minutes.

As soon as hashing is begun, the agitator should be started revolving. When through hashing, the man overseeing the melting, after allowing the agitator to run five or ten minutes, should lift it out of the kettle and clean it off thoroughly with a paddle, and then drop it back into the kettle. In doing this the fat that has accumulated around the center of the kettle, where no heat is available, will find its way to the outer surface where it comes in contact with the hot sides of the kettle and is melted. If this is not done several times during the course of hashing, unmelted fats will be found in the bottoms when they are ready to drop to scrap vat.

The steam should be turned on in the jacket of the kettle as soon as hashing is started. Keep the steam on until the fat shows a temperature of 140° to 142° F. The steam should then be shut off and the surplus heat in the kettle will run the fat up to 150° F., which should be the maximum melting point for No. 1 neutral oil. No. 2, or the flavored oil, may be melted at 155° F. No. 3, or lowest grade of oil, may be melted at 160° F., and in some instances 165° F.

As soon as it is evident that the fat is thoroughly melted the agitator should be stopped and pulled out of the oil, and it should stand at least an hour, the steam being shut off from the jacket, giving it a chance to settle. On this particular process depends the entire result of the making of oleo oil, as the fat being so thoroughly disintegrated in the hasher when it is melted, a great deal of tissue from this fat is held in suspension in the oil and it must have very careful handling in order to get it thoroughly settled out. If it is not all removed from the oil, the latter will turn strong from the decomposition of the tissues.

After the oil has settled throw in about fifteen to twenty pounds of fine salt, scattering it thoroughly over the surface of the oil, the salt having the effect of carrying with it any unsettled tissues which may still remain in the oil. The top of the oil should then be carefully skimmed for, as will be noted, there is quite a scum floating on the top when it is settled. After this is done the siphon pipe (see Fig. 56) is dropped down into the oil and the oil is taken off very carefully from the top of the scrap. It is very essential in drawing this with the siphon pipe that as little scrap and water as possible be taken with it. After the oil has been taken off as far as possible with the siphon the bottom valve of the melting kettle is opened, dropping the contents into the scrap vat. The kettle should be thoroughly washed and cleaned before it is used again.

Ninth.—The oil is now in the clarifier and should be kept at a temperature of about 140° F. It should be allowed to remain in the clarifying kettle about an hour, and during this time should lose about ten degrees in temperature, perfect settling being possible only by lowering the temperature of the material. It should also be lowered about ten degrees in the settling or small kettles.

While oil is in the clarifier, sprinkle about four pounds of salt on the top of the stock. As soon as it is settled skim immediately, and again a second time before the oil goes into the smaller kettles. Skim the oil in the small kettles before letting same into seeding truck, if required. It should not require to be skimmed in the small kettles if handled properly in the clarifier.

It should be drawn off into the seeding truck at a temperature of 120° to 125° F., care being taken at all times in siphoning the oil from the different kettles to see that no water has gotten into the oil. As it is impossible to draw the oil all out of the different kettles with the siphon, the oil that is left in the bottom of the kettle each time should be taken back and put into the melting kettle and allowed to run through with the next melting of fat.

Tenth.—Be particular to have the kettles washed each time after being emptied and see that they are kept at proper heat to receive each lot of fat when ready.

Eleventh.—See that all water, siphon pipes, and drawing-off pipes to the seeders be thoroughly scalded and steamed out before drawing, as there is invariably an accumulation in these pipes, which if allowed to go uncared for will turn rancid and injure the quality of the oil.

SEEDING TRUCKS.

The seeding truck plays a very important part in the handling of oleo oil and is one of the points where a great

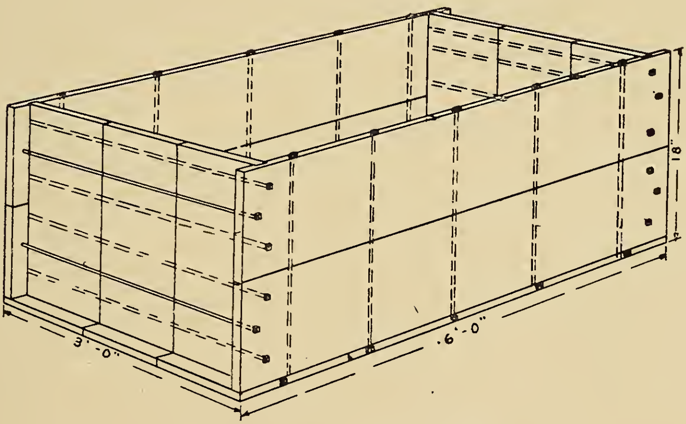


FIG. 58.—OLEO SEEDING TRUCK.

deal of trouble can be developed if not properly watched. When the oil is drawn from the small kettles into the seeding trucks there should be no signs of any water. If there is any water left in the oil it naturally goes to the bottom of the seeding truck, the water being the heaviest. The oil being at a temperature of 120° to 125° F., and it being three and sometimes four days before it is taken out, the heat thus held in the oil, together with the water that may be in the bottom, causes a decomposition and the result is "sour bottoms," which are very offensive. If any of this sour material has gotten into the press, the stearine will be spotted and out of condition. The oil will also show it more or less, so that it is absolutely necessary that this particular point be given very close and careful attention.

It has for many years been considered necessary that the seeding truck be lined with galvanized iron, and in fact many of the large melters today are using this style of truck. The seeding truck, however, which gives the best results is a plain wooden truck (see Fig. 58), without any lining, made of basswood, or whitewood, which are odorless, and can be readily cleaned and kept sweet. The objections to a truck lined with galvanized iron might be summarized as follows:

In the first place, as will have been noted in reading the instructions, considerable salt is used in the material, more or less of which is left in the oil. Now when the melted fat is drawn off into the seeding trucks and is left to stand for three or four days, this salt attacks the iron, and if not watched very carefully small pin-holes will be eaten through the iron, the result being that the galvanized iron pan will leak into the wooden box proper. Again, every time the seeding trucks are emptied, they are thoroughly washed and steamed out and more or less of this water for washing finds its way in between the lining and the wooden box. When the seeding truck is filled with oil, the weight of the oil causes this water, which is held between the iron and the wood, to ooze into the oil, causing "sour bottoms" and the manager is at a loss to know why his oil is not as good as it should be. This particular point has caused the loss of a great many thousands of dollars in the manufacture of this product, even though it is apparently a very unimportant matter.

In handling wooden seeding trucks, the reader's attention is called to a very important item to be considered, and if not carefully looked after the results will be unsatisfactory. As shown, the oil is drawn into seeding trucks at a temperature of about 120° to 125° F., a temperature of itself which will shrink wood very rapidly, therefore the trucks should be made out of thoroughly kiln-dried lumber, which should be *extra* kiln-dried, because the heat of the oil will cause further shrinkage. The bottom and sides of the truck are bolted together with a bolt running through them and one on either end, so that any shrinkage of the wood can be taken up. The same is true of the sides of the truck. In each of the joints, after they are perfectly made, a strand of wicking should be put in between the edges, so that when it is drawn down it forms a perfect packing. As is well understood, the shrinkage of wood is mostly crosswise of the grain, there being very little lengthwise; thus it will be seen that the wood in these trucks, both at the sides and at the ends, must be put in so that it will all shrink uniformly. And now comes the point which must be watched closely. The bottom of the truck will naturally shrink sidewise and if the bolts are drawn up it stops the opening, while if the sides of the truck shrink, the bottom bolts can be drawn up, readily stopping the leak. The ends of the truck must have the grain running up and down instead of crosswise, for if the bottom of the truck joins sidewise and the end pieces are running crosswise of this grain, it will be impossible to draw the bottom up tight, on account of lack of shrinkage of the ends where the grain runs lengthwise of the end. The grain, therefore, of the end pieces should run up and down and be thoroughly bolted together, then when the truck shrinks, as it naturally will, the shrinkage can be immediately taken up, all parts alike, and the truck kept perfectly tight.

The room into which the seeding trucks with their contents are run should be held at a temperature of 85° to 90° F. The material in the seeding trucks, which is now called "stock," should be pressed at a temperature of from 78° to 84° F., according to its quality, as well as to the percentage of stearine which it is desirable to make. The lower the temperature at which the oil is pressed the more stearine will be retained in the cloths. After the stock is chilled to above temperature it will be found that a granulation has taken effect and a very fine oil will be observed on the top of the truck, whereas the heavier and granulated parts of the fat will be at the bottom. This should be thoroughly mixed up before it is sent to the press by a man simply running his hands into the fat and pulling it up from the bottom, care being used to see that he does not scrape the bottom of the cooler. If there is any moisture in the bottom of the truck he would spoil the condition of the stock by mixing it thoroughly. Whereas, if it is not agitated, when it is taken out of the truck the bottom can be examined, and, if it is good, it can be used; otherwise it should be sent to the tallow tanks. After the stock is thoroughly broken up or mixed it is ready for the press, it first being wrapped in cloths. Fig. 59 shows an oleo press of the "knuckle" type. This is the type of press generally used in all oleo oil factories at the present time, being found preferable to the hydraulic presses.

The cloth used in connection with this press is a medium weight piece of ducking canvas, which is cut in the proper sized pieces, about 18 inches square. The cloth is first put on the "former," which is filled with a dipper full of stock; the attendant wraps it up carefully and the man filling the press as it comes around in the wheel, takes the wrapped stock and lays it on the plate, using eight bags of stock on each plate in the press, generally using sixty steel plates for each press.

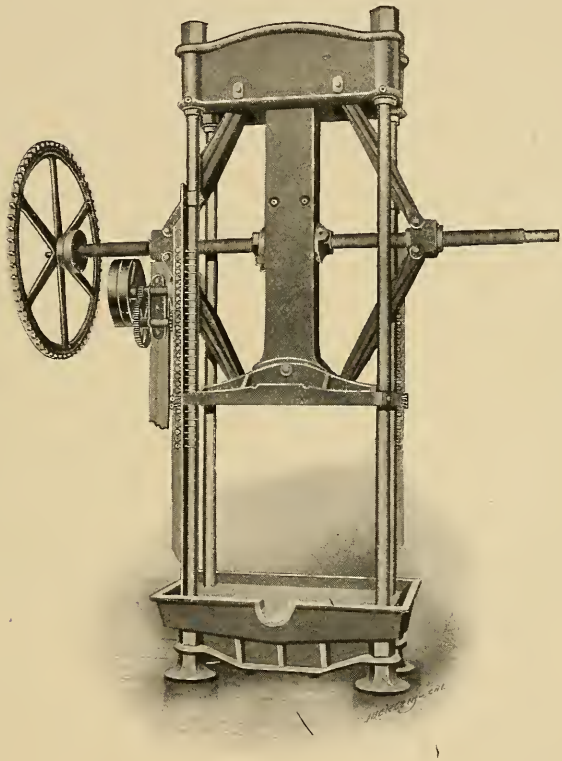


FIG. 59.—KNUCKLE TYPE OLEO OIL PRESS.

When the press is full the power is turned on. The slow speed should be used almost exclusively after the press is started in order to give the oil sufficient time to seep out through the canvas.

The oil as it comes out of the press should run to a receiving tank, as many of these tanks being used as is necessary to keep the different grades of oil separated. Where oil is being made in large quantities it is always advisable to have the receiving tank hold sixty tierces, or a car load of oil, for if smaller receivers are used the oil is liable to run irregular.

The quality of oil varies, as does the quality of cattle; for instance, choice native cattle, which are very fat, make a finer, better oil than western cattle which are not in good condition, and as the killing is always liable to run irregular, if the oil is not assembled in large quantities,

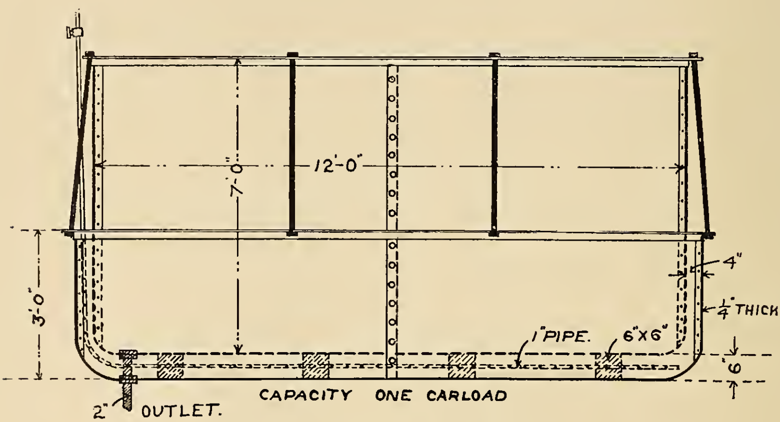


FIG. 60.—OLEO OIL RECEIVER.

makes from the different grades of cattle will show different qualities of oil, and if this is often perceptible, manufacturers soon acquire the reputation of making irregular oil. When that reputation is once established buyers scrutinize closely before making purchases.

The receivers for the oil, above mentioned, should be either jacketed or have a boat bottom; that is, one vat placed inside of the other (see Fig. 60), so that the temperature of the oil in the receivers may be regulated, but under no conditions should steam pipes be used in connection with oleo oil; all heating should be done by radiating surfaces with hot water. In having the vat made with a boat bottom it is simply necessary to fill up the space with water and turn on steam, holding the water at the desired temperature. The oil in the receiver, when ready to be tierced, should be raised to a temperature of from 116° to 118° F., and then drawn off, the tierces being filled through a side bung. After the tierce is filled it should be rolled away and left undisturbed in a temperature of 50° F. for at least four days. The oil thus handled will show a granulation, which is very desirable. If the oil is not allowed to stand until it has thoroughly granulated, or "seeded" it will come out smooth or pasty, and pasty oil is very objectionable to the purchaser. If the oil is not drawn off at this temperature it will be found difficult to have it seed properly, as it chills too quickly for a good granulation to take effect. It is not wise to draw the oil into a temperature lower than 50° F.

After the oil has been seeded it can be kept in any storage that is available below 60° F., but it must be put into the refrigerating temperature for the first three or four days in order to get the best results.

STEARINE.

Stearine is the product which is left in the cloths after pressing the stock from the seeding trucks. This product is used for many purposes, but largely for the manufacture of compound lard on account of its "titer" test, which is the method of determining the hardness of fats. Ordinary tallow will run 41½ to 43, titer; oleo oil runs 40 to 42, titer; oleo stearine should run 50 to 52, titer.

After the oil is thoroughly pressed out, the press is run up and the stearine taken out of the cloths. The stearine should be thrown into a bin where there is an abundant circulation of pure air, in order to thoroughly take the heat out of the stearine; for if it is put into the

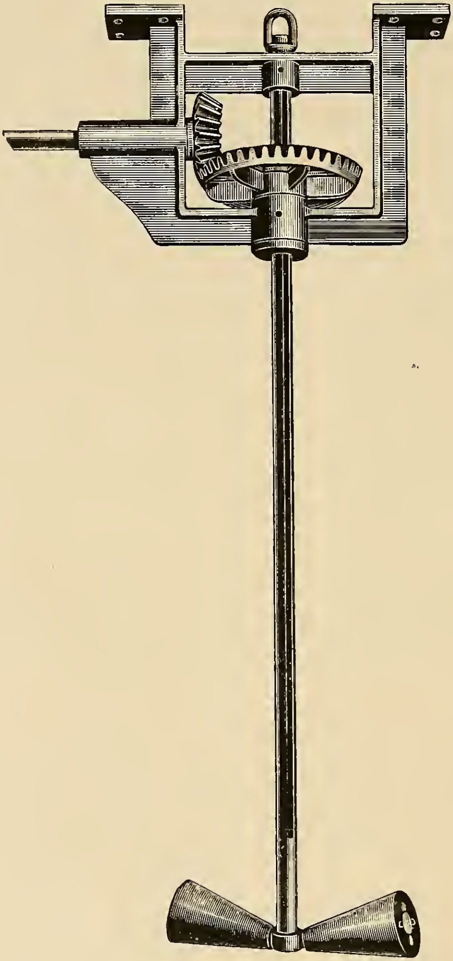


FIG. 61.—STEARINE PACKER.

package too warm, a mold will form which deteriorates it and reduces its value. After it is thoroughly chilled it is put up into packages, either by pounding it, or by means of a machine, recently invented, which is being used very generally and which saves a great deal of labor and puts more material into the package. An illustration of this machine is given in Fig. 61.

Stearine, after being put in packages, can be held for thirty days in almost any kind of storage. If held longer than that, it should be put into a room kept at a temperature of from 40° to 45° F. and which is perfectly dry. Stearine, generally speaking, is a very unsatisfactory article to carry any length of time, for, in pressing, any moisture which may be in the stock is left in the stearine, and if carried for some time this moisture produces a discoloration, which is known to the trade as "spotted stearine." It also causes a moldy or musty smell, which injures it for edible purposes, and while it is often carried for months for an anticipated rise in the market, it is quite as often regretted that it was not sold when it was in good condition for the market.

OLEO OIL AND STEARINE PACKAGES.

Stearine is always packed in slack packages, the regular package being 34 inches high, 90 inches in circumference at the bilge and 23⅝ inches across the head, with eight patented hoops. Oleo oil is always put into a special tierce which is 34 inches high, 81 inches in circumference at bilge and 21 inches across heads, with six iron hoops.

OIL HOUSE YIELDS.

The yields of oleo oil and stearine from stock are regulated largely by the prices of the different articles, as, for instance, when oil is low and stearine is high it is advisable to press the stock at a lower temperature, making all the stearine possible. Reverse the conditions and it is advisable to press the stock at a high temperature, making all the oil possible, hence the general yield of oil in stearine is largely regulated by the price of the two articles, but the yield of stock from the raw tallow is something which interests all melters, and it is of vital importance that the fats be purchased by melters on a safe basis as to yield. As will be noticed, fat gains very materially in weight when put into water, as it absorbs a large amount, and in purchasing fat for melting purposes this must be taken into consideration.

SCRAP VAT.

Another vessel which requires a great deal of attention and in which the yield in the oil house can be very materially increased and improved by proper handling is the scrap vat. After the fat is melted and the oil siphoned off, the balance or residue in kettle is drawn out of the bottom into the scrap vat, which is located directly under the melting kettle. This kettle should be kept full of hot water at a temperature of about 130° F. and when the scrap is dropped in the oil will immediately come to the surface; this should be skimmed off promptly, for if it is allowed to lie in the scrap vat a bad flavor will result and it will then have to be sold as an inferior grade of oil; but if skimmed as stated this strong flavored feature may be avoided.

When through melting for the day, the steam should be turned on the scrap vats to bring them up to a temperature of 190° to 200° F. This will release any fat yet remaining in the scrap, which should be skimmed and used for a lower grade of oil, as it will have a strong flavor. The balance of the scrap is then sent to the tank house, where it is cooked under pressure and the remaining oil taken out.

TESTS ON OIL HOUSE YIELDS.

The following are from actual tests showing the pounds and percentages of yield of different kinds of fat when made into oleo oil. The tables, as will be noted, only show the percentages of fat in oleo stock, this consisting of the oleo oil and stearine before it has been pressed:

TEST NO. 1.

Caul fat run to No. 1 oleo oil:

Hot weight from beds (dry)........................1,505 lbs.
Chilled twenty hours, net weight..................1,937 lbs.

Gain from hot weight ....28.70%= 432 lbs.
Weight of chilled fat to oil house................1,937 lbs.

This fat, hashed into melting kettle, cooked one hour and five minutes, settled one hour, drawn into receiver, settled two hours, and drawn into coolers, gives following:

Yield of oleo stock....1,238 lbs. = { 82.26% from hot weight / 63.91% from chilled weight }

Ruffle fat run to No. 1 oleo oil:

Hot weight from beds (dry)........................1,518 lbs.
Chilled twenty hours, net weight..................1,735 lbs.

Gain from hot weight..................14.29%= 217 lbs.
Weight chilled fat to oil house...................1,735 lbs.

This fat, hashed into melting kettle and cooked one hour, then settled one hour fifteen minutes, after which drawn into receiver and again settled for two hours, and drawn into cooler, gives following:

Yield of oleo stock....1,018 lbs. = { 67.06% from hot weight / 58.67% from chilled weight }

TEST NO. 2.

The second test is very similar to the first, except that it is made on the " peck and reed " fat, which is always used in a No. 1 oil.

Peck and reed fat to oleo oil:

Hot weight from trimming bench (dry)............1,082 lbs.
Through small wash vat to wash (weight from water).1,211 lbs.

Gain in washing from hot weight.........11.92%= 129 lbs.
Weight to chill vat...............................1,211 lbs.
Chilled sixteen hours, weight.....................1,255 lbs.

Gain from washed weight........................ 44 lbs.
Gain in chilling from hot weight........15.90%= 172 lbs.
Weight chilled fat to oil house...................1,255 lbs.

Handled in the usual way gives following:

Yield of oleo stock.....727 lbs = { 67.19% from hot weight / 60.03% from washed weight / 57.93% from chilled weight }

TEST NO. 3.

The third test is chipped fat used for No. 1 oleo. This is a fat which is cut off the middle gut, when being fatted.

Chip fat to No. 1 oleo oil:

Hot weight from trimming bench (dry)............1,500 lbs.
Through small vat to wash (weight from water)....1,639 lbs.

Gain in washing from hot weight........9.26%= 139 lbs.
Weight to chill vat ....1,639 lbs.
Chilled eighteen hours, weight.....................1,760 lbs.

Gain from washed weight................7.38%= 121 lbs.
Gain in chilling from hot weights......17.33%= 260 lbs.
Weight chilled fat to oil house.....................1,760 lbs.

Handled in the usual way, gives following:

Yield in oleo stock...981 lbs. = { 65.40% from hot weight; 59.85% from washed weight; 55.74% from chilled weight }

TEST NO. 4.

Test No. 4 is made on the gut end fat, which consists of miscellaneous trimmings from the gut, ends, etc.

No. 1 gut end fat to oleo oil:

Net weight from trimming bench (dry)............1,347 lbs.
Through small vat to wash (weight from water)....1,514 lbs.

Gain from hot to washed weight.........12.40%= 167 lbs.
Weight to chill vat.................................1,514 lbs.
Chilled twenty hours, weight.......................1,532 lbs.

Gain from washed weight.................1.19%= 18 lbs.
Gain to chilled from hot weight.........13.73%= 185 lbs.
Weight of chilled fat to oil house..................1,532 lbs.

Handled in usual way gives following:

Yield of oleo stock..... 827 lbs.= { 61.39% from hot weight; 54.62% from washed weight; 53.98% from chilled weight }

TEST NO. 5.

This was a test to determine the value and yield of caul and ruffle fat from 165 cattle.

Test on caul and ruffle fat:

Total weight...............5,252 lbs., av. wt. per head, 32 lbs.

Yield "A" oleo oil	52.38%	=2,751 lbs. at	$8.15 per cwt.	$224.21
Yield No. 1 stearine	22.92%	=1,204 lbs. at	8.65 per cwt.	104.14
Yield skimmings to No. 3 oil	1.71%	= 90 lbs. at	6.40 per cwt.	5.76
	77.01%			
Yield scrap to tank		421 lbs.		
Yield tallow	19.24%	=81 lbs., at	$ 4.60 per cwt.	3.73
Yield tankage (dry)	3.80%	=16 lbs., at	$17.50 per ton	.14
				$337.98

Value per cwt. of fat..................................$6.43
Value per head of fat.................................. 2.05

The prices per 100 pounds on oil, stearine and skimmings are the market prices at time test was made, less department expense for 60c per 100 pounds. The price on tallow is market price less 40c per 100 pounds, department expense.

TEST NO. 6.

The following is a test of tripe fat made into No. 1 oleo stock:

Tripe fat to oleo oil:

Hot weight from trimming bench (dry)		1,639 lbs.
Through small vat to wash (weight from water)		1,860 lbs.
Gain in washing from hot weight	13.48% =	231 lbs.
Weight to chill vat		1,860 lbs.
Chilled twenty hours, weight		2,009 lbs.
Gain from washed weight	8.01% =	149 lbs.
Gain in chilling from hot weight	22.57% =	370 lbs.
Weight chilled to oil house		2,009 lbs.

Handled in the usual way, gives following:

Yield in oleo stock, 1,070 lbs. = { 65.28% from hot weight; 57.53% from washed weight; 53.45% from chilled weight }

MUTTON FAT.

The fat derived in the killing of sheep is often used to good advantage in making mutton oleo oil. There are times when there is a ready sale for this oil, in which event it is run in the oil house by precisely the same rules as those laid down for the melting of beef tallow. The yields on mutton fat are considerably less, however, than on beef fat. When it is not advisable to put it into mutton oleo, it is nearly always advisable to make a mutton tallow, providing there is sufficient amount of the raw stock on hand to warrant it, as mutton tallow invariably brings a better price than ordinary commercial tallow. Mutton tallow runs considerably higher in titer than ordinary tallow. It is also much whiter and is often used in the manufacture of cosmetics, etc. When made of the oleo oil it should be made separate from beef fat, as the titer qualities of mutton oleo and stearine are much less than they are in these products made from beef, both having the tendency to become rancid if held for any length of time. Many lard refiners have discovered that where a complaint was made regarding the quality of their lard it was traceable to their oleo stearine, in which mutton fat had been used, this fat having a tendency to turn the lard rancid much earlier than where beef oleo stearine is used.

COST OF HANDLING FATS IN OIL HOUSE.

The following memorandum will cover in a general way the expense of handling fats in the oil house:

	Per 100 lbs.
Labor	$0.20
Ice or refrigeration	.06
Salt	.01
Tierces for oil	.17
Tierces for stearine	.06
Total cost raw fat per 100 lbs.	$0.50

KIDNEY AND COD, PICKINGS AND BONES.

Kidney fat yields the largest percentage of stock of any fat in the animal. The fat in this particular part seems to be richer in oil and in the general handling of same it rarely goes into the water to absorb additional weight, as it is generally purchased from the retail butcher after the carcass has been cut up. This in itself is a large branch of the business, in many places melters making a practice of collecting from the butchers their bones, tallow and fat. The following test will give an idea of the yield of the different products brought from a butcher's shop, when used in an oleo factory or tank room. The prices quoted are those that were paid at the time tests were made. The percentages, however are accurate.

STOCK YIELD FROM 649 POUNDS OF KIDNEY AND COD FAT.

Stock ....507 lbs., or 78.12%, at 9½c per lb.=	$ 48.16
Expense.....................Pkgs., $1.45; labor, $1.27=	2.72
Net value	$45.44

Value per 100 lbs., based on weight of fat, $7.00.

STOCK YIELD FROM 2,004 POUNDS OF PICKINGS.

Stock..............1,124 lbs., or 56%, at 9½c per lb.=	$106.78
Expense...................Pkgs., $3.83; labor, $5.01=	8.84
Net value	$ 97.94

Value per 100 lbs., based on weight of fat, $4.89.

TALLOW YIELD FROM 10,787 POUNDS OF BONES.

No. 1 tallow.....1,513 lbs., or 14.02%, at 6½c per lb.=	$ 98.34
Stock of tankage.1,750 lbs., or 16.22%, at $16 per ton=	14.00
Waste...........7,524 lbs., or 69.76%.	
Expense, labor	2.25
Net value	$110.09

Value per 100 lbs., based on weight of raw bones, $1.02.

SUMMARY.

	Per 100 lbs.
Net value kidney and cod fat.........................	$7.00
Net value pickings	4.89
Net value bones	1.02
Net value kidney, cod and pickings combined...........	5.40
Net value kidney, cod, pickings and bones combined......	1.89

The above is based on green weights. No deductions for steam power and administrative expenses.

The following is the percentages of products used in above test:

	Per cent.
Kidney and cod	4.83
Pickings	14.91
Bones	80.26
	100.00

TEST ON OLEO SCRAP.

The following is a test on the scrap from foregoing test after all the oil had been extracted, which was put into a rendering tank and cooked for twelve hours with forty pounds pressure:

Product	Pounds	Per cent
Scrap to tank....................................	4,246	.....
Produced tallow.	1,195	28.14
Produced pressed tankage.......................	434	10.22

The following is an analysis of the tallow and pressed tankage:

	Per cent.
Tallow, titer test	43.70
Free fatty acids	2.50
Pressed tankage, dry basis—	
Nitrogen	9.16
Phosphoric acid	4.77
Ammonia	11.13
Bone phosphate	10.41
Grease	15.54

LABOR IN OIL HOUSE.

Oleo Melters.—Under this heading are classified all men in the oil house necessary to handle the raw material, run the hashers, operate the melting kettles, and draw the oil into the seeding trucks. The number of men named in appended table in a well-regulated oil house should handle some 75,000 to 80,000 pounds of fat per day. The cost of this labor is $3.16 per hour, or $31.60 per day of ten hours; the cost per 100 pounds of handling fat to this point, $0.0405.

LIST OF OLEO MELTERS AND WAGES PAID.

No. men	Position	Rate per hour	Total
1	Foreman ($23.08 per week—one-half time charged)	$0.19	$0.19
1	Chill vat sub foreman	.20	.20
7	Chill vats	.17½	1.22½
2	Hashers	.20	.40
1	Hasher chute boy	.12½	.12½
1	Melter	.25	.25
1	Melter helper	.17½	.17½
1	Settling kettle	.22½	.22½
2	Oil drawers { one one	.17 .20	.37
17	....	.....	$3 16

Oleo Presses.—Under this heading is placed all the men necessary for handling the stock, pressing the oil, tiercing oil, packing stearine, and doing miscellaneous work about the house. The number of men specified in the list below should be able to handle 50,000 pounds of stock per day of ten hours. Cost of gang, $3.65 per hour; cost of gang per day of ten hours, $36.50; cost per 100 pounds of material handled, $0.075. Wages given are those in vogue in the large packing centers at the present time.

WORKMEN AT OLEO PRESSES AND WAGES PAID.

No. men	Position	Rate per hour	Total
1	Foreman ($23.08 per week—one-half time charged)........	$0.19	$0.19
1	Clerk ($13.50 per week)........	.22½	.22½
1	Assistant foreman........	.22½	.22½
8	Wheel men........	.17½	1.40
3	Shaking out........	.12½	.37½
1	Oil drawer........	.18½	.18½
1	Scraping coolers........	.17½	.17½
1	Scrap vat........	.17½	.17½
1	Stearine packer........	.17½	.17½
1	Piling tierces........	.17½	.17½
1	Stock breaker........	.17½	.17½
1	Janitor and truck washer........	.17½	.17½
21	....	......	$3.65

CHAPTER VIII.

PREPARATION OF HEADS AND FEET OF CATTLE.

BONE DEPARTMENT.

The bone department in the modern packing house is where the bones from slaughtered animals are cared for and prepared for commercial purposes. Nearly all bones that are of any value come from cattle, and to this department are generally sent the horns, skulls, jaws, feet, shank bones (from cattle that are cut up), thigh bones and blade bones. Other bones from the animals, when cut up in large quantities, are cooked for tallow, and afterward for glue purposes. Bones thus handled are over-cooked, are unsalable as a hard bone product and are sold under the head of "steam bone," which is generally used in fertilizers, and their value is calculated on a bone phosphate basis. Hard bones consist of those that are not cooked sufficiently to extract the glue, but enough to remove all grease. These bones are used for various manufacturing purposes and it is under the designation of "hard bones" that all the bones from this department are sold. They are cooked in open vats at a temperature of from 190° to 200° F. Excessive boiling brings the bones out in what is known to the trade as a "chalky condition," and greatly injures the value.

BONE PRODUCTS.

According to Prof. P. T. Austen, small bones are also converted into bone charcoal, which is largely used for the purpose of bleaching sugar and in various medicinal preparations.

Bones are used for a great variety of purposes, including the manufacture of bone charcoal for bleaching, empyrheumatic oils; tallow; black pigment for painting, shoe blacking and filling sheet rubber for overshoes; bone dust for manure; sulphate of ammonia; cupels; vitrified bone for use in making opal glass, and in the manufacture of knife-handles, combs, fans, buttons, etc. Bones also furnish gelatine and glue, and are the starting point for the manufacture of phosphorus.

HORNS.

This is the first product of the bone department which we will mention, as it is one of the most valuable. Owing to the dehorning of cattle as well as the breeding of polled cattle on the range, the supply of horns has been greatly diminished, and whereas twenty-five years ago horns were worth $20 a ton they are now worth from $280 to $300 per ton if they are of the proper selections, hence it will be seen that careful and intelligent handling is necessary to save this particular product in the best condition. The method for so doing is as follows: The horns after being sawed off the head are thrown into a vat of water that is held at a temperature of from 140° to 150° F. After being exposed to this heat for ten or fifteen minutes they are taken out and by hammering the horn across some solid substance, or by laying it on a block and pounding it with a weight or mallet, the pith slips out. The piths are then sent to the dry room, where they are dried, and later used for the manufacture of glue. The horn itself should be put into a room where there is plenty of outside air circulation and not too dry. Artificial heat will cause them to break, which injures their sale. Horns are used for the manufacture of combs and various other ornamental articles. In the course of manufacturing the tip is sawed off to the hollow part of the horn. It is then split open and put under hydraulic steam pressure, flattened out, and the articles manufactured from it when in this con-

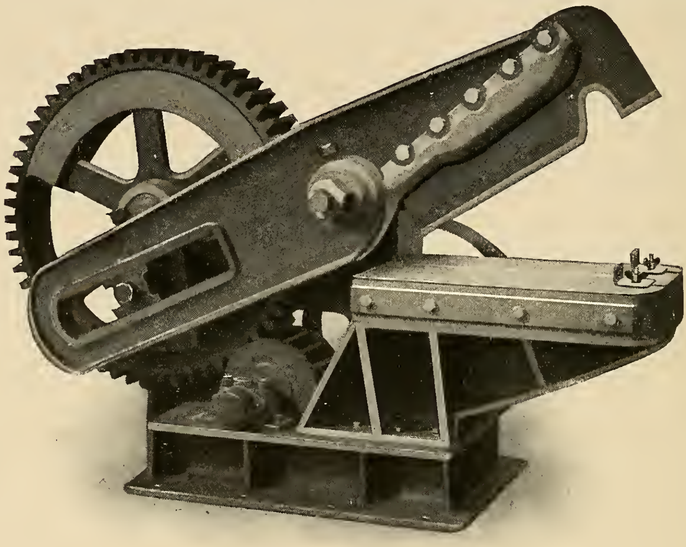


FIG. 62.—CATTLE HEAD SPLITTER.

dition. Any checks or flaws in the horn damage it for manufacturing purposes. If they are submitted to excessive heat in drying or if they are stored in a room that is warm and dry they are sure to become damaged. It is therefore advisable to dry them in a room where there is circulation of air from the outside. When in storage they should be placed in a cellar or room where there is more or less moisture, but not enough to cause them to mold.

In Fig. 62 is shown a machine which is used exclusively to split cattle heads for the purpose of taking the brains out whole. With this machine the heads are split after the jaws are pulled. The head is laid on the table with the teeth up. This knife is made with a semi-circular space in the sharp edge which comes down over the brain without touching same as the balance of the blade is forced through the skull, leaving the brain intact while separating the skull bones. Where a large number of heads are handled in this way it saves a great deal of labor. It is always desirable to remove the brains before cooking the skulls, as the bones become discolored if the brain is left in the skull.

SKULLS.

After the cheek meat has been trimmed from the head, the jaws pulled out, the head split and brain removed, the skull is ready for the cooking vat. Before being cooked, however, it should be thoroughly washed, as there is a large amount of clotted blood usually adhering to the skull, and if not well washed the grease which is derived from the cooking is discolored and injured. For the same reason the brain is removed. In connection with the washing, it is always well, when the vat is filled, to turn on the steam and bring the water up to a point where the grease does not begin to melt, and draw this water off. It will be found to be discolored. The parboiling greatly adds to the appearance of the fat or butter stock. The vat is then filled with water sufficient to cover the skulls and the steam turned on, bringing the temperature up to 190° to 200° F. After that the steam should be graduated so as to hold the temperature at above point eight and one-half or nine hours, when the heads will be found to be cooked sufficiently, so that all meat and grease will fall off. The skull is then put through a revolving washer with a spray of warm water which will wash off all the meat and refuse left hanging to them, and they are then ready for the dry room. They should be dried for about twelve hours at a temperature of 110° to 120° F. according to the facilities for drying, when the bones are ready for shipment.

JAW BONES.

Jaw bones should be handled practically in the same

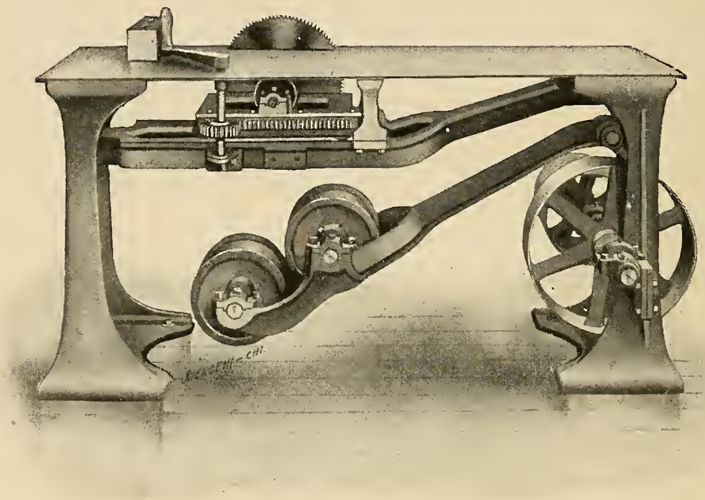


FIG. 63.—BONE SAW WITH IRON FRAME.

way as skulls, except that they should be cooked from nine to ten hours.

FEET.

In the handling of the feet the first consideration is to see that they are not allowed to become dry on the killing beds. They should be removed from the beds as fast as cut off, as there is always considerable blood and dirt accumulation on them. It greatly adds to their appearance and to the facility with which they can be handled if they are put through a revolving washer and all the manure and dirt thoroughly washed off. The next operation is to skin off the cords on the front and back of the legs, this being used for glue purposes, care being used not to cut too deep into the heel of the foot, it being preferred to leave some glue stock on the foot rather than to cut too deep and remove the fat which goes to make up the neatsfoot oil which is much more valuable than the glue stock. After the glue stock has

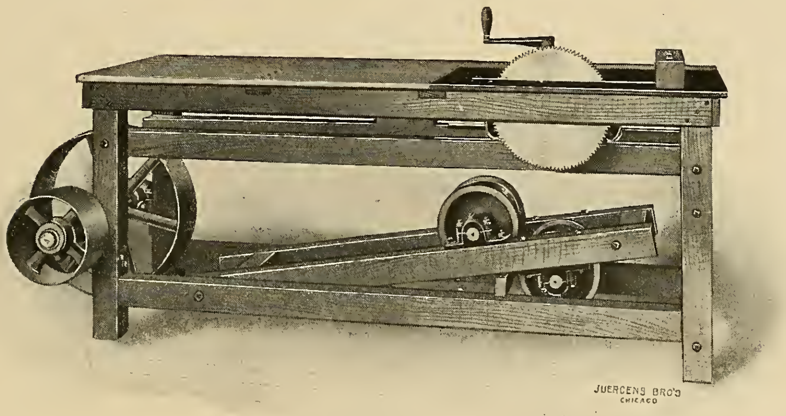


FIG. 64.—BONE SAW WITH WOOD FRAME.

been removed the foot goes to the bone saw (see Figs. 63 and 64), where the knee end of the leg is first cut off, cutting back just far enough to expose the marrow. The piece thus cut off goes in with the bones known as the knuckles.

The shin bone is next cut off from the foot near enough to the joint to barely expose the marrow. The front shin bones are termed "flat shins," and the hind bones "round shins." These are used in the manufacture of bone ornaments and articles. Round shin bones should be cooked five hours at a temperature of from 180° to 190° F.; flat shin bones should be cooked six hours at a temperature of 190° F. After they are thoroughly cooked they should be allowed to stand for about an hour and the grease which is used in the neats-foot oil should be carefully skimmed off into an ordinary tank. After the bones are thus cooked they should be thoroughly washed, and are then ready to be dried.

Where this work is done in sufficient volume, a very practical device may be used which is a revolving rack,

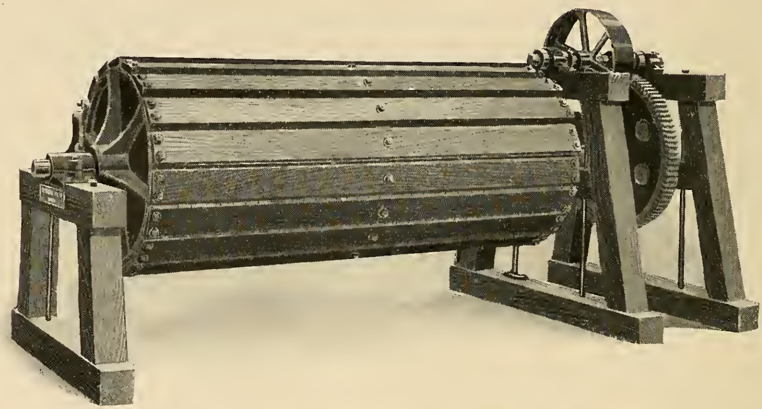


FIG. 65.—REVOLVING RACK FOR BONE WASHING.

illustrated in Fig. 65, into which the bones are placed and tumbled for about an hour. Any loose pieces of meat that may adhere to the bones are thus removed and by sprinkling them continuously with hot water while revolving it has the effect of polishing the bones and they come out of the tumbler in a very smooth condition, looking much better than if they were hand-washed. After this the bones should be placed on racks on the floors to be air dried, a room with a temperature of 70° to 90° F. being sufficiently warm. If excess heat is used on these bones they will "check" which damages them materially. After they are thoroughly dried they should be

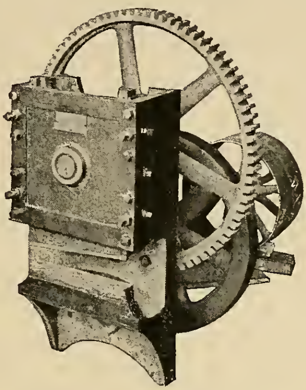


FIG. 66.—POWER HOOF PULLER.

stored in a bin, in a room where the temperature does not exceed 80° F.

The balance of the foot, after the shins are cut off, next goes to a scalding vat, the temperature of the water

FIG. 67.—HAND HOOF PULLER.

being from 150° to 170° F. After they are sufficiently scalded the hoof is pinched off, either by hand, or by a machine designed for that purpose. Two practical machines for this purpose are shown in Figs. 66 and 67.

The feet are then put into a vat and cooked, the bones thus obtained being classed as "knuckle bones." They are cooked at a temperature of 200° to 210° F. for nine hours. After they are thoroughly cooked they should be given an hour to settle, when the oil is taken off and the bones put through a revolving washer where they are thoroughly cleaned and sent to the dry room to be dried, after which they are ready to be marketed.

NEATSFOOT OIL.

This is a product which requires very careful handling and thorough drying out, as any moisture left in this oil tends to injure it and cause an excessive amount of free fatty acid. The oil, after being skimmed from the vats, should go into a receiving tank which is jacketed; the steam should be turned on and the oil brought up to a temperature of 210° to 215° F. and ten to fifteen hours allowed for settling. The bottom should then be drawn off, as all the water and impurities will settle, after which the steam should be turned on again and the oil brought up to a temperature of 240° to 250° F. and held there for one or two hours, this having the effect of drying it, evaporating all the moisture. After it has been allowed to stand until it has cooled down to a temperature of 80° to 90° F. it can be put in tierces. The drying feature in handling this oil is very essential to its production in a satisfactory condition for the trade.

SINEW GLUE STOCK.

This part of the product, after having had plenty of time to drain the water out of it as much as possible, should be taken to a cool, although not necessarily refrigerated room, and thoroughly salted. It is often found necessary to overhaul it and resalt it in order to keep it from "sweating." After it has been cured ten days or two weeks it is ready for the glue department. The following test shows the average yield from head and feet of 130,470 cattle, same based on the market prices prevailing at the time the test was made. While prices vary the percentages given are accurate.

AVERAGE YIELD OF HEAD AND FEET ON KILL OF 130,470 CATTLE.

Product	Yield per cent	Market price			Value per head
		per ton	per gal.	per lb.	
Skulls	4.079	$18.00	....	......	$0.0367
Jaws	2.289	18.00	....	.....	.0206
Knuckles	2.641	18.00	....	.....	.0237
Hoofs	1.744	22.00	....	......	.0191
Hoofs, white	.147	50.00	....	......	.0036
Piths	.456	21.00	....	......	.0047
Round shins	1.198	42.00	....	......	.0251
Flat "	.956	30.00	....	......	.0143
Horns	.518	200.00	....	......	.0518
Neatsfoot oil	1.061	......	$0.64	......	.0905
Cheeks	3.580	.....	....	$0.03	.1074
Head meat	.698	......	...	.03	.0294
Fine "	1.072	......	....	.03	.0321
Sinews	1.899	19.00	....	......	.0180
Tallow	1.730	......	....	.06¾	.1167
Tankage	1.160	16.00	....	......	.0092
Brains	.650	......	....	.02¼	.0146
Head oil	1.068	......	....	.06¾	.0726
Total value	......	......	....	......	$0.6901

CHAPTER IX.

PREPARATION OF CASINGS.

DESCRIPTION OF CASINGS.

Casing is a product made from the intestines of cattle, sheep and hogs, when they are slaughtered in quantities sufficiently large to warrant the care and attention required. Before the advent of the modern packing house this was one of the products which was entirely lost where animals were slaughtered on a small scale. It is a product worthy of a great deal of consideration and careful attention must be given to its production in order to have it turned out in a good, marketable condition.

Casings consist of round or small guts, middle or large intestines, bungs, weasands and bladders, these being the different descriptions of casings that are obtained from slaughtered cattle.

THREE ESSENTIAL POINTS IN HANDLING CASINGS.

First.—Good, clear water.

Second.—That they be handled promptly and not allowed to accumulate and lie around, as they become discolored, and the color of casings has much to do with their value.

Third.—That the man cleaning them does not use water too hot so as to injure them, and that they be turned out with as many whole pieces as possible. These points being followed closely will aid greatly in the general results.

As fast as the casings are cleaned they should be measured into sets of 108 to 110 feet each. A standard set of rounds is supposed to measure 100 feet, but the larger measure is allowed as in the salting and curing they shrink so that when measured, as above given, they will not exceed 100 feet when salted. A set of rounds should not have to exceed five holes, or consist of more than five pieces, the less the number of either holes or pieces the more desirable.

After they are thus measured they are thrown into a salting box, where they are shaken up by hand so as to make all the salt possible adhere to them; the casings being wet the salt adheres readily. They are then thrown into an old barrel which is bored full of holes, or else piled up in an open truck, so that all the water possible will drain off. After lying in this condition for a day they are taken up and resalted and packed into tierces, 210 sets to the tierce, ready for shipment. It is necessary, in order to get in this amount of casings, to use pressure and press them in very tightly, glucose packages being used for this purpose.

Casings are put up for export and domestic purposes, the export rounds being reasonably narrow and absolutely free of knots. The knots referred to are small abrasions on the sides of the intestines which are often found in the entrails of native cattle, or cattle that have been highly fed, these knots being looked upon as objectionable in the foreign trade. The color of the casing, if properly handled, should be of a reddish tinge, and the smell absolutely sweet. The casings, after they are packed, should be put in cold storage, where the temperature ranges from 38° to 45° F., and should

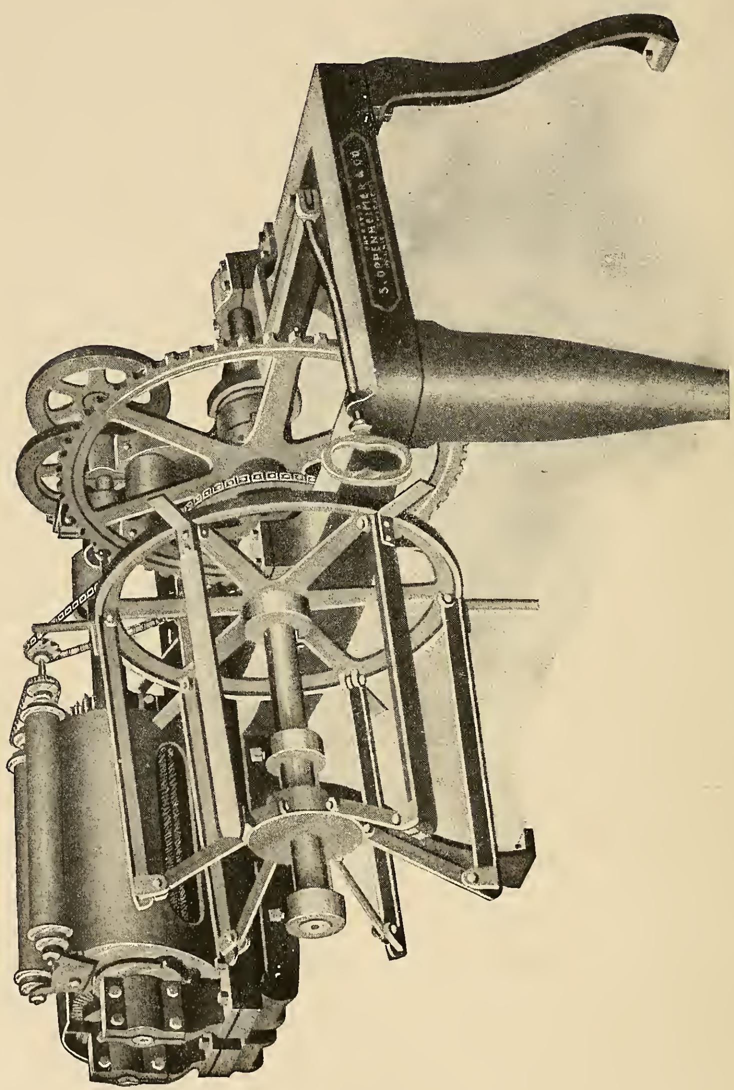


FIG. 68.—FATTING MACHINE FOR CASINGS.

be watched occasionally to see that the liquor is not allowed to leak off, as it injures them to become dry.

CLASSIFICATION OF CASINGS.

Round Casings.—These are first run off from the ruffle or fat, care being taken in running them that they are not cut and that as little fat is left on them as possible. This casing should be taken out in two pieces, it being impracticable to leave full lengths on account of the danger of tearing it in removing the contents. After they are cleared of the contents, they are put through the fatting machines (Fig. 68), or if no machine is used are scraped by hand, removing all the fat that adheres to them. It is essential that *all* the fat on the casings should be removed, as it is much more valuable than the casings themselves and is detrimental if left on. After they have been "fatted" they are put into a vat of water and "turned," which process turns them wrong side out, exposing the internal part of the intestine. This is then put through the sliming machine, which removes all the membrane. This operation is sometimes done by hand. When this work is completed it is only the muscular portion of the intestine that remains. After they are thus finished they are measured, inspected, tied into bundles and put into the first salting. After remaining one or two days in the salt they are resalted and packed into tierces.

Domestic Rounds.—These are rounds used for domestic trade in this country. They are wider and heavier than those exported and it is not considered essential that they should be absolutely free from knots. They are handled the same, however, all the way through, and are packed from 150 to 170 sets to the tierce, the difference in the number of the sets indicating that they are wider casings and not as carefully selected as the exports, which are packed 210 to the tierce, the number of sets indicating, to some extent, the quality of the goods.

Beef Middles.—After the ruffle has been pulled off from the intestines on the gut bench, the middles are pulled out, leaving on all the fat that will adhere to them. The contents of the intestine is washed out and the gut then goes to the fatter, who cuts off all the fat with a knife. It is a very important part of the work to see that no fat is left on the casing, as the next operation is to turn it inside out; any fat which may be left on the casing cannot then be removed, and will detract very much from the appearance of same when used for sausage purposes. After these casings are thoroughly cleaned they are measured 62 feet to the set, allowance being made for shrinkage in salting, so that after they have been salted they will measure 57 feet, this being the commercial length required. These are handled on the salting benches, etc., the same as rounds. They are selected as follows: They must be of prime quality, properly cleaned, slimed and salted, closely fatted, free from holes, good color and smell, no piece to be less than 3 feet in length, not more than one such piece in a set, and the thin end of the gut must be cut off. They should be assorted in accordance with requirements into—

Narrows	packed	140	sets	to	the	tierce
Wides	"	95	"	"	"	"
Regulars (which means the run of the house)............	"	110	"	"	"	"

Beef Bungs.—These consist of the end of the large intestine, which is cut off an average length of about 4 feet, which will vary according to the size of the cattle. The opening where the small intestine connects with the large should be in the center. These are handled and packed the same as the casings heretofore described.

Bungs, handled practically the same as the previously described casings, must be of good quality, full length, properly cleaned, slimed, salted and fatted, free from holes, reasonably free from scores and cuts and of good color. The regular run of these casings should be packed 400 pieces to the tierce, tied in bundles of five each.

Beef Bladders.—Bladders should be cut with a long neck and after they have been fatted should be blown up as large as possible and hung in a dry room to dry. After they are blown and dried, the necks are cut off and they are flattened out and packed in bundles of twelve each. The first grade consists of bladders 14 inches in length, with or without necks. The second grade consists of bladders from 11 to 13 inches in length with the neck. The third grade consists of bladders, with or without necks, not under 9 inches in length.

Beef Weasands.—After the meat has been trimmed from the outside the weasand is turned wrong side out, washed, both ends tied, and blown full of air. After they are blown with air pressure they are hung in a dry room, which should have a temperature of 110° to 120° F., and left there until thoroughly dried. They are then taken out, the ends cut off, the weasands put into bundles of twenty-five each, twenty bundles tied together into a large bundle, five or ten of these large bundles constituting a case. Regular weasands must be of prime quality, properly dried, entirely free from worms, and at least 24 inches long, allowing not over four pieces of shorter (same to be at least 18 inches long) to the bundle of twenty-five. Two of such short ones will be counted as one full weasand.

Narrow weasands are those which, while being dried have a weight of about four pounds hung on the end, drawing them out as long as possible, which has the tendency to make them narrow. These should not be blown as full of air as those that are not thus handled. After they are dried they must be at least 26 inches long and from 2 to 2½ inches in width when flattened out. Other conditions same as the regular weasands, except that they must be entirely free from skin worms and skin-worm marks.

Bung Gut Skins.—From the bung gut is often removed the outside membrane, known as the "bung gut skins." These are used by gold beaters. They are handled as follows: The bung gut skins should be started at the cap end, being careful to remove the skin for about 4 to 6 inches from the end of the cap, then remove same around the bung end, back of the cap end first, and next take off toward the open end, after the bung is skinned back as far as possible beyond the small intestine. These skins are very thin and difficult to remove; there is no difficulty experienced, however, in getting them 30 inches or over in length, if properly handled. After the skin is removed it is placed in a pail of ice water, and, when well chilled, is salted thoroughly in the cap and outside. The object of putting the skin in ice water is to facilitate handling.

After they are thoroughly salted they are hung over a bar covered with a piece of burlap and allowed to hang for one or two days, until they are thoroughly drained, or dried. When dry each skin is separately handled, the loose salt shaken off and examined for holes and fat and ragged ends. Holes near the edge of the skins can be cut out without materially injuring them. All fat on the edge and ragged ends should be cut off. After the skins have passed this inspection they should be spread full length and width on a table, one over the other, gathered in bunches of fifty, tied in the center and packed in a tierce. Care should be taken in handling the skins not to let them come in contact with any iron that will produce rust or discolor them. Many casing men object to removing the bung gut skins, believing that it injures the casing. If they are handled carefully, however, the injury will not be more than 5 per cent.

YIELD OF CASINGS.

Beef Rounds.—The length of these varies in the animal from 90 to 130 feet. In the finished product, under proper management, they should run about 102 or 103 sets of rounds per 100 cattle.

Middles.—The length of these in the animal varies from 18 to 35 feet, the former measurement in young cattle, the latter in old. The average should be from thirty-eight to thirty-nine sets of middles per 100 head of cattle.

Bungs.—Bungs if handled carefully should yield from 95 to 98 per cent. Weasands and bladders the same.

The average cost per head for labor of cleaning and handling beef casings should be about 13½c to 14c per head of cattle killed.

The salt used for salting casings is a medium fine grain evaporated salt.

CHAPTER X.

THE TANK HOUSE.

CONSTRUCTION AND OPERATION OF A TANK HOUSE.

This department is almost an innovation which came in with the modern packing house. When packing was done promiscuously throughout the country, sufficient offal was not collected at any one point to necessitate a tank house, and consequently, in a small way, open kettles were used with either a fire under them, or jacketed for steam, and the best of the tallow was thus rendered, while all of the offal was thrown away, it being impossible to render offal to any advantage under these conditions. For this reason the tank, or " digester " as it is called by many, was evolved. It consists of a very strong, tight tank, which is usually operated under forty pounds steam pressure, giving a temperature of nominally 280° F., this high temperature having the effect of thoroughly disintegrating all the parts that go into the tank, and liberating all the grease. The residue from cooking in this manner, after being thoroughly pressed. is dried and sold as fertilizer. The effectiveness of this process is shown, for instance, by the fact that if a hundred cattle heads are put into a tank, after the cooking nothing is found of them except the teeth, the bones being entirely disintegrated.

Probably few departments of the packing house need closer attention than the tank house. It is not an inviting place and consequently does not ordinarily receive the attention necessary to get the best results.

After the material has been cooked and allowed to settle, the greases are drawn from the side of the tank, as far as possible, and the remaining contents dropped into a vat where the mass is as thoroughly skimmed as possible of all grease. It is then put into the hydraulic presses where what grease is left is pressed from it.

It is only within the past few years that much attention has been paid to tank house construction, but it is

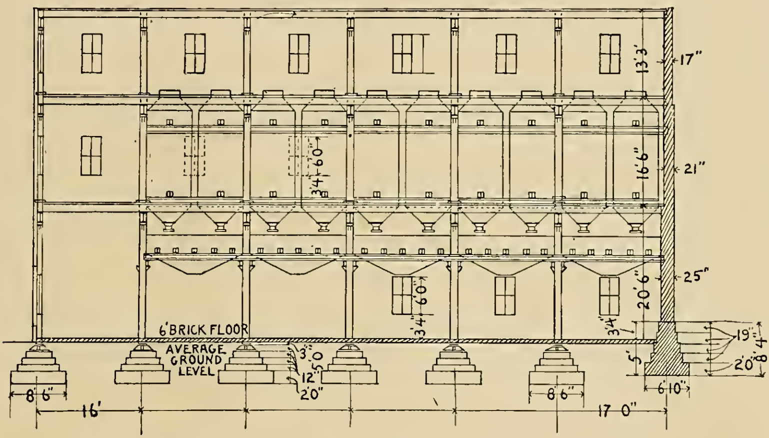


FIG. 69.—LONGITUDINAL SECTION MODERN TANK HOUSE.

found that a building properly designed for this purpose saves a great deal of expense and labor, and as the labor in this department is expended largely on the less valuable material, such as the fertilizer, it is found advantageous to build correctly. Figs. 69 and 70 present sectional views of a modern tank house. It will be seen that the tanks are high enough from the floor to give sufficient room for the scrap vats, and under the scrap vats ample room is left to run the press carriages, so that the material can be drawn directly from the scrap vat into the presses. It was formerly allowed to fall to the floor and was shoveled into the presses.

In Fig. 71 is given a sectional view presenting details of a rendering tank and the method of supporting same with iron construction. Tanks for this purpose have to be put up very rigidly as the tank is very heavy in itself and contains upward of 20,000 pounds weight when filled. The tank shown in the illustration is known as the "drop gate" type and the segments which form the false bottom of the tank are put in in such a way that

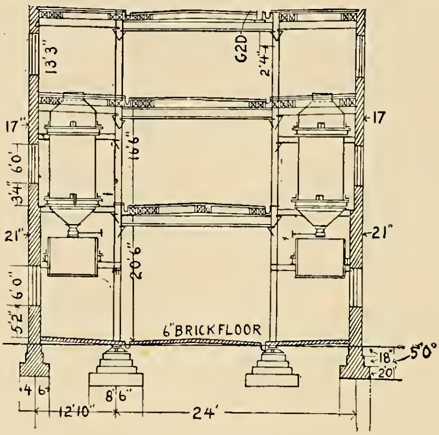


FIG. 70.—CROSS SECTION MODERN TANK HOUSE.

their own weight holds them in place, as may be noted in the view shown. The false bottom put in is perforated and the steam for cooking the contents is admitted at the bottom of the tank under the plate, thereby giving the steam a chance to permeate the entire mass. Without a device of this kind the steam is liable to find its way up on the side of the tank, heating the tankage in some places and leaving it cool in others, in which case the material sours. This false bottom also aids in draw-

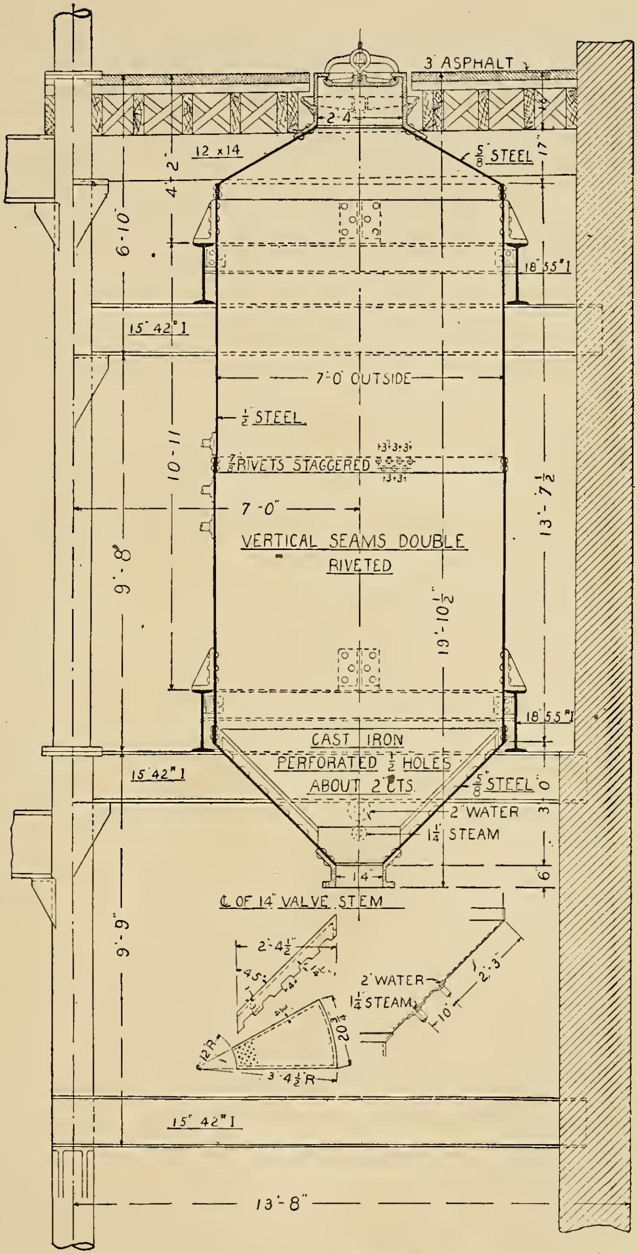


FIG. 71.—SECTIONAL VIEW OF RENDERING TANK.

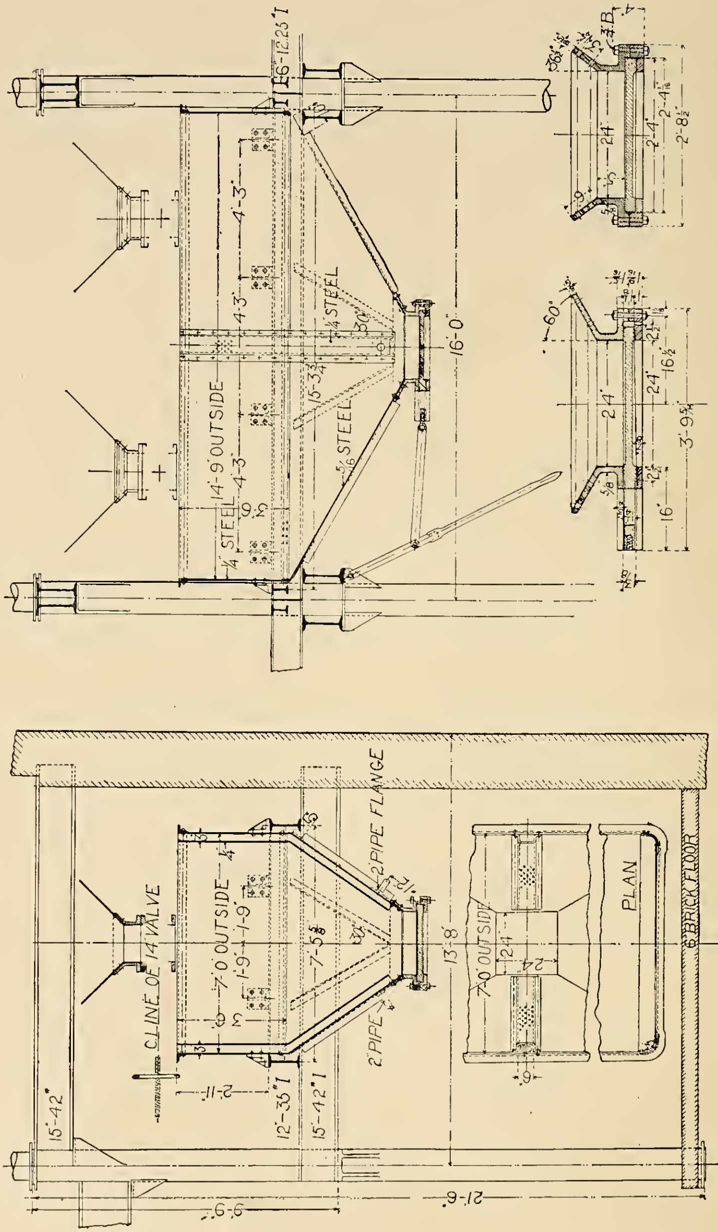


FIG. 72.—OUTLINE VIEW OF MODERN SCRAP VAT WITH VALVES, GATES, ETC.

ing the water out of the tank during the process of cooking, preventing the solid matter from stopping up the outlet.

Fig. 72 presents an outline view of a scrap vat, together with valves, gates, etc., such as is now in general use in modern packing house plants.

A feature which is of great advantage to the life of the tanks, is the cast iron head (Fig. 73). It was formerly the practice to put in the tank a head made either with segments or dished, extending from 4 to 12 inches

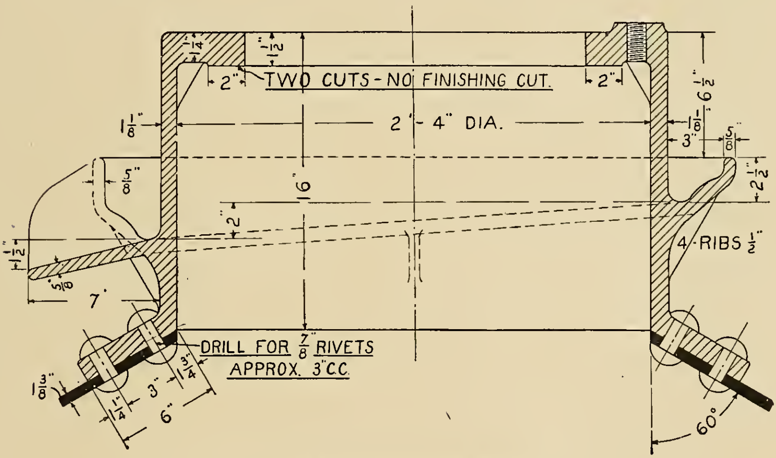


FIG. 73.—DETAIL OF CAST IRON HEAD FOR RENDERING TANK.

above the floor. In order to work with any degree of comfort around these tanks it was necessary to have the floor fit tight to the side of the tank, which being the case, the water and residue worked in between the tank and the floor and invariably damaged the tank all the way around where the floor came in contact with it, so that it was rendered unsafe long before it was otherwise worn out. If a space is left between the floor and the side of the tank, the water and refuse will run down on the tank and cook onto the sides until it becomes very offensive.

Therefore on the side of the head is placed a flange, which goes completely around the tank, having a discharge at the lowest point, so that any water which may

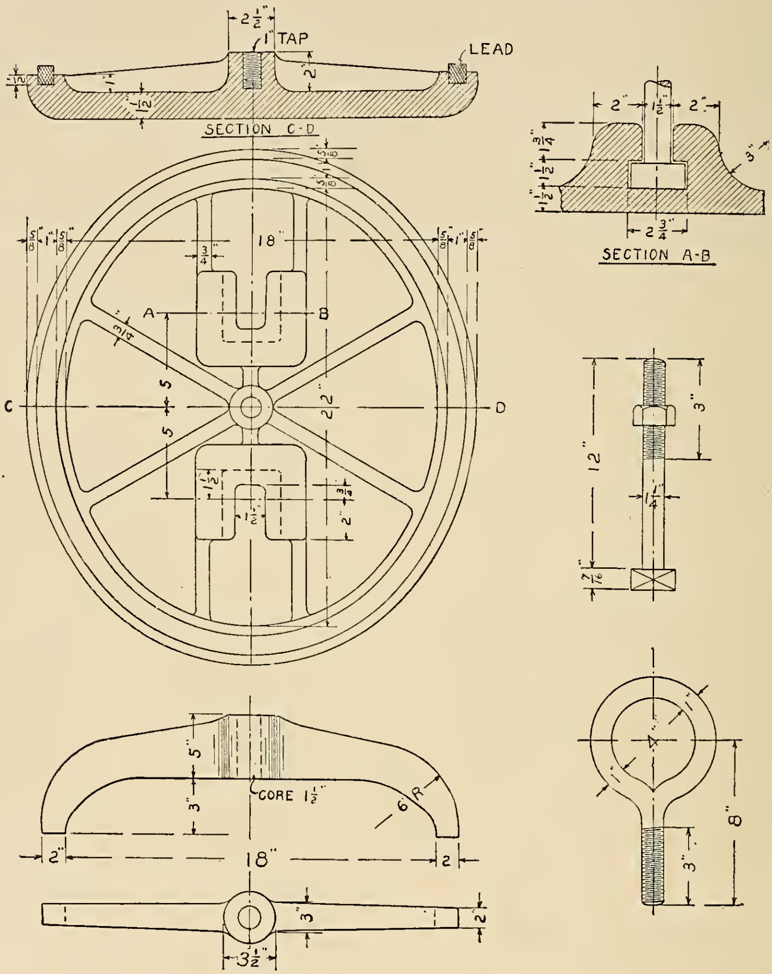


FIG. 74.—DETAILS OF MAN-HOLE HEAD AND CRAB.

seep through between the floor and the tank is caught in this gutter and runs off into the vats, thereby leaving the tanks perfectly clean and avoiding the offensive odor which would otherwise be developed in the tank room by the continual seepage on the hot tanks. It also saves the tanks very materially from the wear and tear which is caused by rusting.

In Fig. 74 is shown details of the man-hole head and crab used with this cast iron head.

HOW TO COOK A TANK.

After the tank has been thoroughly cleaned, draw in about two hogsheads of water, for a 7 x 14 foot tank, or a proportionate amount for tanks of other sizes, turn on the steam, bring the water to a boil and then begin filling the tank. Allow sufficient steam to enter to keep the tank boiling continuously. When the tank is two-thirds full, shut off the steam, draw off the water and put in about as much more cold water; again turn on the steam, bringing the contents to a boil the second time. Do not fill the tank to exceed three-fourths full, as the cooking is better done if sufficient room is left at the top for the "roll." After cooking for a half hour, draw off the water a second time.

It will be found, especially in cooking freshly killed matter, that the water thus drawn off is very dark colored, as it carries with it a large amount of blood and dirt that has accumulated on the tissues. If this is not drawn off it has the effect of darkening the lard or tallow very materially.

After the water has been drawn off the second time, put in the tank head and turn on the steam, the condensation from the steam being sufficient to cook the material; no more water is needed. See that the blow-off and escape pipes are shut and the pet-cock is open. Continue cooking in this manner until a moderate pressure is secured on the tank, then set the safety valve at forty pounds, open the blow-off valve leading to the safety valve wide, open the escape valve just enough so that you may know the gas is escaping, and shut the pet-cock. At the completion of this operation the cooking of the tank begins. A tank of tallow should cook thoroughly in from nine to ten hours with forty pounds pressure.

Oftentimes freshly killed material will be found to lie closely together and a " cold spot " will be found in the tank—a spot where the material has become partially solidified and the steam has not penetrated. In such case, if the tankman will shut off the steam, draw off all the water, and then turn on the steam, the cold spots will disappear. " Cold spot " has the effect of souring lard and tallow; in other words before the heat has penetrated into the solid mass, the heat surrounding it will have caused it to sour. This is a point that should be closely watched, especially in tanking lard.

Tankmen should try the pet-cock on the tank each half hour to find out if the tank is " flush." If the tank is " flush " or foaming, the foam will come out instead of steam. In this case shut off the tank ten minutes, then draw off the water, but see that no grease is drawn off with it. The cause of the flushing, or foaming, is that the tank is too full, or that there is too much water in it, consequently it is necessary that the tankman should try his pet-cock very often during the operation of cooking to see that the contents is being properly cooked.

The material from catch basins (which consist of pockets in the sewers where any grease or fats may be caught that otherwise escape through the sewer) and partially cooked stuff from different departments should be handled very promptly and gotten into the tank as soon as possible, as the stuff quickly decomposes if allowed to lie about, and the longer it is out of the tank, and the more decomposition takes place, the more free acid it will develop.

After the tank has cooked about ten hours, shut off the steam and open the pet-cock of the tank for about ten minutes, then open the escape valve, being careful not to give it too much escape at first, or the tank will "roll." By this is meant that the extreme heat of the material will generate steam, which, as soon as the pressure is relieved, will cause the material to "raise" or boil very violently, but if the pressure is removed from the tank slowly, this condition will not appear. When a tank has "rolled" it takes a great deal more time to settle it, the grease being thoroughly mixed up with the residue of the tank. As the pressure dies down the tankman can increase the blow-off.

When the pressure is off the tank, take out the head and use about a water-pail full of fine salt in settling the tank. This salt thrown in and scattered around in the tank has the effect of carrying with it sediment and tissue which may be held in suspension. The tank should stand about two hours before running off the fat, which gives it a chance to become thoroughly settled. Draw off the fat from the side valves of the tank, as clean as possible, into coolers. It is often necessary, in doing this, to raise the contents of the tank, as there may be considerable tallow or lard below the lowest draw-off valve. Such being the case run water into the bottom of the tank sufficient to raise its contents so that all the rendered fat will have a chance to escape through the lowest valve.

In places where the tank water is saved, it is always advisable to have some of this water in a vat above the

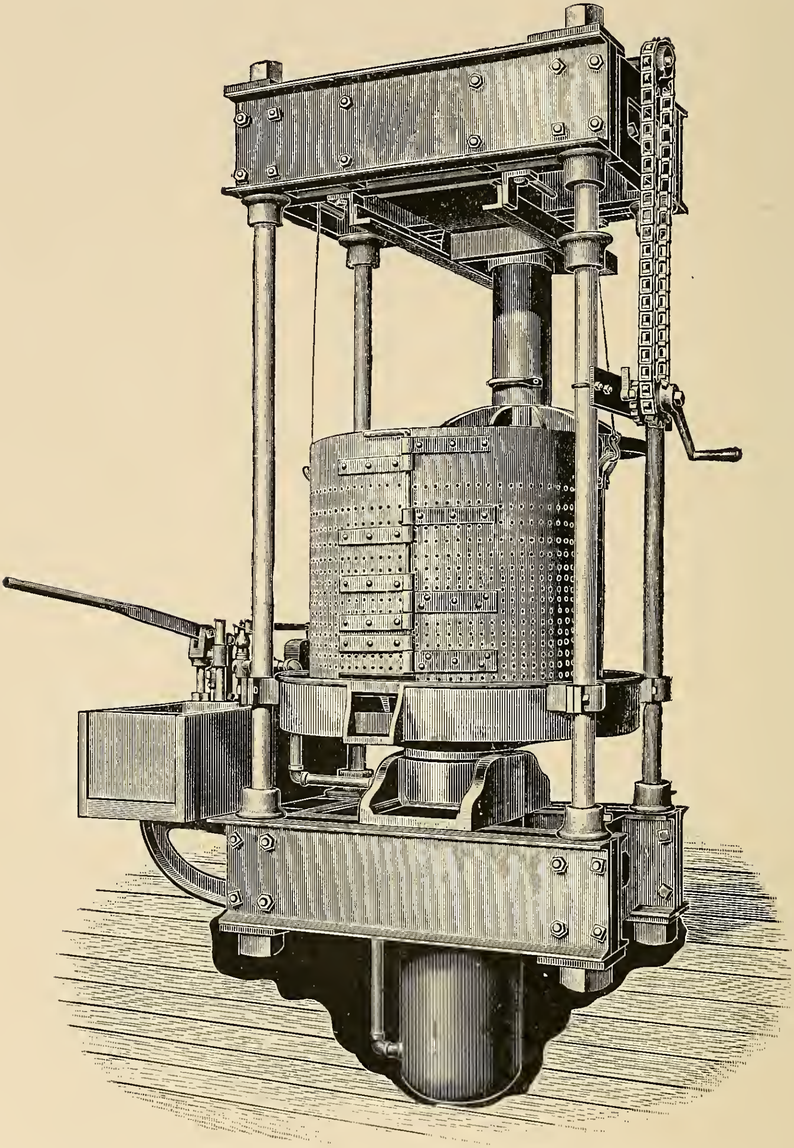


FIG. 75.—HYDRAULIC LARD AND TALLOW HOOP PRESS.

tanks, so that when they need raising, it can be done by simply drawing this tank-water into the bottom of the tanks. When handled in this manner, it saves putting additional fresh water into the tanks, which will later on have to be evaporated.

After the fat is drawn out of the tank, the residue is dumped into the scrap vat. Anything that has not been thoroughly cooked will float on top in the vat. These floaters should all be skimmed off and put back into the tank to be re-cooked. The tankage, after being thoroughly agitated with a pole or rake, should be cooked for about ten minutes with live steam, then it is allowed to settle and the grease is skimmed off the top. The skimmings thus obtained all go back into the tank for the next cooking. In taking off the skimmings take as little water as possible with them. As soon as the operation of the skimming of the vat has been thoroughly accomplished the contents are in the proper condition to be pressed and should be handled while still hot.

PRESSING TANKAGE.

Different types of presses are used in different methods; for instance, many small killers, where their offal is not saved, will use an open kettle, either fire or steam heat, in which to render their tallow and lard. In material thus treated, when thoroughly cooked, the scrap will rise to the top of the oils and is very hard and crispy. A hoop press is used for this material, into which the scrap is forked and pressed, the oil or grease oozing out through the perforations on sides of the press (see Fig. 75). Where the material is cooked in a tank, under pressure, the residue is left in an altogether different form, it being entirely disintegrated and so mixed with the water that it has to be pressed in cloths between press racks, for which an entirely different press is required (see Fig. 76).

In the latter case when the material in the vats has been thoroughly skimmed it is handled in press cloths,

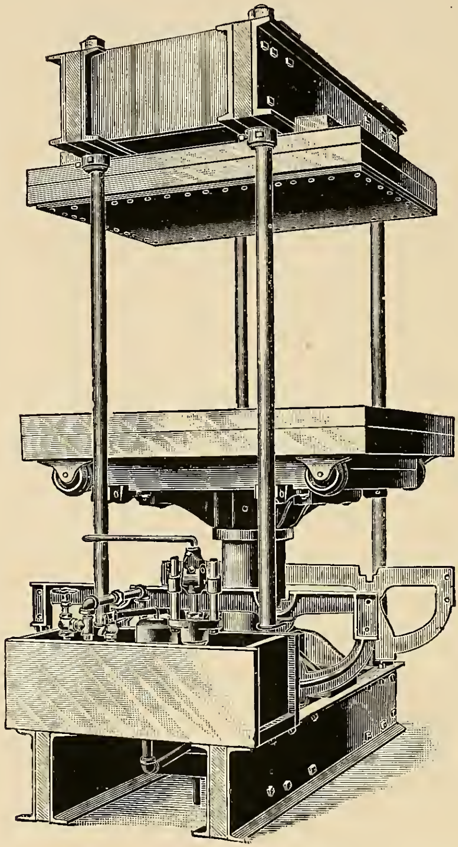


FIG. 76.—HYDRAULIC TANKAGE AND FERTILIZER PRESS.

which consist of a very heavy grade of burlap made especially for this purpose. In building such a press a rack made of 1 x ¼ inch material, usually elm, thoroughly riveted together, is first laid on the press head. Next a frame of the size and depth required to handle the different plates is used. The press cloth is then spread over them and the material drawn onto the press. After sufficient material has been drawn to make the plate 4 or 5 inches in thickness and well spread out, the cloth is carefully folded over the top of it. The form is then lifted off the press, another press rack is put on top of the plate already made, and the process repeated. Ten or twelve plates are generally used to a press. Plates should not be made too thick, for if they are it is impossible to press the grease out as thoroughly as it should be.

After the press is filled it is run into the hydraulic press proper and pressure applied. This should be done slowly at first, giving the water ample time to run out of the press. If the pressure is run up too fast the tendency is for the material to slide out on one side or other of the press, but if the water is pressed out slowly the material adheres better or gets a good "bond," so that it will not slip.

After the press has run until the cakes are about one-half of their original thickness turn on a hose with hot water, thoroughly washing off the sides of the press. Then turn on more pressure until this reaches about 300 tons on a 5 x 5 foot plate. It will be found that it is the last pressing which brings out the grease.

Where tankage is properly handled it should run from 11 to 14 per cent of residual grease on a dry basis. Where improperly handled it will oftentimes run from 18 to 20 per cent, the excess being lard or tallow which should have been saved, but worthless if left in tankage.

When the fat is drawn from the tank it should first be run through a catch basin, which will retain any floaters or pieces of tissue which may come out with the fat from the tank. It then overflows to a receiving vat, where it is allowed to settle. It is unwise to have any coils in receiving vats for either lard or tallow, as it interferes with the cleaning of the vats, and when steam is turned into the coils it has a tendency to discolor the fat.

If receiving vats are simply set on the coils, sufficient heat will be obtained in the vat to warm the material at any time and at the same time not burn it. The vat should be set sloped toward one corner. From this corner the draw-off pipe, through which the fresh product is drawn out for tiercing or other use, should extend from 2 to 3 inches into the vat, thus avoiding the drawing of any bottoms. Another opening should be just level with the bottom of the vat through which all water and residue can be drawn off and sent back to the tank to be re-cooked. Before drawing off the grease all water and residue should be drawn out of the lower pipe, and what is left in the vat after it has been drawn out of the pipe extending through the bottom should always be taken back to the tank and re-cooked.

TANK WATER.

In the cooking of different materials in tanks under pressure, the tank water is really the condensed steam used in the cooking, and is very rich with the sediment and the juices of material cooked, running as high as 8 and 10 per cent solids. The sediment obtained by evaporating this tank water is known to the trade as "concentrated tankage," which runs from 15 to 16 per cent ammonia and is consequently a valuable by-product when saved.

Under the head "How to Cook a Tank," attention is called to the advisability of using tank water "to raise the tank" when drawing off the tallow or greases, thus avoiding an unnecessary amount of fresh water, as the fresh water must all be evaporated if put in with the tank water. After the tankage has been dumped into the scrap vats and all the grease skimmed off, the tank water should be drawn off into a separate vat; it is then ready for treatment. The "press water," which is the water from the pressing of the tankage, should also be caught and placed in the same vat. The material at all times, however, should be kept hot, for if it is allowed to cool off a decomposition sets in which renders it unprofitable to handle. The temperature should never be allowed to go below 160° F.

There are several methods of utilizing this product. It being of a peculiar nature, the animal salts, which are left to a large degree when it evaporates, soon draw moisture unless neutralized. For instance, it may be evaporated and dried to a powder, but unless it is properly treated it will turn to a liquid form in storage, or when exposed to the air, becoming about the consistency of coal tar. In that condition it is valueless.

One method of converting this product into a merchantable article is to reduce the tank water in vacuum pans to a consistency of about 28° to 30° Baumé, as it comes from the vacuum pans. It is then pumped into a "mixer" made of cast iron, equipped with heavy cast iron paddles, and to 800 pounds of this evaporated water, or "stick," as it is now called, are added 175 pounds of cooked and pressed beef blood, 25 pounds of raw 60-degree sulphuric acid, and 120 pounds of chemical.

The chemical referred to is made as follows: Take a lead-lined vat holding about 200 gallons; into this put about 160 gallons of 60-degree sulphuric acid, adding water enough to make the solution about 12° Baumé. Into this solution throw old scrap iron of any description and allow it to stand until the solution will dissolve no more iron. It is then pumped into a shallow lead-lined vat with lead coils, and evaporated to about 40° Baumé. It is next drawn off into barrels of fifty gallons each and to each barrel forty pounds of black oxide of manganese are added and thoroughly mixed.

After the tank water has been thoroughly treated with this chemical, and the other materials mentioned, in the mixer, it is ready to go to the drying ovens. These consist of ovens through which heat is forced artificially, the " stick " being put into pans about 14 x 20 inches in size and 4 inches deep. Into each pan is put about ten pounds of this wet " stick." After it has been dried for about twenty-four hours the pans are dumped, the " stick " going through a breaker, and it is then ready to be ground and shipped.

The above method of drying " stick water " has been largely superseded in the last few years by using instead a roller heated with steam (Fig. 77). Much greater economy in operation, for labor as well as for repairs, is secured by means of this machine. The acids used in neutralizing the animal salts in the water are very detrimental to all kinds of wrought iron, the pans and ovens eating out very rapidly. This machine is made of cast iron rollers, revolving at about eight to ten revolutions per minute. The evaporated stick is put on the roller at a consistency of about 30° Baumé, a thin film of this material sticks to the roller and before it gets around to the scraper the internal heat of the cylinder has dried it and the scraper at the bottom of the roller scrapes it off.

When dried the product is known to the trade as " concentrated tankage " and sells on an ammonia basis. In arriving at a value of products thus sold, an analysis is made showing the unit or percentages of ammonia in the product. The price of the product per ton is then regulated by the price per unit according to the analysis.

Example:—Blood analyzing 16 per cent ammonia, and selling at \$2.00 per unit, would mean that the blood was worth \$32.00 per ton. A higher or lower analysis would increase or decrease the price. Concentrated

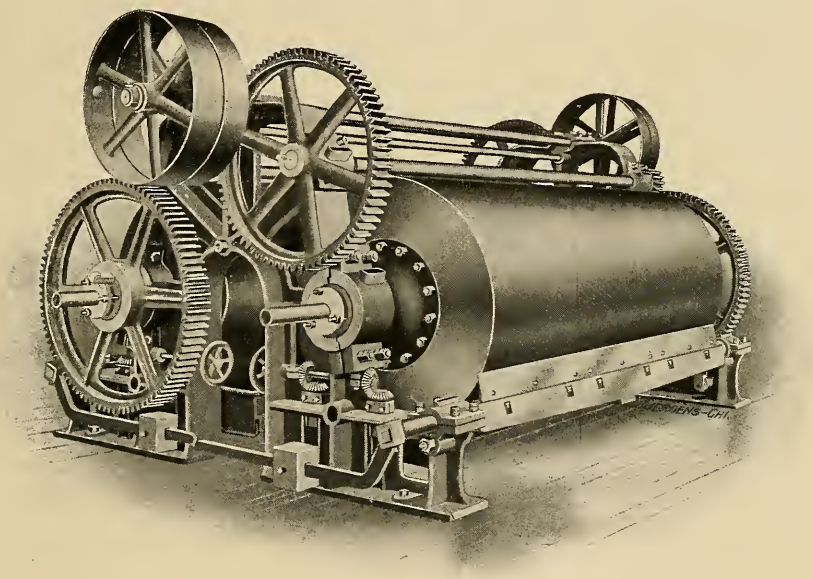


FIG. 77.—DOUBLE "STICK" DRYER.

tankage sells usually from fifteen to twenty-five points less than blood on this basis. It should run between 14½ and 16 per cent ammonia.

Another method of treating the tankage, and one more generally used, is to mix the tank water directly with the tankage, after the former has been reduced to 25° Baumé, the mass being dried in regular steam dryers. The addition of the tank water, of course, has the effect of increasing the ammonia in the tankage, thereby enhancing its value. Before the tank water can be used in this manner, however, it is essential that it be treated with chemicals, otherwise when the tankage containing this "stick" is dried it will, very soon after exposure to the air, become pasty and unsalable.

The method of treatment is as follows: The tank water, after being run off from the tanks, is held in a large vat or vats for from ten to twenty-four hours, at a temperature of 180° F., for the purpose of getting all the grease possible out of the water. It will be found that after allowing the water to stand for some time at this temperature, quite an amount of grease will rise upon it. The different vats of tank water are then tested with a Baumé hydrometer and for every 2,000 gallons of tank water at indicated degree, Baumé, ordinary commercial copperas should be added as follows:

Water	testing	5°	Baumé	166	lbs.	dry	copperas
"	"	4½°	"	150	"	"	"
"	"	4°	"	133	"	"	"
"	"	3½°	"	117	"	"	"
"	"	3°	"	100	"	"	"

These varying amounts of copperas are put into a barrel of hot water and thoroughly stirred until dissolved. The solution is then poured into the vat of tank water, the mass allowed to stand six or eight hours, and then skimmed off before being pumped to the evaporating machine. It is there reduced by evaporation to a density of 30° Baumé, when at a temperature of 180° F. It is next pumped into a storage vat so situated that it will gravitate onto the feeder of the dryer.

After the tankage has gone through the picker the "stick" is admitted to the regular tankage, the two going into the dryer together. The "stick" at this point, which is about the consistency of cold molasses, mixes readily with the ground tankage. In ordinary practice not to exceed 70 per cent of the " stick " produced from the tank water may be utilized in the fertilizer in this manner. If either of the above methods is used, a great saving is effected by thus handling this particular product, instead of letting it run out to the sewer, as is generally the case, especially in the smaller packing houses.

In order to realize the value of this product the reader is referred to the copy of a test, made by an expert, on a plant handling about 5,000 cattle and 5,000 hogs per week, as follows:

ESTIMATE OF THE PRODUCTION AND VALUE OF TANKAGE MADE BY EVAPORATING TANK WATER.

TEST FOR AMOUNT OF WATER DRAINED OFF VATS BEFORE PULLING TANKAGE.

Tank	Product	Gallons	Av. gallons
No. 1	Prime tallow (cutting room bones, etc.) ..	1,445	
No. 1	" " " " " " ..	1,734	1,589
No. 2	Prime tallow (bed fat, etc.).............	1,645	
No. 2	" " " "	1,365	
No. 3	" " " "	1,426	
No. 3	" " " "	1,827	1,566
No. 4	No. 2 tallow (catchbasin stuff)............	668	
No. 6	Pluck tank..............................	905	
No. 9	" "	562	
No. 10	" "	624	
No. 10	" "	847	735
No. 11	Prime steam lard........................	1,382	
No. 11	" "	1,248	1,315

TOTAL NUMBER OF TIMES TANKS FILLED AND COOKED.

Product.	No. Tanks
Prime tallow with cutting room bones....................	6
Prime tallow with bed fat, etc...........................	10
No. 2 tallow	6
Pluck tanks	13
Prime steam lard	6
Total	41

BASIS FOR ESTIMATE OF PRODUCTION.

No. of Tanks	Average contents gals.	Total contents gals.	Solids per gal. lbs.	Total solids lbs.	Per cent Ammonia	Units of Ammonia
6	1,589	9,534	0.88	8,390	16.76	1,406
10	1,566	15,660	1.03	16,130	16.89	2,724
6	668	4,008	.399	1,599	14.59	233
13	735	9,555	.763	7,290	16.85	1,228
6	1,315	7,890	.0481	380	16.00	61
..	....	46,647	....	33,789	16.73	5,652

Total units of ammonia per tank, 5,652. Average units of ammonia per tank, 16.73. 8 per cent of moisture, dry basis.

This production at $1.66 per unit would be worth $27.77 per ton, or the yearly production would bring $24,396.32.

Figuring the production of tankage to be 66,000 pounds per week and that with this could be mixed through the dryer 600 pounds or 107.3 gallons of "stick," 25° Baumé with each ton of dry tankage—then thirty-three times 600 pounds, or 19,800 pounds, would be the limit of production from the tank water.

The regular tankage runs on an average of 10 per cent ammonia and 16.4 bone phosphate, and as shown above the production from the tank water with 8 per cent moisture would run 16.73 per cent ammonia. The product would therefore consist of the following:

Materials	Weight pounds	Per cent Ammonia	Units Ammonia	Per cent Phosphate	Units Phosphate
Regular tankage......	66,000	10.00	6,600	16.4	10,824
Evaporated tank water	19,800	16.73	3,312	....	......
Total production....	85,800	....	9,912	....	10,824

Analysis, ammonia 11.55%, bone phosphate 12.62%
Value per ton $19.93, or for the yearly production, $44,459.84.

Should there be added worthless material sufficient to reduce the percentage of ammonia to 10, the following formula would apply:

Materials	Weight pounds	Per cent Ammonia	Units Ammonia	Per cent Phosphate	Units Phosphate
Regular tankage......	66,000	10.00	6,600	16.4	10,824
Evaporated tank water	19,800	16.73	3,312	....	......
Worthless material....	13,320	....	....	....	......
Total production....	99,120	....	9,912	....	10.824

Analysis, ammonia 10%; bone phosphate 10.92%.
Value per ton \$17.25½, or for the yearly production \$44,468.32

RECAPITULATION.

	Debit.	Credit.
Value of total production for one year..		\$44,468.32
Value of tankage for one year..........	\$30,030.00	
6 per cent interest on \$10,000 investment	600.00	
15 per cent depreciation on \$10,000 investment	1,500.00	
Additional labor, five men, "full time"...	2,340.00	34,470.00
Net profit on investment..........................		\$ 9,998.32

It will be noted from the recapitulation of this test that a depreciation of 15 per cent was allowed as well as 6 per cent interest on the investment, and at the same time it shows that \$10,000 could be saved annually on a product which prior to that time had been running into the sewers.

After a careful study of the tables and recapitulation as given above, any packer can compute the loss that he is actually sustaining by comparing the figures given with the volume of business which he is doing, and it will readily be seen that here is a product that is wasted in many cases that would yield handsome returns if handled as described.

The percentage of solids and liquids, as well as the respective weights in tank water at different degrees Baumé, are shown in the following table:

TABLE FOR TANK WATER.

Degrees Baume	Per cent solids	Per cent water	Weight of cubic foot	Weight of gallon
1	1.90	98.10	62.14	8.30
2	3.83	96.17	62.46	8.34
3	5.77	94.23	62.79	8.39
4	7.77	92.23	63.11	8.43
5	9.85	90.15	63.43	8.47
6	11.93	88.07	63.91	8.54
7	14.04	85.96	64.41	8.60
8	16.19	83.81	64.89	8.67
9	18.38	81.62	65.38	8.73
10	20.60	79.40	65.81	8.80
11	22.71	77.29	66.39	8.87
12	24.84	75.16	66.92	8.94
13	26.97	73.03	67.44	9.01
14	29.11	70.89	67.97	9.08
15	31.27	68.73	68.49	9.15
16	33.55	66.45	69.05	9.23
17	35.88	64.12	69.61	9.30
18	38.22	61.78	70.17	9.37
19	40.59	59.41	70.72	9.45
20	42.98	57.02	71.28	9.52
21	45.11	54.89	71.89	9.60
22	47.24	52.76	72.79	9.68
23	49.37	50.63	73.09	9.77
24	51.50	48.50	73.70	9.85
25	53.63	46.37	74.30	9.93
26	56.31	43.69	74.95	10.01
27	59.04	40.96	75.60	10.10
28	61.80	38.20	76.25	10.19
29	64.61	35.39	76.90	10.27
30	67.54	32.46	77.55	10.36
31	70.34	29.66	78.35	10.46
32	73.27	26.73	78.94	10.55
33	76.24	23.76	79.64	10.64
34	79.25	20.75	80.33	10.73
35	83.21	17.79	81.00	10.83

SERIES OF TESTS ON TANKING.

The following is a series of tests showing yield of various materials cooked in tank:

TEST ON TRIMMINGS AND SEAM FAT.

Trimmings and seam fat taken from 327 pieces of tripe (2,060 pounds finished plain tripe) to determine value to tank.

Weight to test tank 1,300 pounds, value $1.273 per 100 pounds. Cooked in test tank four hours at forty pounds pressure.

Yield of No. 1 tallow	21.92%;	285 lbs. @ $5.60 per cwt.	$15.96
Yield tankage	5.15%;	67 lbs. @ 17.50 per ton	.59
Total value			$16.55

TEST ON CONDEMNED HOGS—YIELD OF GREASE.

Condemned hogs to tank	954 lbs.	
Yield of white grease	467 lbs.	48.95%
Yield pressed tankage	173 lbs.	18.13%
Yield dry tankage	86 lbs.	9.01%

On the above the leaf lard was left in and heads off.

COMPARATIVE TEST OF SHEEP HEADS AND JAWS TO TANK AND BONE HOUSE.

325 sheep heads and jaws (cheeks off) to tank	765 lbs.		
Yield to tallow	73 lbs.	@ $ 0.06 per lb.	$4.38
Yield dried tankage	150 lbs.	@ 19.00 per ton	1.42
Total value			$5.80

Value, per head, $0.0178; tallow, 9.54%; dried tankage, 19.47%.

325 sheep heads and jaws (cheeks off) to bone house	765 lbs.		
Yield to tallow	51 lbs.	@ $ 0.07 per lb.	$3.57
Yield dried bones	177 lbs.	@ 18.00 per ton	1.59
Total value			$5.16

Value, per head, $0.0159; tallow, 6.66%; dried bones, 23.14%.

TEST ON TRIPE TRIMMINGS.

Green weight to tank	1,206 lbs.	
Yield prime tallow	356 lbs.	29.52%
Yield tankage	53 lbs.	4.39%

TEST ON CONDEMNED LIVERS.

Green weight to tank	1,010 lbs.	
Yield No. 2 tallow	42 lbs.	4.16%
Yield pressed tankage	206 lbs.	20.38%
Yield dry tankage	103 lbs.	10.19%

TEST ON CATTLE PECKS TO TANK.

Green weight to tank	1,306 lbs.	
Yield No. 2 tallow	16 lbs.	1.22%
Yield tankage	95 lbs.	7.27%

TEST ON CATTLE PAUNCHES TO TANK.

Green weight to tank	1,056 lbs.	
Yield prime tallow	94 lbs.	8.90%
Yield pressed tankage	106 lbs.	10.04%
Yield finished tankage	53 lbs.	5.02%

TEST ON HOG STOMACHS TO TANK, UNTRIMMED.

Killed, 240 pigs and 836 hogs, a total of 1,076.

Green weight to tank	2,845 lbs.	
Yield prime steam lard	1,275 lbs.	44.81%
Yield finished tankage	188 lbs.	6.60%

TEST ON WINDPIPES TO TANK.

Green weight to tank	880 lbs.	
Yield No. 1 tallow	141 lbs.	16.00%
Yield tankage	33 lbs.	3.75%

TEST ON SHEEP PAUNCHES AND PLUCKS TO TANK.

(Trimmings from sheep house.)

Green weight to tank	1,150 lbs.	
Yield No. 1 tallow	105 lbs.	9.13%
Yield pressed tankage	89 lbs.	7.73%
Yield dry tankage	45 lbs.	3.86%

TEST ON SHEEP (OFFAL).

Green weight to tanks	28,680 lbs.	
Yield tallow No. 1	4,538 lbs.	2.28 lbs. per head
Yield tallow No. 2	730 lbs.	.37 lbs. per head
Yield tankage	2,893 lbs.	1.46 lbs. per head

TEST ON NECK TRIMMINGS FROM KILLING FLOOR.

Green weight to tanks	880 lbs.	
Yield No. 1 tallow	397 lbs.	45.11%
Yield dry tankage	49 lbs.	5.56%

TEST ON SHEEP FEET TO TANK.

Green weight to tank	1,170 lbs.	
Yield No. 2 tallow	40 lbs.	3.42%
Yield dry tankage	148 lbs.	12.65%

CHAPTER XI.

BEEF TRIMMINGS.

PICKLING FORMULA.

In the slaughtering of live stock in large numbers there is a great accumulation of trimmings which has to be cured for the sausage room or canning department, as the case may be. The following formula will serve for the curing of beef, pork and sheep cheek meat and hearts, hanging tenderloins and other meats for sausage and canning purposes.

To 1,100 gallons of seventy-degree pickle dissolve seventy-nine pounds saltpetre. Use this pickle for the curing of beef cheek meat, pig snouts, pork cheek meat, sheep cheek meat, ox-lips, beef hearts, etc. This material is usually cured in vats and should be overhauled in five, fifteen and thirty days after being packed. (The above pickle costs about three quarters of a cent per gallon.)

WEASAND MEAT.

This is a meat which is taken off the weasands. It is a low grade of meat and is at times " tanked " rather than saved, when trimmings are cheap. When saved it should be packed in tierces, and to a tierce of 400 pounds sprinkle thoroughly through same, when packed, a mixture of twenty pounds of salt and one pound of saltpetre.

The goods should be held in storage at from 37° to 40° F. during the process of curing.

BEEF TONGUES.

This is a part of the animal which it is very essential should receive careful attention from the time it is taken out of the head, until it is cured. The tongue should be left perfectly smooth on the bottom, leaving on all the fat. When it is taken from the head it should be cut close to the jaws, taking off with it all the fat possible, as it is worth much more on the tongue than if left on the head. After the tongue has been thoroughly washed in water of from 70° to 80° F. (washing off all the blood and saliva), it should be hung in a cooler on a small hook at the point where it is cut off from the jaw, the point of the tongue also being put on the same hook. This gives the tongue a compact appearance, but if it is hung up by the point alone when warm, its own weight stretches it out of shape, and it never looks as well as when hung as described.

Tongues should be hung in a temperature of from 34° to 38° F. for forty-eight hours, after which they are trimmed, according to size and demand, into either long or short cuts. "Long cut tongue" means that the gullet and about two joints of the windpipe are left on. In "short cut tongue" the gullet is entirely cut away. Long cut tongue should average not less than five pounds in weight. When thoroughly chilled they are ready for curing. They should first be put into a plain pickel, eighty degrees strong, at a temperature of 38° to 40° F. for twenty-four hours. This is done to remove all the saliva from the tongue, which has the effect of making the pickle "strong," if the tongues are put direct into the curing pickle.

After treatment with plain pickle they are put into a sweet pickle to be cured, the sweet pickle consisting of 280 pounds of salt, English salt being preferable, to which is added ten pounds of saltpetre and twenty-four pounds of sugar to each 160 gallons of water. This should be stirred well to insure thorough dissolving of the ingredients. The tongues are then put into barrels, hogsheads or vats, as the case may be, and sufficient pickle put on to submerge them. At the end of five days they should be shifted from one package to another, and at the end of fifteen days they should be re-handled, this being done to bring the pickle into thorough contact with the different pieces. Tongues should be fully cured at the end of thirty days, ready to smoke, or for shipment. When tongues are packed in barrels, after being fully cured, they should be packed, 202 pounds to the barrel, filling the package up with the same pickle in which they were cured. They are then ready for shipment.

The trimmings from the tongue, after being chilled, should be retrimmed, as there is considerable fat on these trimmings that makes good No. 2 oleo oil.

As there is an increased demand for tongues in the warm months over any other part of the year, where they are produced in large quantities, it is very advantageous to hold them frozen until the demand for them develops. In freezing them it is necessary that they should be put in a very low temperature and frozen quickly, as if handled otherwise it has a tendency to give them an undesirable color when cured.

In some instances it is advisable to freeze tongues, holding them in this condition until there is a demand for them, when they can be thawed out, cured, and smoked as required. The following test will give an accurate yield of tongues thus handled, showing the percentage of shrinkage, freezing, curing and smoking:

TEST ON FREEZING BEEF TONGUES.

	Lbs.	Per cent.
Weight of twenty-five 5½-lb. beef tongues to freezer..	140	
In freezer one week—weight	138	
Freezing shrinkage	2=	1.43
Taken from freezer to leacher—weight	138	
Leached twenty hours in city water—weight	144	
After leaching, drained twelve hours—weight	142	
Gain leaching from frozen to drained weight	4=	2.90
Gain leaching from green to drained weight	2=	1.43
After leaching—pickled—weight to pickle	142	
Rubbed in salt and packed in bbls. with seventy-deg. pickle to remain for forty-five days; overhauled in forty days, and five days later dumped at forty-five days weight	141	
Drained eight hours—weight	139	
Shrinkage from green to cured—drained weight.	1=	0.71
Shrinkage from leached to cured—drained weight	3=	2.11
Weight from cellar to smoke house	139	
Smoked fifteen hours—average temperature, 116° F.—smoked weight	117	
Shrinkage to smoked from green weight	23=	16.43
Shrinkage to smoked from leached weight	25=	17.60
Shrinkage to smoked from cured weight	22=	15.82

CANNING TONGUES.

Canning tongues are tongues usually taken from light cattle, and from which all the fat is trimmed. The bones are removed from the gullet, leaving nothing but the lean part of the tongue for canning purposes.

The following tests will show the cost of converting "long cuts" into "short cut tongues" and "canning tongues," indicating that the heavier the tongues the less they are worth for canning purposes, for in trimming, the depreciation is less on light tongues than on heavy ones. As will be noted, in each instance the trimmings are worth less than the original tongue; therefore it increases the price of the trimmed product, as shown in the second line of each test:

TEST NO. 1.

Converting long cut tongues, average four pounds, into short cut tongues:

Ten long cut tongues	40¾ lbs.	@	$0.09¾	$3.9731
Ten short cut tongues	34¾ lbs.	@	.1127	
Lean trimmings	3 lbs.	@	.02¼	.0675
Fat	1 lb.	@	.02½	.0250
Bones	2 lbs.	@	.00½	.0100
				$0.1025
Cost of trimming tongues and meat				.0470
				$0.0555

Cost per pound of short cut tongues, $0.1127.

The same short cut tongues converted into canning tongues:

Ten short cut tongues	34¾ lbs.	@	$0.1127	$3.9163
Ten canning tongues	23¾ lbs.	@	.1573	
Lean trimmings	4½ lbs.	@	.02¼	.1012
Fat	5 lbs.	@	.02½	.1250
Bones	1½ lbs.	@	.00½	.0075
				$0.2337
Cost of trimming tongues and meat				.0530
				$0.1807

Cost per pound canning tongues, $0.1573.

TEST NO. 2.

Converting long cut tongues, average four and one-half pounds, into short cut tongues:

Ten long cut tongues	45½ lbs.	@	$0.09¾	$4.4362
Ten short cut tongues	38½ lbs.	@	.1137	
Lean trimmings	3 lbs.	@	.02¼	.0675
Fat	1 lb.	@	.02½	.0250
Bones	3 lbs.	@	.00½	.0150
				$0.1075
Cost of trimming tongues and meat				.0470
				$0.0605

Cost per pound short cut tongues, $0.1137.

The same short cut tongues converted into canning tongues:

Ten short cut tongues	38½ lbs.	@	$0.1137	$4.3774
Ten canning tongues	26½ lbs.	@	.1578	
Lean trimmings	4½ lbs.	@	.02¼	.1012
Fat	5½ lbs.	@	.02½	.1375
Bones	2 lbs.	@	.00½	.0100
				$0.2487
Cost of trimming tongues and meat				.0530
				$0.1957

Cost per pound canning tongues, $0.1578.

TEST NO. 3.

Converting long cut tongues, average five pounds, into short cut tongues:

Ten long cut tongues	50½	lbs. @	$0.10¼	$5.1762
Ten short cut tongues	43	lbs. @	.1191	
Lean trimmings	3¼	lbs. @	.02¼	.0631
Fat	1	lb. @	.02½	.0250
Bones	3½	lbs. @	.00½	.0125
				$0.1006
Cost of trimming tongues and meat				.0480
				$0.0526

Cost per pound short cut tongues, $0.1191.

The same short cut tongues converted into canning tongues:

Ten short cut tongues	43	lbs. @	$0.1191	$5.1213
Ten canning tongues	10	lbs. @	.1633	
Lean trimmings	4½	lbs. @	.02¼	.1012
Fat	6¼	lbs. @	.02½	.1563
Bones	2	lbs. @	.00½	.0100
				$0.2675
Cost of trimming tongues and meat				.0530
				$0.2145

Cost per pound canning tongues, $0.1633.

TEST NO. 4.

Converting long cut tongues, average five and one-half pounds, into short cut tongues:

Ten long cut tongues	54½	lbs. @	$0.11½	$6.2700
Ten short cut tongues	46¼	lbs. @	.1340	
Lean trimmings	3	lbs. @	.02¼	.0675
Fat	1¼	lbs. @	.02½	.0312
Bones	4	lbs. @	.00½	.0200
				$0.1187
Cost of trimming tongues and meat				.0470
				$0.0717

Cost per pound short cut tongues, $0.1340.

The same short cut tongues converted into canning tongues:

Ten short cut tongues	46¼	lbs. @	$0.1340	$6.2000
Ten canning tongues	33	lbs. @	.1800	
Lean trimmings	4¾	lbs. @	.02¼	.1068
Fat	6½	lbs. @	.02½	.1625
Bones	2	lbs. @	.00½	.0100
				$0.2793
Cost of trimming tongues and meat				.0540
				$0.2253

Cost per pound canning tongues, $0.18.

LIVERS.

There is no edible part of the animal which becomes stale and out of condition as quickly as the liver, it being, naturally, a very large percentage water, and only by the most careful attention will they keep a very great length of time unless they are frozen. The vital point in handling livers successfully is to keep them dry. In all large houses where many cattle are slaughtered a special truck is used for conveying livers promptly from the killing beds.

Complete details of the truck described above are shown in Fig. 78 on the following page.

As soon as they are taken from the animal they should be trimmed, care being taken that in cutting the gall bag from the liver they are not contaminated with the gall, and that they are placed in a cooler as quickly as possible. This is the only piece of meat, in the author's estimation, that should be subjected to an artificial circulation of air.

They should be allowed to hang in the air current for twenty-four hours at a temperature of from 33° to 36° F. and, before being exposed to the outside temperature, should be thoroughly wiped, removing any moisture that may be left on the outer surface. If the livers are thus carefully treated it will be found that they will stand exposure and keep in good condition much longer than they otherwise would.

At certain times of the year it is profitable, when there is a limited demand for livers, to freeze them for the winter trade. Where this is done it will be found that if they are first properly dried and chilled, they freeze in much better condition than if put into the freezer when they are full of moisture. They should be frozen at a temperature as near zero F. as possible, for

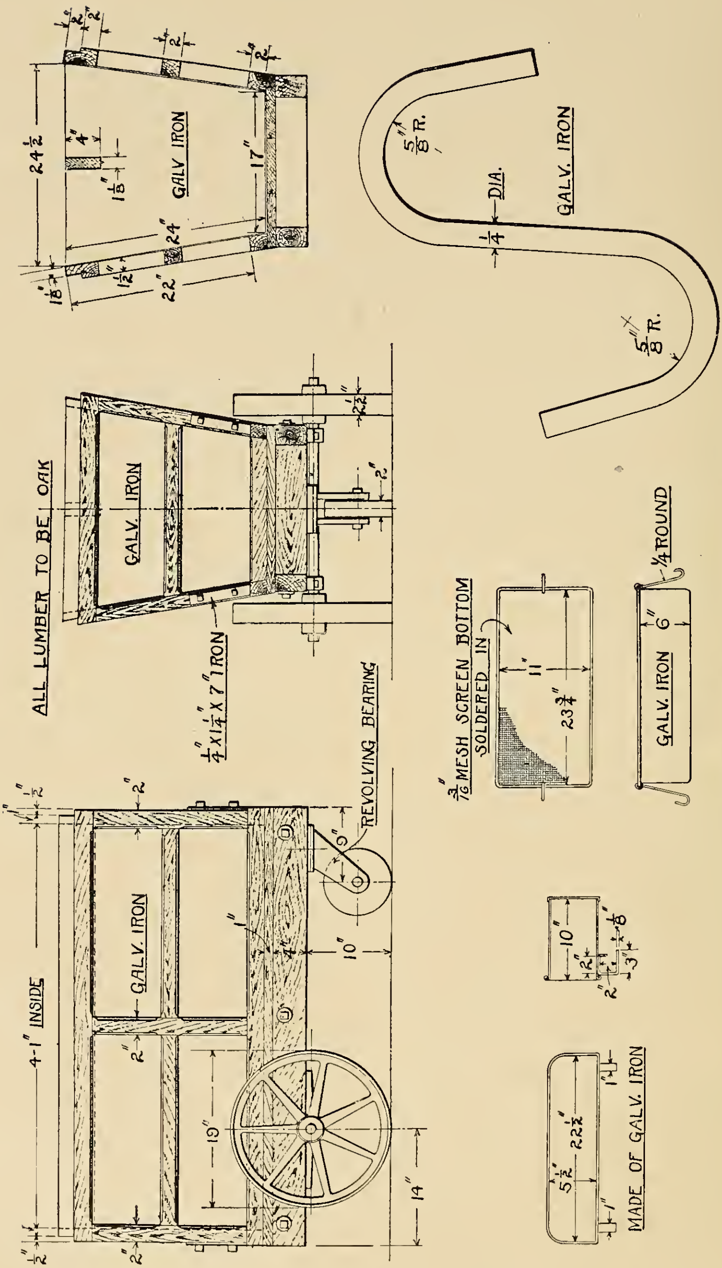


FIG. 78.—DETAIL OF KILLING BED LIVER TRUCK.

if frozen quickly they retain their natural color, whereas, if they are put into a higher temperature and the freezing is delayed, they will have a dark appearance when thawed out. Many packers make a practice, in shipping livers, to sprinkle them with powdered borax, this having a tendency to prevent them from becoming wet and out of condition, but it greatly injures their appearance, and if they are handled properly in the first place it is generally an unnecessary precaution.

DEFROSTING ROOM.

Wherever meats are frozen in order to hold them for future use it is very important that the best method possible be used in thawing out or defrosting them. If the meat is simply placed in a warm room without any special air circulation, the frost, as it comes out of the meat, condenses the moisture in the air upon its surface, leaving it wet and giving it a very unattractive appearance, the meat turning dark; whereas if the meat is thawed in a room properly equipped for this purpose, it comes out with a bright, attractive appearance, and only the trained eye of an expert could tell whether the meat had been frozen or not.

An approved design for a modern defrosting room is shown in Fig. 79. Above the room where the meats are stored is a brine loft for the refrigerant, which may be either ice and salt, exposed brine, brine pipes, or direct expansion. In the thawing room proper is built a skeleton table, the top being covered with galvanized iron. Beneath this table should be located pipes through which steam may be admitted. The heat, rising, comes in contact with the metal top of the table, which, being an excellent conductor, imparts it to the meat placed thereon. With the refrigeration above and the heat from the steam coils below a very rapid circulation of air is produced in the cooler. The warm, moist air rising from the meats deposits its moisture on the pipes, leaving the surface of the meats dry. This room should be held at a tempera-

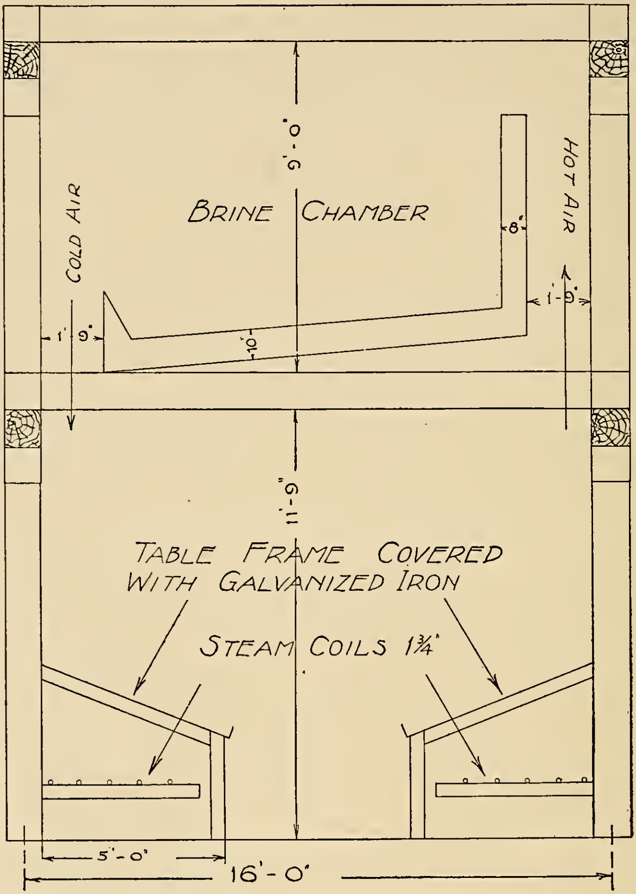


FIG. 79.—DIAGRAM SHOWING DESIGN FOR A MODERN DEFROSTING ROOM.

ture of 42° to 46° F. Ribs and loins can be defrosted in a room of this kind in from eight to twelve hours, and will come out looking bright, firm and fresh and as there is always a difference of from one cent to three cents a pound, according to the demand either for frozen or fresh meats, it is obvious that it greatly enhances the values of the meat if it is properly frozen and properly defrosted. It is only within the last few years that the great advantage of handling frozen meats properly has been realized.

SWEETBREADS.

This is a delicate piece of meat and practically the only one in the packing house that improves by being kept in water. The sweetbread should be cut out when the animal is stuck, thereby avoiding the danger of their becoming bloody and discolored. After they have been washed and all fat trimmed off, they should be put in ice water in the coolers and there held over night; the next day they are ready for shipment and should be packed in cracked ice.

If they are to be frozen they should be allowed to drain properly before placing them in the freezers. A low temperature is very essential for the preservation of sweetbreads, as well as for livers, in order to have them come out with the best possible appearance. When frozen quickly they retain a bright, clean appearance when thawed out. If they are frozen slowly they turn to a slate color when thawed out and have a very undesirable and unwholesome look, which materially operates against their being disposed of to advantage.

Western or range cattle yield a very small proportion of sweetbreads, they being undeveloped by the animal when living in their natural state. Cattle which have been fattened in feed lots, however, yield very much larger sweetbreads.

BEEF HEARTS.

This piece of meat is of small value and is generally used in sausage and canning, largely in the former. The hearts after being taken from the animals are trimmed and washed and should be hung in a cooler where there is a temperature of from 34° to 38° F. After they are thoroughly chilled they are used for sausage purposes, either fresh or cured.

TAILS.

There is little to be said on the handling of tails, except that they should be kept clean, for if handled carelessly and allowed to become stained it is impossible ever to get them clean afterward, and it is always preferable not to wash them, as this has a tendency to discolor them when chilled. If they are to be frozen they should be put into the freezer under a low temperature in order to have them come out in the most desirable condition.

BEEF HAMS.

Where cattle are cut up in large quantities it is nearly always impossible to sell the rounds fresh, there being comparatively small demand for round steak. It is, therefore, necessary to work up this particular part of the meat into some other product, which is done by making what is known as "beef hams," whenever the rounds are of proper weight. The very lightest rounds, or rounds out of canning cattle, are generally used for canning purposes, they being too light to suit the trade for "beef hams."

STRIPPING BEEF HAMS.

In preparing "beef hams" the rounds are cut off from the cattle by what is known as the "packing house cut," which leaves a larger piece of meat from the rump on the round, as compared with the ordinary cut. This piece is what is known as the "knuckle" piece of the rounds. Rounds cut this way are considered regular.

When rounds are stripped that were cut for market they are known as short knuckled rounds and are not accepted by the trade as regular.

From the knuckle of the round, before it is stripped, is removed the fell, or covering, this being skinned off, and the seam of the knuckle followed around by the knife, cutting clear to the bone. The round is then hung on a hook and an incision made just above the stifle joint and the knuckle piece peeled off from the bone. The round is then turned on the hook and opened clear to the bone, making what is known as the "inside-and-outside piece" of the round.

In opening the round what is known as the "kernel fat" should be equally divided. The round is then stripped off, leaving the coarse meat on the shank. These three pieces are what is known as regular beef hams when packed in sets. When separated they are known as "insides," "outsides" and "knuckles." These hams, before being marketed, are cured and smoked and are sold at retail for what is known as dried beef, the largest sale for this particular kind of meat being in warm weather.

On the manner in which beef hams are cured depends, to a great extent, their sale, as the object in curing is to have them not too salty, thoroughly cured through, and of a bright and attractive color when smoked. There are different methods of curing but the following method and formula are used in the largest plants in this country for the curing of this product.

METHOD OF HANDLING AND FORMULA FOR CURING BEEF HAMS.

The hams when cut from the cattle should be either spread out or hung up in a room held at a temperature of from 33° to 35° F., for twenty-four hours, thereby insuring the elimination of all animal heat. They are then best cured in vats holding 1,000 pounds each; many, however, cure them in tierces or barrels.

The formula for the pickle used is as follows: For 1,500 gallons of 80-degree strength pickle, add 300 pounds granulated sugar, 105 pounds saltpeter and twenty-five pounds borax. Where a smaller amount of pickle is wanted make it proportionate to above. When the meat is packed in vats, as it is being thrown in sprinkle in a little fine salt. The vat should then be filled with above pickle and a rack or weight put on the top to keep the meat submerged. The hams should be overhauled three times, first in ten days, again twenty-five days later and again forty days after the second overhauling. Beef hams should be considered fully cured in from seventy-five to eighty-five days. If cured in tierces or barrels, these should be rolled at the same periods as in the case of the vats, giving the pickle a thorough chance to get at all parts of the meat.

Another formula which is used very extensively by some of the largest packers where beef hams are packed and cured exclusively in barrels, is as follows: Dissolve 150 pounds of saltpetre in hot, 88-degree pickle, made from Ashton or "Perfect" dairy salt, a sufficient amount of pickle being used to make fifty-two gallons when dissolved. It is necessary to heat the pickle in order to dissolve this amount of salt. Add 450 pounds of granulated sugar and sufficient cold 88-degree pickle to make 200 gallons of the finished solution. This is then chilled to a temperature of 40° to 45° F. One gallon of this solution is put into each barrel before commencing to pack the meats.

When packing the meat in barrels, use twenty-three pounds of Ashton, or "Perfect" dairy salt, sprinkling same between the layers as they are put in. When the barrel is packed and coopered, fill with water at a temperature of 40° to 45° F., barrels to be rolled in ten, thirty and fifty days after being packed. They should be stored in a temperature of from 38° to 40° F. if they are to be used in ninety days. If they are to be held for five or six months they should be kept at a temperature of 35° to 39° F. for the first thirty days and thereafter at a temperature of from 28° to 29° F. until used. Meats cured with this formula will be found to have a very good color and flavor and at the same time will not be too salty. In putting the meat in packages, pack 215 pounds green weight per barrel. The following is a smoking test on regular beef hams:

REGULAR OUTSIDES FOR SHIPMENT.

	Packed	Wt. lbs.	Per cent.
Twenty-three tcs. dry packed 449 lbs. each, marked weight 440 lbs. each	1,127 pcs.	10,327	
Twenty-three tcs. dumped to smoke, actual weights	1,127 pcs.	10,215	
Pounds loss while in storage		112	
Per cent loss while in storage			.0128
Culls not smoked	44 pcs.	235	
Actual weights to smoke	1,083 pcs.	9,980	
Smoked weights	1,083 pcs.	7,099	
Shrinkage in smoking		2,881	
Per cent shrinkage in smoking			.2887

Smoked 108 hours, temperature 112° to 128° F.

REGULAR INSIDES FOR SHIPMENT.

	Packed	Wt. lbs.	Per cent.
Sixteen tcs. dry packed, 449 lbs. each, marked weight 440 lbs. each	497 pcs.	7,184	
Sixteen tcs. dumped to smoke, actual weights	497 pcs.	7,027	
Pounds loss in storage		157	
Per cent loss in storage			.02119
Culls not smoked	8 pcs.	73	
Actual weights to smoke	489 pcs.	6,954	
Smoked weights	489 pcs.	5,351	
Shrinkage in smoking		1,603	
Per cent shrinkage in smoking			.2304

Smoked ninety-six hours, temperature 112° to 124° F.

REGULAR KNUCKLES FOR SHIPMENT.

	Packed.	Wt. lbs.	Per cent.
Eight tcs. dry packed 408 lbs. each, marked weight 400 lbs. each	389 pcs.	3,264	
Eight tcs. dumped to smoke, actual weights	389 pcs.	3,190	
Pounds loss in storage		74	
Per cent loss in storage			.0227
Culls not smoked	1 pc.	4	
Actual weights to smoke	388 pcs.	3,186	
Smoked weights	388 pcs.	2,388	
Shrinkage in smoking		798	
Per cent shrinkage in smoking			.2505

Smoked ninety-four hours, temperature 112° to 128° F.

A great deal of dried beef is put up in glass jars under a vacuum, as well as in tin cans. Beef handled in this manner is cured by same formulas as given heretofore, but in smoking it is handled somewhat differently, being smoked less and dried more, it being necessary to have all the pickle and moisture evaporated from the meats in order to insure keeping.

After the meat has been handled as described it is generally put in smoke houses equipped with steam coils, the heat brought up to 110° to 120° F., and left to dry from three to four days. It then shows a shrinkage anywhere from 35 to 42 per cent. It is absolutely necessary to dry beef in this manner in order to make it keep satisfactorily when put in cans.

The following test will show the shrinkage of this product when smoked in the manner described above for canning purposes:

SHRINKAGE ON SMOKED DRIED BEEF HAMS.

	Packed.	Wt. lbs.	Per cent.
Thirty-two tcs. beef hams four months old, weight to smoke	1,461 pcs.	12,542	
Smoked weight	1,461 pcs.	7,254	
Shrinkage in smoking		5,287	
Per cent shrinkage in smoking			42.15

Smoked eleven hours; temperature 112° to 139° F.; hanging in house to dry, seventy-two hours.

PLAIN PICKLE FORMULA.

The following formula will be found to turn beef out in very nice shape and with a good color. This is for plate beef, rump butts, briskets, clods, and all trimmings of a similar character:

To 1,500 gallons of 100-degree strength pickle add ninety-eight pounds saltpeter. It will be found necessary to dissolve the saltpetre before putting it into the pickle.

FORMULA FOR PRESERVATIVES.

The following formula for a preservative is used very successfully on fresh meats to prevent mold. It can also be used in boxing fresh meats for freezer, to aid in preserving:

7 pounds salt.
25½ pounds sulphate soda.
55 pounds borax.
12½ pounds boracic acid.

This should be thoroughly mixed, in a powdered form. For cheek meat or other trimmings, which it is desired to hold fresh as long as possible, use two and one-half pounds to 100 pounds of meat. Eight ounces of the mixture to 100 pounds of meat, in pork sausage, will greatly aid in the keeping.

Beef cuts which it is desired to keep fresh, if dipped into a solution of this mixture, equal to two pounds of the powder to each gallon of water, will be found to retain their fresh appearance. It will also aid in the prevention of mold.

TRIPE.

Tripe is an article for which there is a large demand in the eastern and New England states, comparatively little of it being consumed in other states, while there is not a very great foreign demand. It is made from the stomachs of cattle and is a very wholesome and nutritious dish. Fresh tripe is often ordered by doctors for patients convalescing from typhoid fever, on account of its being so nutritious and easily digested.

The stomach, after being emptied of its contents and thoroughly washed, is put into a small kettle, or vat, and scalded, the temperature of the water being from 140° to 160° F. After a few minutes immersion the inside lining of the stomach may be easily removed. When sufficiently scalded it is scraped, leaving a clean, white surface. After the scraping it is put into a boiling vat and boiled for about three hours, or until it is tender. It is then put into cold water and after being chilled, the fat from the seams is all removed and the "finishing process" begins by first scraping off all the loose fat with a sharp scraper and then removing a membrane on the outside of the stomach, which, when worked carefully, comes off, leaving the "tripe" perfectly clean and free of any fat, etc.—the tripe being the muscular part of the stomach.

The tripe, after being thoroughly cleaned, is ready for the pickling cellar. It should first be put into a 45-grain white wine vinegar pickle for ten to fifteen hours. After it has been submitted to the first pickling it is ready to be put into barrels and the vinegar in which it was first pickled should be strengthened with full-strength vinegar, making it again 45-grain, when it is packed in barrels and should be held in a temperature of from 45° to 50° F.

There is a remarkable gain in tripe if it is properly handled. A barrel of tripe packed at 135 pounds, at the end of three weeks, will weigh out 200 pounds and sometimes as high as 215 pounds. This is because the tripe absorbs the vinegar, and it is very essential in storing tripe that it be kept at a temperature where this absorption can take place, for if it is kept in too cool a temperature it will not take up the vinegar as it should, consequently the gain will not be found when the package is opened. The following test will show the gain in a barrel of honey-comb and a barrel of plain tripe, one barrel of each being packed in 45-degree vinegar and one barrel of each in 60-degree vinegar:

TEST PACKING TRIPE HOT DIRECT FROM FINISHING TABLE.

	Lbs.		Per cent.
One barrel honey-comb, 45-degree vinegar, 95 pcs. packed weight	125		
Held in cellar for two weeks and unpacked, weight	227		
Gain	102	=	81.60
Drained over night on racks, weight	183		
Loss draining from pickled weight	44	=	19.38
Gain to drained weight from packed weight	58	=	46.40
One barrel honey-comb, 60-degree pickle, ninety-three pcs. packed, weight	125		
Held in cellar for two weeks and unpacked, weight	227		
Gain	102	=	81.60
Drained over night on racks, weight	194		
Loss draining from pickled weight	33	=	14.53
Gain to drained weight from packed weight	69	=	55.20
One barrel plain, 45-degree pickle, thirty-nine pcs. packed weight	125		
Held in cellar for two weeks and unpacked, weight	193		
Gain	68	=	54.50
Drained over night on racks, weight	182		
Loss draining from pickled weight	11	=	5.70
Gain to drained weight from packed weight	57	=	45.60
One barrel plain, 60-degree pickle, thirty-eight pcs. packed weight	125		
Held in cellar two weeks and unpacked, weight	201		
Gain	76	=	60.80
Drained on racks over night, weight	184		
Loss draining, from pickled weight	17	=	8.45
Gain to drained weight from packed weight	59	=	47.20

Temperature all pickle when put on tripe 65° F. Temperature cellar, from 50° to 52° F.

The following test shows the cost of 100 tripe, including packages and vinegar:

TEST ON 100 TRIPE FINISHED.

100 regular bellies	2,053 lbs.	average weight		20.53 lbs.
Honey-comb	400 lbs.	"	"	4.00 lbs.
Plain	1,653 lbs.	"	"	16.53 lbs.

Debits:

5 barrels	$0.80	each	= $4.00
75 gallons 45-grain vinegar	.02½	per gallon	= 1.88
100 bellies	.1309	each	= 13.09
Labor and expense	1.08	per cwt. finished	= 7.13
Total			$26.10

Credits:

Scrapings to tank	312 lbs.			
Yield tallow	15 lbs.	$0.0525 per lb.	$0.79	
Yield dry tankage	75 lbs.	14.00 per ton	.53	
Trimmings to tank	200 lbs.			
Yield tallow	8 lbs.	.0525 per lb.	.42	
Yield dry tankage	5 lbs.	14.00 per ton	.04	
Seam fat—finishing bench	83 lbs.			
Yield oil	25 lbs.	.1035 per lb.	2.59	
Grease from cooking into oil	75 lbs.	.6850 per lb.	5.14	$ 9.51
Total cost				$16.59

Cost per barrel, 135 lbs., $3.31; per cwt., fresh, loose, $2.51.

Green weight, 1,653 pounds; scraped, 1,333 pounds; cooked, 933 pounds; finished, 660 pounds.

PRESERVATIVE PICKLE FOR FRESH TRIPE.

Oftentimes there is a demand for fresh tripe and comparatively little for pickled, in which case the tripe is kept fresh by a preservative made as follows:

100 gallons of water.
20 pounds boracic acid.
6 pounds of borax.
5 pounds of fine salt.

Mix thoroughly until ingredients are all dissolved; chill to a temperature of 45° F. Use same as vinegar. Fresh tripe thus handled will keep perfectly for two or three weeks in temperatures ranging from 40° to 50° F.

A dry solution is often used on tripe where it is to be shipped or held fresh without a pickle, consisting of:

12 ounces boracic acid.
12 ounces borax.
16 ounces fine salt.

All thoroughly mixed and sprinkled on the tripe. This amount of powder is sufficient for 100 pounds of fresh tripe. Tripe handled properly will keep in this preservative for two or three weeks.

TRIPE TESTS.

The following tests show the cost of tripe in different packages, the cost of packages and vinegar being figured at the market prices at the time tests were made:

FRESH REGULAR TRIPE.

1,500 pieces tripe at 75c per 100	$11.25
Labor, scalding	3.15
" scraping	15.00
" cooking	1.71
" inspecting	3.42
" finishing	25.61
" inspecting	1.00
" weighing	.83
" miscellaneous	3.50
General expense, consisting of administrative cost, steam, power, electric light, etc., at 49c per 100 lbs	62.74
Total cost	$128.21

Finished weight, 12,805 pounds; cost per pound, 1c.

FIVE TIERCES PRESERVATIVE REGULAR TRIPE, 1,425 POUNDS.

1,425 pounds tripe at 1c per pound	$14.25
Five tierces at $1.12	5.60
Packing	.30
Pickle	1.50
Coopering	.13
Miscellaneous labor	.10
Total cost	$21.88

Cost per cwt., $1.46; cost per tierce, $4.37.

FIVE BARRELS PRESERVATIVE REGULAR TRIPE, 1,000 POUNDS.

1,000 pounds tripe at 1c per pound	$10.00
Five barrels at 80c	4.00
Pickle	.45
Packing	.13
Coopering	.08
Miscellaneous labor	.10
Total cost	$14.76

Cost per cwt., $1.48; cost per barrel, $2.95.

FIVE HALF-BARRELS PRESERVATIVE REGULAR TRIPE, 365 POUNDS.

365 pounds tripe at 1c per pound	$ 3.65
Five half-barrels at 36c	1.80
Pickle	.30
Packing	.09
Coopering	.06
Miscellaneous labor	.08
Total cost	$ 5.98

Cost per cwt., $1.49; cost per half-barrel, $1.19.

SIX QUARTER-BARRELS PRESERVATIVE REGULAR TRIPE, 216 POUNDS.

216 pounds tripe at 1c per pound	$ 2.16
Six quarter-barrels at 20c	1.20
Packing	.06
Pickle	.14
Coopering	.04
Miscellaneous labor	.08
Total cost	$ 3.68

Cost per cwt., $1.54; cost per quarter-barrel, $0.61.

TEN EIGHTH-BARRELS PRESERVATIVE REGULAR TRIPE, 180 POUNDS.

180 pounds tripe at 1c per pound	$ 1.80
Ten eighth-barrels at 18c	1.80
Packing	.06
Pickle	.20
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 3.96

Cost per cwt., $1.98; cost per eighth-barrel, 40c.

TEN KITS PRESERVATIVE REGULAR TRIPE, 140 POUNDS.

140 pounds tripe at 1c per pound	$ 1.40
Ten kits at 14c	1.40
Packing	.03
Pickle	.15
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 3.08

Cost per cwt., $2.00; cost per kit, 31c.

FRESH HONEY-COMB TRIPE.

820 honey-comb tripe at 15c per 100	$ 1.23
Labor, scalding	.27
" scraping	2.05
" cooking	.29
" finishing	2.20
" inspecting	.50
" miscellaneous	.27
General expense, consisting of power, steam, electric light, etc., at 49c per cwt	4.90
Total cost	$11.71

Finished weight, 1,000 pounds; cost per cwt., $1.17.

FIVE TIERCES PRESERVATIVE HONEY-COMB TRIPE, 1,425 POUNDS.

1,425 pounds tripe at $1.17 per cwt	$16.67
Five tierces at $1.12	5.60
Packing	.44
Pickle	2.75
Coopering	.19
Miscellaneous labor	.09
Total cost	$25.74

Cost per cwt., $1.72; cost per tierce, $5.15.

FIVE BARRELS PRESERVATIVE HONEY-COMB TRIPE, 1,000 POUNDS.

1,000 pounds tripe at $1.17 per cwt	$11.70
Five barrels at 80c	4.00
Packing	.26
Pickle	.45
Coopering	.08
Miscellaneous labor	.09
Total cost	$16.58

Cost per cwt., $1.65; cost per barrel, $3.32.

FIVE HALF-BARRELS PRESERVATIVE HONEY-COMB TRIPE, 365 POUNDS.

365 pounds tripe at $1.17 per cwt	$ 4.27
Five half-barrels at 36c	1.80
Packing	.09
Pickle	.27
Coopering	.06
Miscellaneous labor	.08
Total cost	$ 6.57

Cost per cwt., $1.64; cost per half-barrel, $1.31.

SIX QUARTER-BARRELS PRESERVATIVE HONEY-COMB TRIPE, 216 POUNDS.

216 pounds tripe at $1.17 per cwt	$ 2.53
Six quarter-barrels at 20c	1.20
Packing	.09
Pickle	.13
Coopering	.04
Miscellaneous labor	.08
Total cost	$ 4.07

Cost per cwt., $1.70; cost per quarter-barrel, 68c.

TEN EIGHTH-BARRELS PRESERVATIVE HONEY-COMB TRIPE, 180 POUNDS.

180 pounds tripe at $1.17 per cwt	$ 2.11
Ten eighth-barrels at 18c	1.80
Packing	.06
Pickle	.20
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 4.27

Cost per cwt., $2.13; cost per eighth-barrel, 43c.

TEN KITS PRESERVATIVE HONEY-COMB TRIPE, 140 POUNDS.

140 pounds tripe at $1.17 per cwt	$ 1.63
Ten kits at 14c	1.40
Packing	.03
Pickle	.15
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 3.31

Cost per cwt., $2.31; cost per kit, 33c.

TEN EIGHTH-BARRELS PICKLED REGULAR TRIPE, 200 POUNDS.

200 pounds tripe at $0.0113 per pound	$ 2.26
Ten eighth-barrels at 18c	1.80
Packing	.06
Pickle	.20
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 4.42

Cost per cwt., $2.21; cost per eighth-barrel, 44c.

TEN KITS PICKLED REGULAR TRIPE, 140 POUNDS.

140 pounds tripe at $0.0113 per pound	$ 1.58
Ten kits at 14c	1.40
Packing	.03
Pickle	.15
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 3.26

Cost per cwt., $2.17; cost per kit, 33c.

PICKLED HONEY-COMB TRIPE.

820 pieces honey-comb tripe at 15c per 100	$ 1.23
Labor, scalding	.27
" scraping	2.05
" cooking	.29
" finishing	2.20
" inspecting	.50
Miscellaneous labor	.27
Curing charges	2.25
General expense, consisting of power, steam, electric lights, etc.	4.97
Total cost	$14.03

Cooked and finished weight, 1,000 lbs.; cured weight, 1,100 lbs.
Gain, 10 per cent; cost, $0.0128 per lb.

FIVE TIERCES PICKLED HONEY-COMB TRIPE, 1,425 POUNDS.

1,425 pounds tripe at $0.0128 per pound	$18.26
Five tierces at $1.12	5.60
Packing	.30
Pickle	2.75
Coopering	.13
Miscellaneous labor	.10
Total cost	$27.14

Cost per cwt., $1.81; cost per tierce, $5.43.

FIVE BARRELS PICKLED HONEY-COMB TRIPE, 1,000 POUNDS.

1,000 pounds tripe at $0.0128 per pound	$12.80
Five barrels at 80c	4.00
Packing	.15
Pickle	.43
Coopering	.08
Miscellaneous labor	.10
Total cost	$17.56

Cost per cwt., $1.76; cost per barrel, $3.51.

FIVE HALF-BARRELS PICKLED HONEY-COMB TRIPE, 365 POUNDS.

365 pounds tripe at $0.0128 per pound	$ 4.67
Five half-barrels at 36c	1.80
Packing	.09
Pickle	.30
Coopering	.06
Miscellaneous labor	.08
Total cost	$ 7.00

Cost per cwt., $1.75; cost per half-barrel, $1.40.

SIX QUARTER-BARRELS PICKLED HONEY-COMB TRIPE, 216 POUNDS.

216 pounds tripe at $0.0128 per pound	$ 2.77
Six quarter-barrels at 20c	1.20
Packing	.06
Pickle	.14
Coopering	.04
Miscellaneous labor	.08
Total cost	$ 4.29

Cost per cwt., $1.71; cost per quarter-barrel, 71c.

TEN EIGHTH-BARRELS PICKLED HONEY-COMB TRIPE, 200 POUNDS.

200 pounds tripe at $0.0128 per pound	$ 2.56
Ten eighth-barrels at 18c	1.80
Packing	.06
Pickle	.20
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 4.72

Cost per cwt., $2.36; cost per eighth-barrel, 47c.

TEN KITS PICKLED HONEY-COMB TRIPE, 140 POUNDS.

140 pounds tripe at $0.0128 per pound	$ 1.79
Ten kits at 14c	1.40
Packing	.03
Pickle	.15
Coopering	.04
Miscellaneous labor	.06
Total cost	$ 3.47

Cost per cwt., $2.31; cost per kit, 35c.

CHAPTER XII.

SHEEP DRESSING AND CHILLING.

THE STRING GANG.

The increased consumption of mutton has been very marked in this country in the last fifteen years. Prior to that time, while there were many sheep raised unsystematically, mutton, except in the large centers, was comparatively little used. The packers by being able to obtain sheep in large quantities at the local live stock centers, and with their superior distributing facilities, soon created a demand for mutton at points where previously there had been very little demand for it. As a consequence there has been a large increase in the production of sheep and the consumption in this country has in all probability more than doubled during the last ten years.

It is a meat for which many must acquire a taste, but it is very healthful and nutritious. At the central abattoirs, where government inspection is in force, comparatively few diseases, or few diseased sheep, are found, this particular kind of live stock proving to be much healthier than either cattle or hogs. The people of England, as compared with those of all other civilized nations of the earth, are the largest consumers of mutton and a notable lack of cancerous troubles among them is attributed by the medical profession generally to the fact that they consume individually a greater proportionate amount of this meat.

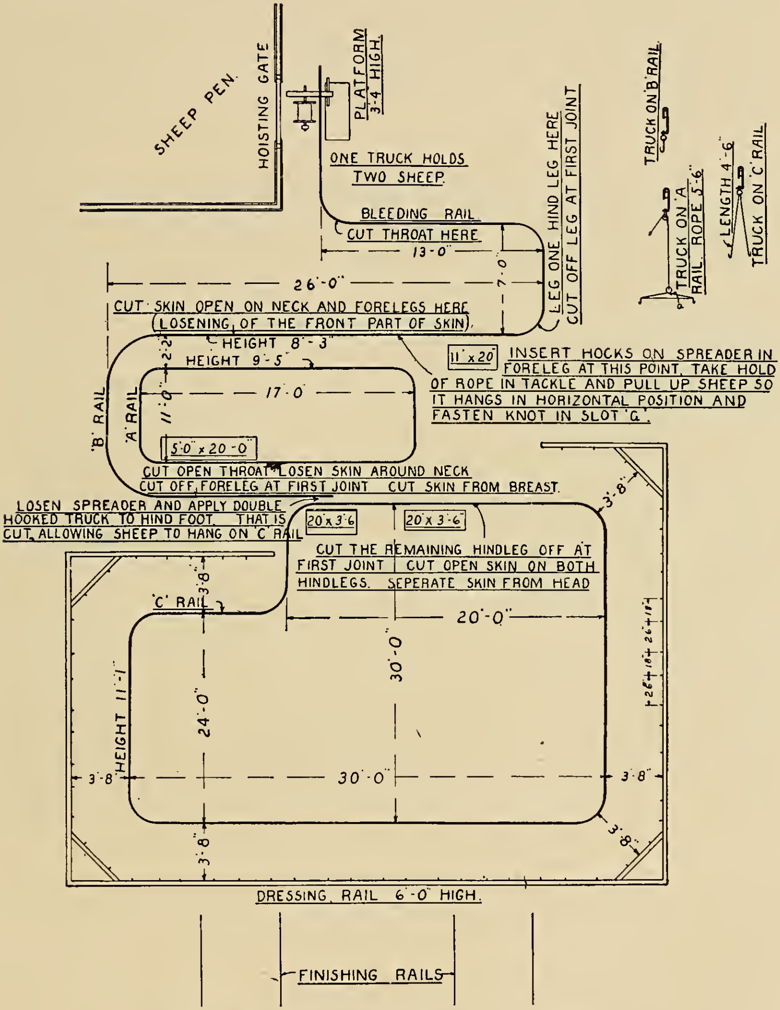


FIG. 80.—DIAGRAM SHOWING ARRANGEMENT FOR SHEEP KILLING WITH "STRING GANG."

THE STRING GANG.

In the economic distribution of labor about the modern packing house, probably no other department can show the benefit accruing from same to greater advantage than has been found in sheep slaughtering. The effects of this division of labor in any department are first, economy, and second, better workmanship. It is natural that a man performing one particular operation day after day becomes more expert than if he were doing

FIG. 81.—HOISTING SHEEP TWO AT A TIME TO STICKING RAIL.

various kinds of work. Formerly sheep were slaughtered largely on a piece-work basis, one man dressing the sheep throughout. With the modern method each man does one particular part of the work, becoming very quick and expert in his line, consequently in dressing sheep by what is known as a "string gang," the improvement, as compared with the old method when each man dressed his own sheep, is very marked.

In Fig. 80 is shown in detail a sheep killing arrangement where a string gang is operated. In a space 80 x 32 feet in size 2,000 sheep per day can be handled readily by means of this method. The sheep are hoisted with a double shackle, two at a time, and the work is continuous from there on until they are dressed, the sheep never touching the floor again, which means a great saving of labor over the old way of handling sheep by hand entirely. This diagram illustrates the different processes in the arrangement; also gives height of rails, trucks, spreaders and hooks used on the different rails. Wherever a volume of thirty sheep per hour or over are being slaughtered a saving can be effected by adopting this method of handling.

In Fig. 81 is shown how the sheep are handled by means of a hoist, two at a time, and hung on the sticking rail. Where sheep are killed in large numbers, it is advantageous to hoist two at a time as shown. The men shackling become very expert and can shackle two in practically the same time that they can one, and if a gang are running on a capacity of five hundred per hour, it will be seen that considerable time is gained by doing it in this manner.

In Fig. 82 a string gang at work killing and dressing sheep is shown. A gang sufficient to handle 300 sheep an hour should have at least thirty-six to forty sets of hooks, or, in other words, facilities for working on thirty-six to forty sheep at one time on the dressing rails. As will be noted in the table of wages given on page 241, the work is divided up into a great many different parts, which is very necessary, as in slaughtering animals so rapidly one man has time to do but comparatively little on each animal; hence the necessity of having a sufficient number of carcasses hanging up at one time to allow the

FIG. 82.—VIEW OF A "STRING GANG" AT WORK KILLING AND DRESSING SHEEP.

different men time to do their respective parts. The numbers above given are found to be the most advantageous, as, if there are but a few carcasses on which to work at one time, the help is crowded and unable to do the work satisfactorily. If there are too many carcasses at one time, they show a tendency to become too dry and discolored before being washed; hence it is necessary to get the best results as to workmanship and quantity of work performed, to have the right number of carcasses hanging all the time.

Another important feature in the working of a string gang is the economy of space obtained, a room 32 x 100 feet in size being ample in which to kill 250 sheep an hour, whereas under the old system when each man slaughtered and dressed his own sheep, this space would not accommodate to exceed seventy an hour.

SHEEP DRESSING.

In the dressing of sheep the following suggestions will prove advantageous in turning out work with the best results, whether the sheep are dressed by day work, one man dressing them throughout, or whether they are handled by a string gang.

Legging.—This consists in opening up the skin around the legs and center of the body. In doing this work care should be taken that the skin be opened up as little around the necks and butts as possible, for wherever the skin is removed in the legging there is more or less stain on the meat, which it is impossible to wash off.

Pelting.—In removing the pelt from the carcass care should be taken that the "fell" is not broken in any part, for wherever this is broken, the meat will show the effect of age, and will present a very unsightly appearance.

Methods of Dressing.—This is a part of the work which is very hard to describe, as the dressing at different points varies to such an extent that there are hardly two large cities where the methods are alike, especially in the case of lambs. Generally speaking mutton is round dressed, using no back sets and not using the caul. Lambs are dressed according to localities, some round dressed, same as mutton, others with double back sets and the caul on, others with single back sets and the ribs broken and still others with inside sets, in every instance the caul being left on. In general, however, the point to be watched in all this work is that it be done in a neat and workmanlike manner, neatness in all cases being extremely essential.

When the mutton is run immediately into a well-built refrigerator where the proper circulation and temperatures can be maintained, there is no danger in using an excess amount of water in the washing. A wash cloth made of ten to fifteen thicknesses of very loosely woven cheese cloth, quilted together, makes an excellent cloth with which to wash sheep. This, in connection with plenty of hot water, will give a bright and attractive appearance to the meat.

Where the dressed mutton is not run into a cooler, and outside air is depended upon for chilling, very little water should be used, the meat simply being wiped with a rag, made as heretofore described, wringing same out in hot water.

Sheep should always be kept in dry pens before killing, for if their fleece is allowed to become dirty, it is practically impossible to prevent the meat from becoming stained. Where the sheep get wet and muddy it is found of great advantage to hold them for a time in pens with two to four inches of dry sawdust on the floor, this sawdust having the effect of cleaning and drying the legs and under part of the body so that after slaughtering, when the pelt is removed, the meat may be kept much cleaner than otherwise.

The rates of wages paid sheep butchers in Chicago is given in the following table:

TABLE OF WAGES FOR SHEEP BUTCHERS.

No. men	Position	Rate per hour	Total per hour
1	Foreman ($23.00 per week)	$0.38⅓	$0.38⅓
1	Sealer	.22½	.22½
1	Driving up	.12½	.12½
1	Shackler	.18½	.18½
1	Hoister (also marks joints)	.22½	.22½
1	Sticker (also breaks joints)	.25	.25
1	Forequarter hoister	.20	.20
1	Forequarter legger (also skins joints)	.27½	.27½
1	Shoulder puncher	.20	.20
2	Brisket pullers (also helps legger)	.30	.60
1	Scalper (also helps jaw skinner)	.21	.21
1	Cutting down " "	.20	.20
3	Hind leggers (also punches cods)	.27½	.82½
1	Swinger off	.20	.20
1	Shoving sheep (also hangs to ring)	.20	.20
1	Ripping down	.24	.24
3	Pelters	.37½	1.12½
3	Rumpers (also pull backs heel up)	.26	.78
1	Header	.22½	.22½
1	Scrubber	.17½	.17½
1	Breast splitter	.27½	.27½
1	Gutter	.22½	.22½
1	Neck trimmer	.17½	.17½
1	Caul puller	.26½	.26½
2	Dressers	.32½	.65
1	Rib cutter	.42½	.42½
1	Setting up	.37½	.37½
1	Legger	.20	.20
2	Pick up guts and pelts	.17½	.35
2	Rack men	.17½	.35
2	Set and skewer boys	.12½	.25
4	Scrubbers and wipers	.17½	.70
1	Pinning up legs	.12½	.12½
1	Cooler men	.17½	.17½
2	Gut fat pickers	.15 .16½	.31½
1	Scrap vat	.10	.10
51			$10.80⅓

Average kill, 150 sheep per hour; average cost, $0.072 per head.

FIG. 83.—VIEW IN SHEEP CHILL ROOM.

When dressing sheep with the "string gang," on this basis of wages, with skilled help, they should be dressed, including all expense of foreman, offal work, etc., for 7c per head.

CHILLING.

As fast as sheep are slaughtered they should be run directly into coolors, where they are hung on racks as shown in Fig. 83. If they are left out, and partially air-chilled, it has the effect of discoloring them about the legs and thin parts of the carcasses, causing these to look dark and less attractive than they do when placed in the cooler immediately after slaughtering. There is little or no danger of chilling sheep too fast, as long as the temperature is above 32° F., as the dressed carcass is not of sufficient thickness at any part to prevent the animal heat from escaping before decomposition can set in, and the colder the room into which they are put, as long as it is above the freezing point, the better will be the appearance of the mutton when it comes out of the cooler. Sheep chilled for twenty-four hours in proper coolers, and thoroughly dried and hardened, are ready for shipment or the cutting block. In many places, especially in Australia and South America, they are frozen; some few being frozen, of late, in this country for export. In such case, however, they should first be thoroughly chilled in a dry cooler where there is a good natural circulation of air, for twenty-four hours, after which they may be put into the freezers at a temperature as near zero as possible, so that the freezing will not be delayed. If they are frozen quickly they retain a clear, bright appearance when thawed out.

Sheep Pelts.—The handling of sheep pelts, especially in hot weather, requires careful attention. The pelts, as soon as taken off, should be spread out in a room where it is as cold as possible without being refrigerated, and allowed to cool off for at least twelve hours before salting. This is especially necessary when the animal slaughtered has a very heavy fleece; with shearlings there is little or no necessity for taking this precaution. Fleece skins, however, hold the animal heat, so that when put into a pack and salted, if not properly cooled, they soon begin to get warm and decompose, and as soon as the wool slips, the leather of the skin is ruined.

After the pelts have been spread out and allowed to thoroughly chill, as suggested, they should be salted in piles not to exceed thirty inches high by putting one skin on top of another, flesh side up, and using a fine solar salt, care being taken that they are thoroughly salted around the heads and leggings. After they have been in salt for a week, it is well, especially in warm weather, to overhaul them, shifting the packs so that when through, the top pelts are on the bottom and vice versa. After they have lain in salt for two weeks they are ready for shipment.

Lamb Tongues.—All tongues from sheep come under this head. After they have been cut out of the heads they should be thrown into ice water, washed and spread out on a table, or in pans, in the cooler at a temperature of from 34° to 38° F. for twenty-four hours. Following that they should be trimmed, cutting off the extra pieces of fat and the gullet. They are then ready for curing. They should be cured in a plain 75-degree strength pickle with six ounces of saltpeter to 100 pounds of meat, holding them in this pickle for a week or ten days. They are then ready for use, either in sausage or for cooking.

Pickled Lamb Tongues.—When tongues are pickled they are put up with a white wine vinegar and are handled as follows: After they are thoroughly chilled they are scalded sufficiently to take off the outside film or skin on the tongue. This is then scraped off with a hand scraper, or knife, and the tongue is trimmed, cutting off any parts that are discolored, or any loose pieces of fat. The tongues are afterward cooked until they are soft enough for the bone to pull out readily. No special time can be fixed upon for this work as the cooking varies greatly, according to the condition of the animals from which the tongues were taken, and it is well in cooking them to keep the sheep and lamb tongues separate.

After they are cooked and the bones are pulled out at the root of the tongue, they are ready for pickling. They should first be pickled in 45-degree vinegar for at least twenty-four hours, when they are ready to be packed in packages for shipment, using 40-degree vinegar by adding full strength fresh vinegar to the pickle they were first put in. In packing them in small packages especially, they are generally seasoned with coriander seed, bay leaves and sliced lemon.

LAMB TONGUES TESTS.

The following tests show yields of pickled lamb tongues at values prevailing at the time they were made:

TEST ON 1,000 PIECES OR 320 POUNDS LAMB TONGUES.

Cost of 1,000 pieces lamb tongues at ¾c each..	$ 7.50	
Scraping, 10c per 100 pieces	1.00	
Snouting, cooking, etc., one and a half hours, at 18c	.27	
Trimming at 5c per 100 pieces	.50	
Pickling, 10c per 100 pieces	1.00	
Miscellaneous labor	.17	
General expense, 42c per cwt. on 143 lbs. produced	.60	
		$11.04

Produced:

Green weight	320 lbs.
Cooked weight	143 lbs.
Shrinkage	177 lbs. or 55%

Credit 23 lbs. trimmings at 1½c per lb	$ .35
Cost of 143 lbs. of lamb tongues	$10.69

Cost per pound, $0.0747.

COST OF ONE BARREL OF LAMB TONGUES PACKED AT 190 POUNDS NET.

190 pounds lamb tongues at $0.0747 per pound	$14.19
One barrel	.78
Packing, one hour at 17½c	.18
Pickle, eleven gallons at 2½c	.28
Coopering, one-sixth hour at 25c	.04
Miscellaneous labor	.03
Cost of one barrel	$15.50

COST OF TWO HALF-BARRELS LAMB TONGUES PACKED AT SEVENTY-THREE POUNDS NET.

146 pounds lamb tongues at $7.47 per cwt	$10.91
Two half-barrels at 35c	.70
Packing, three-quarter hour at 17½c	.13
Pickle, nine gallons at 2½c	.23
Spices at 2c each	.04
Coopering, one-twelfth hour at 25c	.02
Miscellaneous labor	.02
Total cost	$12.05
Cost per half-barrel	6.03

COST OF THREE QUARTER-BARRELS LAMB TONGUES PACKED AT THIRTY-SIX POUNDS NET.

108 pounds lamb tongues at $7.47 per cwt	$ 8.07
Three quarter-barrels at 20c	.60
Packing, one-half hour at 17½c	.09
Pickle, seven and one-half gallons at 2½c	.19
Spices at 2c each	.06
Coopering, one-sixth hour at 25c	.04
Miscellaneous labor	.02
Total cost	$ 9.07
Cost per quarter-barrel	3.02

COST OF FIVE EIGHTH-BARRELS LAMB TONGUES PACKED AT EIGHTEEN POUNDS NET.

Ninety pounds lamb tongues at $7.47 per cwt	$ 6.72
Five eighth-barrels at 18c	.90
Packing, three-quarter hour at 17½c	.13
Pickle, seven and one-half gallons at 2½c	.19
Spices at 2c each	.10
Coopering, one-sixth hour at 25c	.04
Miscellaneous labor	.03
Total cost	$ 8.11
Cost per eighth-barrel	1.62

COST OF THIRTY KITS LAMB TONGUES PACKED AT FOURTEEN POUNDS NET.

420 pounds lamb tongues at $7.47 per cwt	$31.37
Thirty kits at 14c	4.20
Packing, one and three-quarter hours at 17½c	.31
Pickle, thirty gallons at 2½c	.75
Spices at 2c each	.60
Coopering, two-thirds hour at 25c	.17
Miscellaneous labor	.18
Total cost	$37.58
Cost per kit	1.25

CHAPTER XIII.

HOG SLAUGHTERING AND CHILLING.

INTRODUCTORY.

In no department of the packing industry has the progress, as well as the evolution, been so extensive as in pork packing. Only a few years ago, comparatively, it was considered impossible to kill hogs for packing purposes, except during the winter season, and the various packing plants located throughout the country worked during the winter months in their crude way, packing as many hogs as conditions would permit, turning out the cured meat in the spring, ready for delivery, in a very inferior condition and at a far greater cost to the consumer than is the case today.

Under the conditions then existing there was comparatively little of the hog that was sold fresh, for being killed as they were, in isolated places, there was little opportunity for handling fresh product quickly enough to make it available for general consumption, consequently fresh pork was sold only in the immediate vicinity of the slaughtering place and it was necessary to cure the balance. Under present methods, fresh pork product is shipped to England from Chicago and western points, and delivered in good condition to the consumer. When one stops to consider the advancement that has been made in the past decade in this particular line it seems almost impossible that a like progress could be made in the future, although doubtless, as is often said, the packing house business is still in its infancy.

REFRIGERATION OF HOGS.

The first important step in the evolution of "all-the-year packing" from "winter packing" was the introduction of the ice machine, and in the best managed packing houses today little or no regard is paid to the outside temperature, as the hogs when killed are run directly from the killing floor to the chill room. It is cheaper and safer to handle hogs with mechanical refrigeration than to depend on the outside air for chilling, for when they are partially air dried, or chilled, they may be over-chilled, or under-chilled, according to atmospheric conditions, whereas, if they are put into the cooler, the chilling and removal of the animal heat is under absolute control, and where it is thus handled the percentage of "sour" meat is reduced to a minimum—practically nothing. Under the older methods, where hogs were chilled with ice, with the most careful management, from 5 per cent to 15 per cent of the hams and shoulders soured, whereas under modern methods this will not average one-tenth of 1 per cent in well managed houses; it is therefore readily understood how the intelligent application of the modern refrigerating machine has caused an evolution which is astounding. Another great advantage over old methods is found in the transportation facilities that are now available. When killing hogs in large quantities the fresh pork product is practically all sold fresh, and a much greater revenue is derived from the hogs handled in this manner than when salted as formerly and sold in the shape of cured meats. With the present facilities for distribution the public at large can buy fresh pork at any time of the year, handled in the most approved and hygienic manner, while a few years ago it was impossible to obtain it at any price, unless the purchaser was located in the immediate neighborhood of the place when the animals were slaughtered.

THE HOG SLAUGHTER HOUSE.

The outlay for buildings for pork packing is very much greater than for beef packing, for in slaughtering

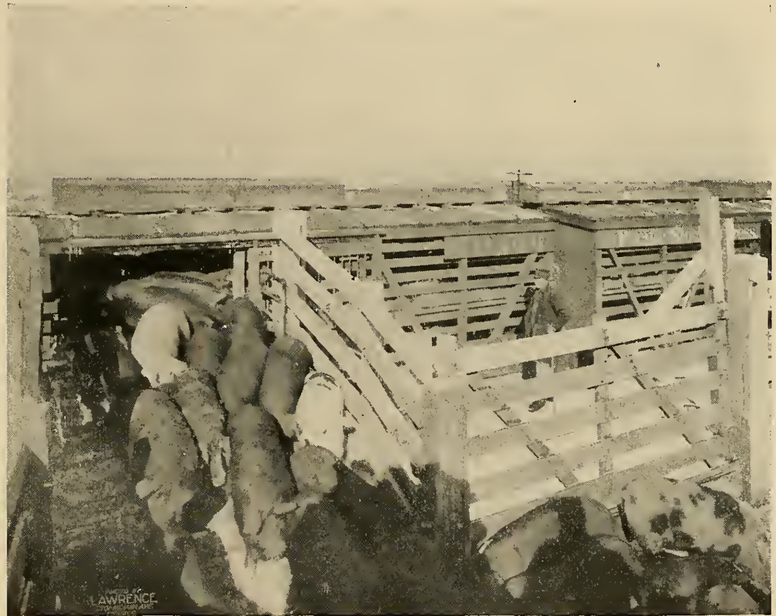


FIG. 84.—UNLOADING HOGS FROM CAR.

cattle there is comparatively little left behind that requires storage, but in slaughtering hogs fully 70 per cent of the carcass goes into the curing department, to stay there anywhere from thirty to ninety days; consequently a much larger and more expensive set of buildings is required than in the slaughtering of cattle. For instance, in the matter of chill room it is customary to

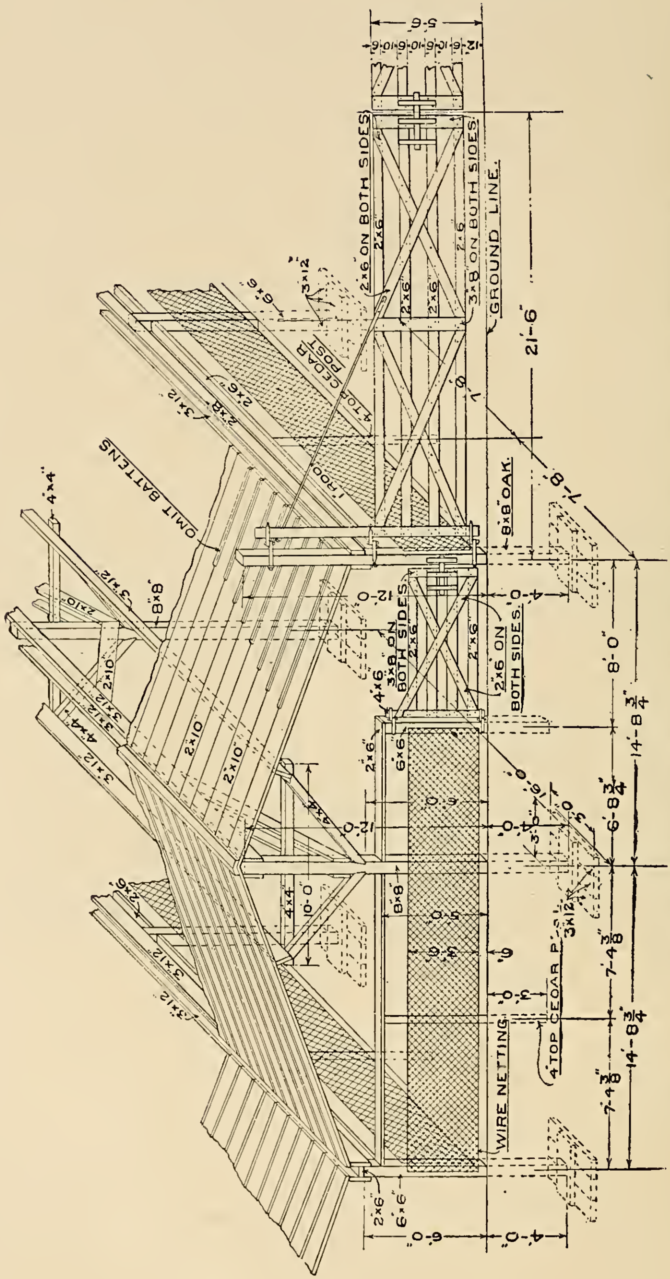


FIG. 85.—DIAGRAM OF COVERED PEN FOR HOGS AND SHEEP WITH DETAIL OF CONSTRUCTION.

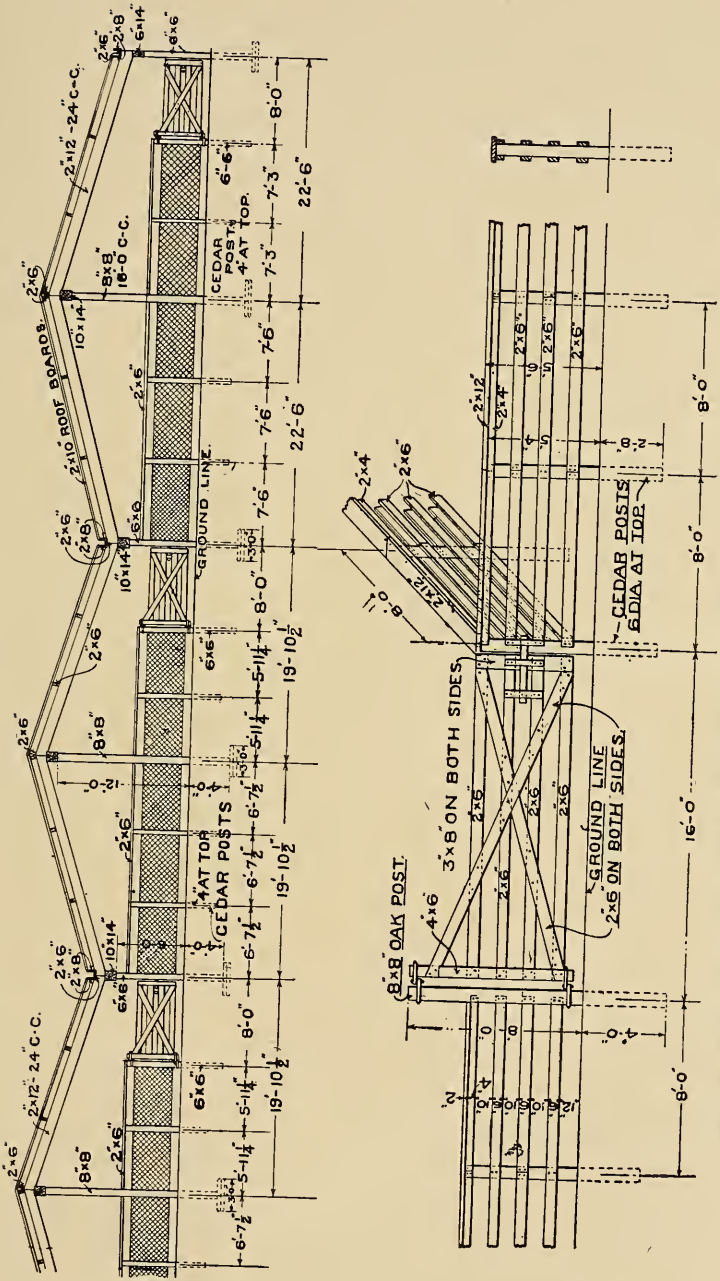


FIG. 86.—ELEVATION FOR COVERED PEN FOR HOGS AND SHEEP WITH DETAIL OF FENCE AND GATE.

figure cold storage for five times the hog hanging capacity; in other words, if a plant was to be built to kill a thousand hogs a day there should be hanging capacity for 2,500, and five times the hanging capacity should be in ordinary practice sufficient for curing the product, providing it is sold promptly as cured. If it is to be carried for any length of time a greater ratio than five to one should be used. This, of course, does not refer to any of the auxiliary departments of the plant but only to the cold storage, or chill room department.

In general practice it is considered essential that the killing should be done in the same building with the rendering department, thereby keeping all the offal near the tanks and reducing the labor to a minimum. It is always best to confine the chilling and curing to one building. It is cheaper in construction, if building anew, and it is of great advantage in the matter of insurance, which is always a very important item; and it is in keeping down the expenses in all lines that the profit of the business is realized. It is always advisable to have the chill rooms for the hogs on the top floors, as gravity is the cheapest force that can be employed to move the products from floor to floor for delivery to their various destinations.

HANDLING OF LIVE HOGS.

More care should be used in the handling of hogs than any other live stock as the hogs are much the heaviest for their size and strength and are, therefore, more easily injured. Special pens should be provided for their reception, details of a pen being shown in Figs. 85, 86 and 87. Hogs should never be killed until they are thoroughly rested and in as normal a condition as it is possible to have them. In taking them to the killing pens they should be handled carefully, and crowding and piling up avoided as much as possible. Many hams are injured by the hogs being driven roughly, causing them to pile on top of one another, spreading the lighter ones and thereby causing what is known to the trade as a

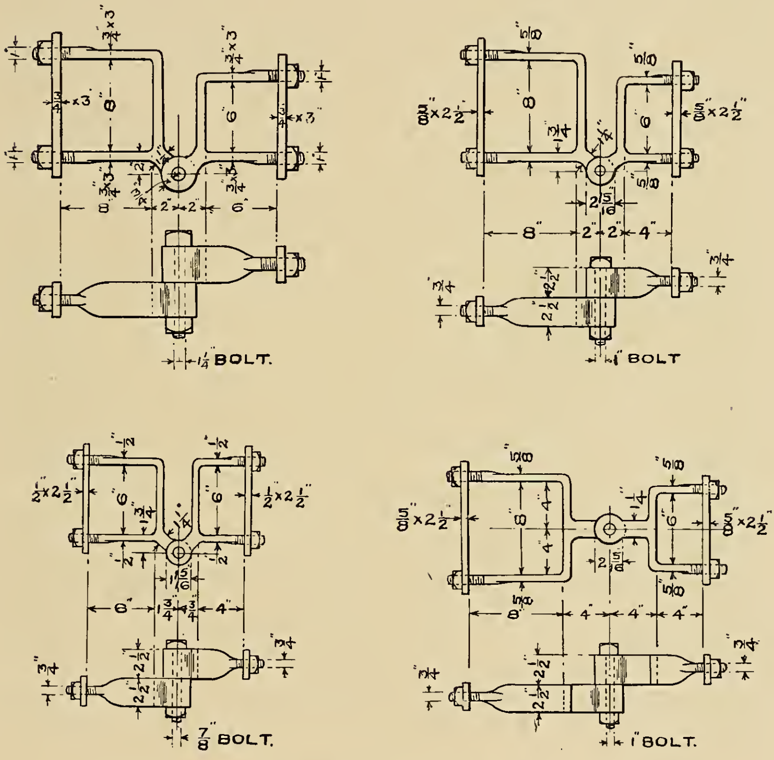


FIG. 87.—DETAIL OF HINGES FOR MODERN HOG PEN GATE.

" face bruised ham." Men driving hogs should not be allowed to use a whip, as they soon become careless and mark the hogs more or less. A better method is to use a paddle shaped stick about 18 inches or 2 feet long with a piece of canvas sewed onto it. With this canvas they can strike the hogs, and as it makes a noise it will do more toward driving them without injury than a whip, which marks them and injures the meat. At most of the large packing houses located in the great hog killing

FIG. 88.—HOGS RESTING AND COOLING OFF BEFORE BEING TAKEN TO THE SLAUGHTER HOUSE.

centers of the United States cooling pens are provided, directly adjoining the killing rooms (a good idea of which may be obtained from the view shown in Fig. 88), where the animals may rest after being driven from the storage or receiving pens. By permitting the animals to rest in these pens for a short period the abnormal amount of heat caused by excitement and fear is gotten rid of leaving them in much better condition for killing before they are taken to the slaughter house.

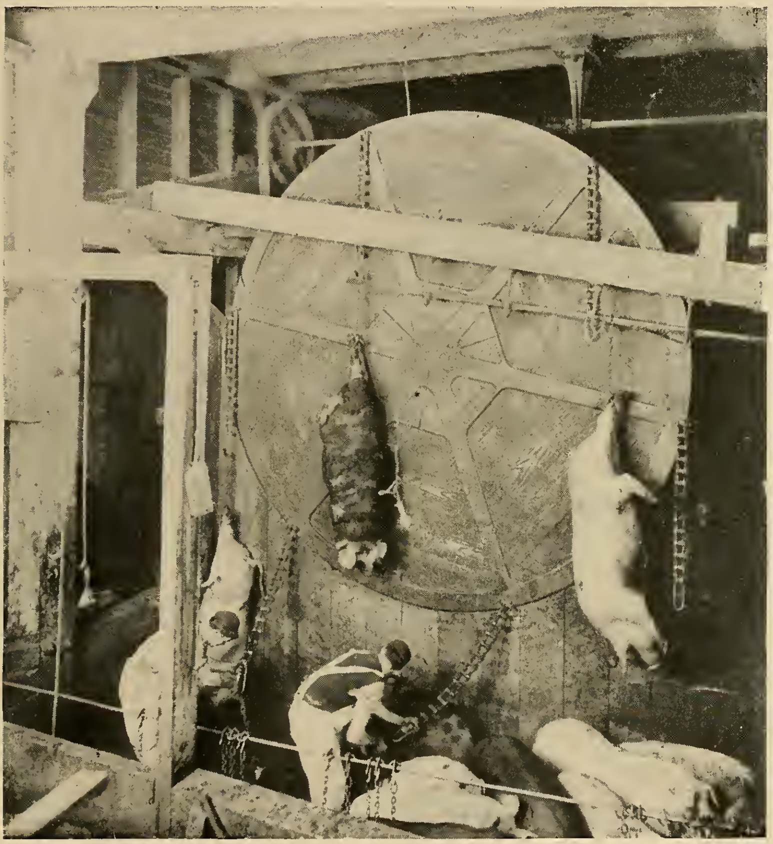


FIG. 89.—HOISTING HOGS ON A HURFORD REVOLVING WHEEL.

PENNING.

In handling hogs in the cooling pens, men should never be allowed to use sticks or clubs, but they should be provided with the canvas covered paddle already referred to and described in these pages, to urge on the hogs without bruising them. All gates and openings into closed pens should be large enough, so that the hogs will not crowd, or climb upon one another.

SHACKLING.

Men shackling should always be made to shackle the hind leg next to the revolving or Hurford wheel, so that

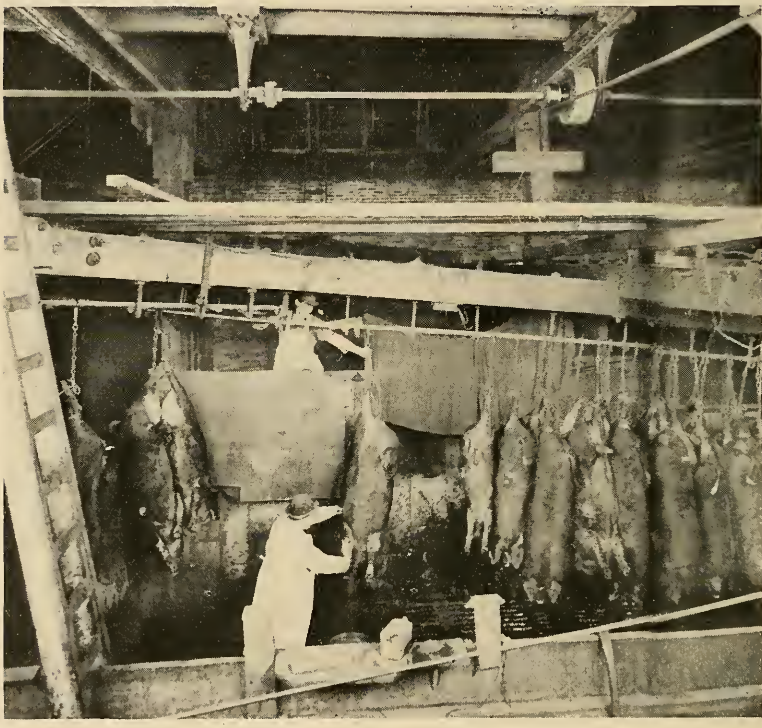


FIG. 90.—STICKING AND BLEEDING HOGS.

when the hog is raised, it is done with as little twisting effect as possible. As fast as the hogs are hoisted by the wheel, which operation is shown very clearly in Fig. 89, and run on the rail, they are stuck and bled, as shown in Fig. 90.

A small hoist, lifting but one hog at a time, as shown in Fig. 91, is often used and is not only a very useful and labor saving device but is also very economical from the fact that it does not jar or injure the hogs when being hung up, as is often the case with an ordinary hand hoist. This particular machine is adapted for small slaughter houses rather than where business is done on a large scale, in which case a double machine will be

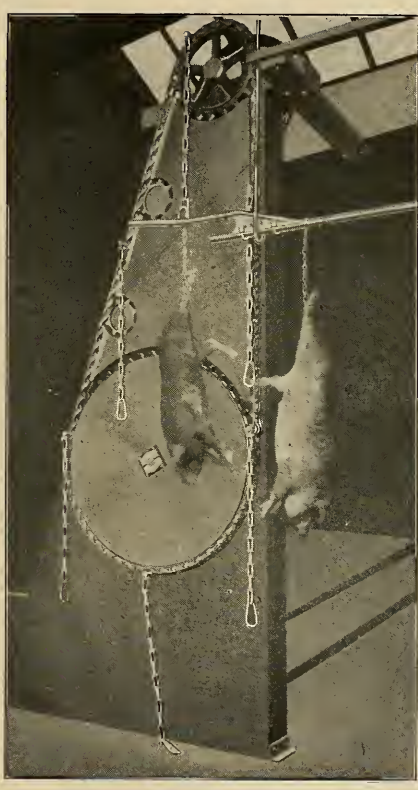


FIG. 91.—HURFORD SMALL HOG HOIST.

found to be almost indispensable. It is therefore generally in use in all large houses.

STICKING.

Men sticking hogs should be made to keep up close, sticking them just as fast as hung up. They should be instructed to make a good large opening in the neck, 3 or 4 inches long, in order to give the blood a good free flow. They should also be careful to see that they sever the veins and arteries; at the same time that they do not cut into the shoulder, as in that instance the blood settles there, and it becomes necessary to trim at considerable loss. It is advisable to have a daily report

FIG. 92.—HOG SCALDING.

made out from the cutting floor of all shoulder stuck hogs, having the sticker sign it daily, thereby showing him what kind of work he is doing. This quite frequently has the effect of making him more careful in his work.

SCALDING.

A great deal depends on this work, as to speed obtained, as well as to general appearance of the hogs when

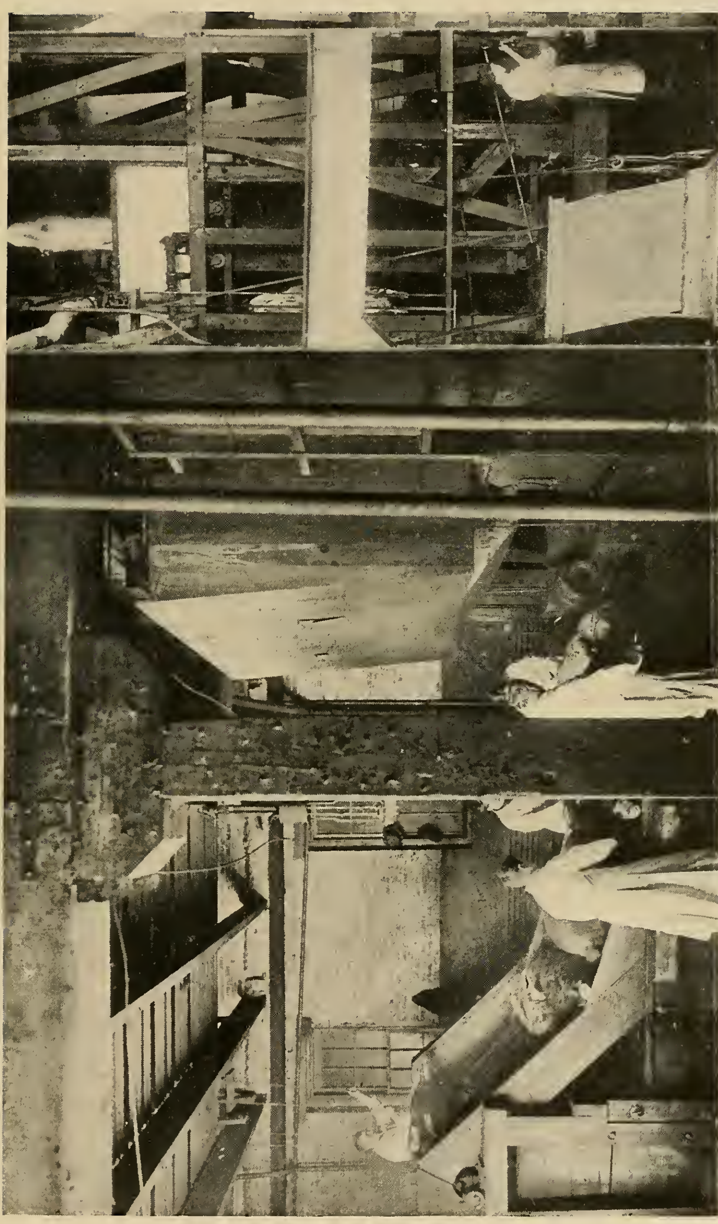


FIG. 93.—PULLING HOG BRISTLES. SCRAPING MACHINE IS SHOWN TO THE RIGHT.

dressed. Care should be used to see that water is kept at an even temperature, and that the hogs are thrown into the tub evenly. The scalder will sometimes become careless, and throw out hogs whether they are ready or not, or when rough ones are thrown in, which should receive careful attention, throw them out in their turn, instead of holding them back until properly scalded.

FIG. 94.—HOG SCRAPING GANG AT WORK.

These are points which should be followed very closely in hog dressing.

The operation of hog scalding as it is done on a large scale is illustrated in Fig. 92.

SCRAPING.

Pulling the bristles is shown in Fig. 93. From the bristle bench the carcass should be promptly put into the scraping machine, shown to the right in Fig. 93. All hair left on the hog after it comes through the machine should be scraped off as much as possible, instead of being shaven, as is often done. When it is left on the hog, and is shaven off after the meats are cured and smoked, the rind of the meat shrinks, leaving the hair sticking out in a rough, unsightly manner, disfiguring the meats. After having been scraped as well as possible, the skin should then be shaven, care being

FIG. 95.—CLEANING HOG CARCASSES.

used to see that all hair is taken off without scoring the hog.

Fig. 94 shows the scraping gang at work, and Fig. 95 the operation of cleaning the hog carcasses.

HAM FACING AND GUTTING.

In ham facing care should be used to see that the workmen cut off the fat down to the lean meat, and at the same time that they do not break the striffin. In gutting great care should be taken to see that the hams are opened centrally; also that the intestines are saved carefully, and that the work is done in a cleanly and tidy manner in every particular.

LEAF LARD.

Pulling the leaf lard, which is done just before the splitting (Fig. 96), is a part of the work that should be

FIG. 96.—SCRAPING LEAF LARD.

done with considerable care in order that the leaves may be pulled as clean as possible.

If this operation is performed in an indifferent and careless manner, a considerable amount of the leaf lard will be left in the carcasses and it is afterward scraped

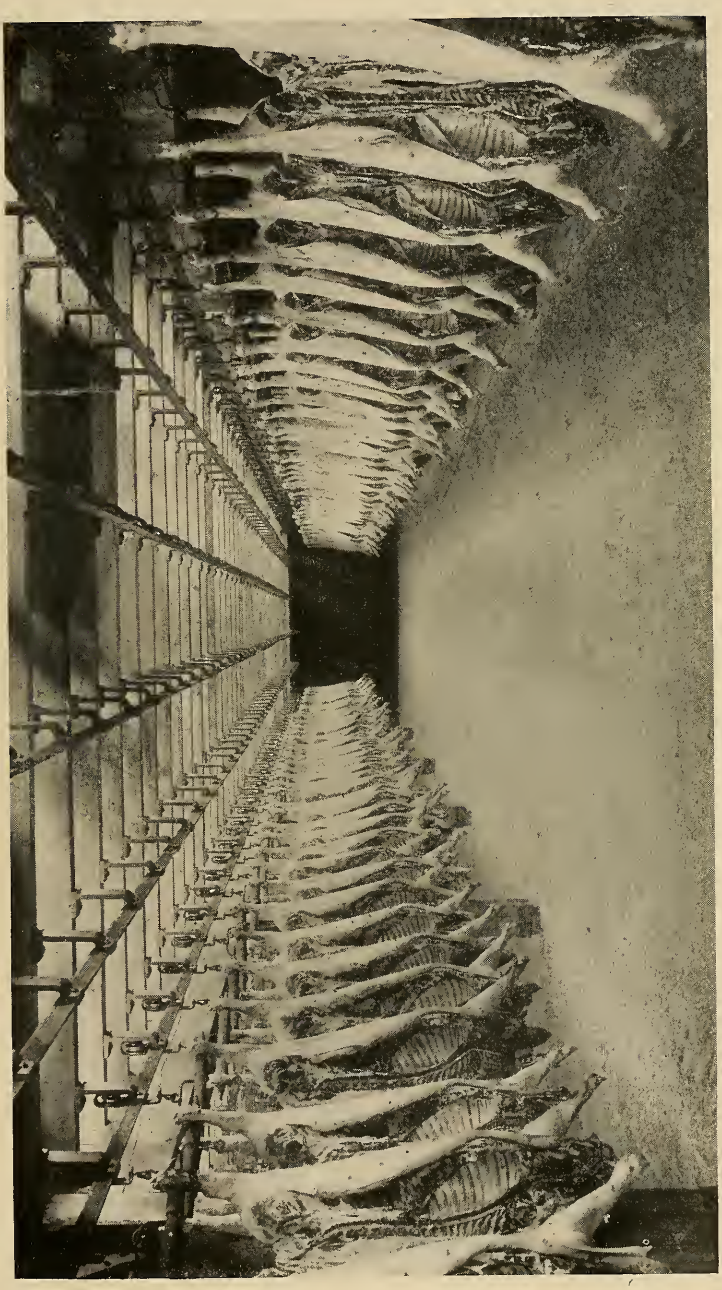


FIG. 97.—VIEW IN HOG CHILLING ROOM.

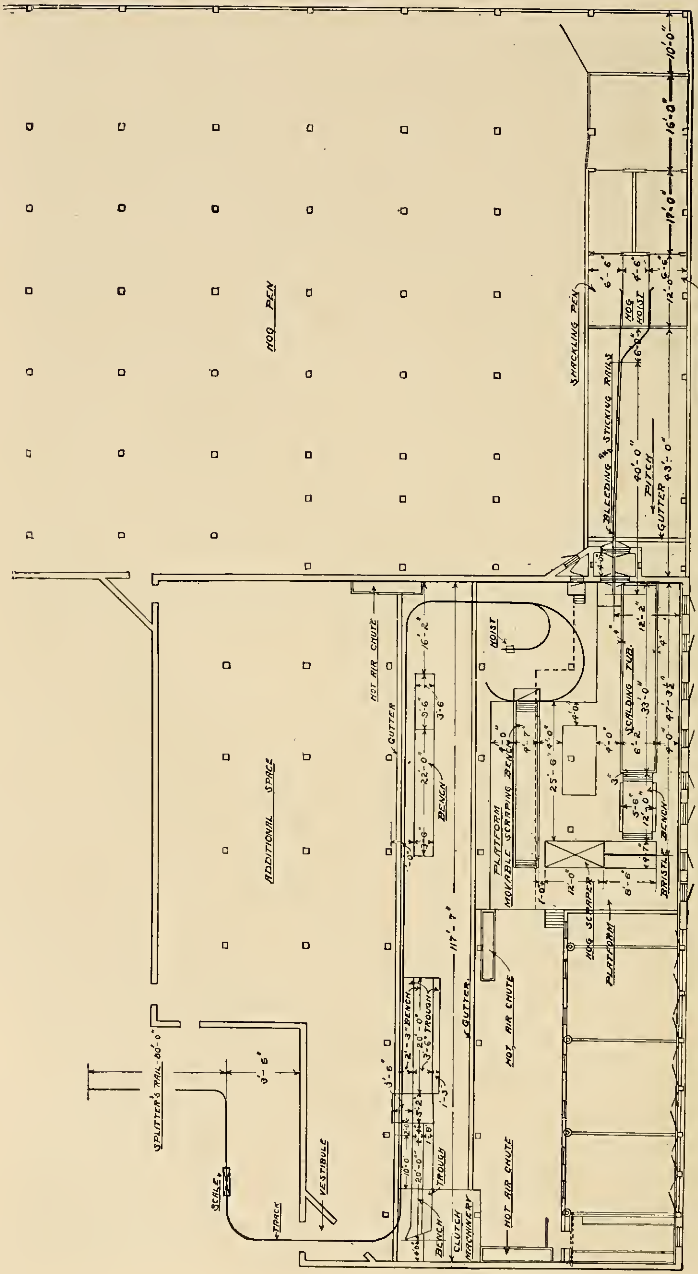


FIG. 98.—FLOOR PLAN OF HOG SLAUGHTERING ROOM, PENS, ETC.

out, whereas if given careful attention at first, it is made into neutral. What lard is left, however, after pulling the leaf, should be scraped out, as it is often worth more if taken as lard than if left as side meat. Besides its presence greatly disfigures the meat.

SPLITTING.

This should receive careful attention, splitting through the center of the back so as to leave a smooth pork loin.

TEMPERATURES IN CHILL ROOM.

Hogs should be run into coolers at a temperature of 28° to 30° F. In filling the tunnels, the temperature will run as high as 45° to 46° F., but should be down as low as 36° F. in the first twelve hours, and from that brought down gradually to a temperature of 32° F. by the time the carcasses have been forty-eight hours in the cooler.

Fig. 97 shows the manner in which hogs are run into the chill room. The usual construction is six rails to a 16-foot bay, which will nominally figure about 4½ feet of floor surface per hog. A fairly good idea of the relative or proportionate size of cooler and hog slaughtering rooms may be obtained from a study of the floor plan shown in Fig. 98.

Fig. 99 (see following two pages) shows a section through a hog killing floor, designed for a modern packing house, showing carrying rails, scraping benches, sticking pens, etc.

CARE IN CHILL ROOM.

As before stated, it is in this particular part of the house that the greatest changes have been made, and it is also in this particular place where the most careful and minute attention to details is necessary in order to turn out meats in the best marketable condition, as only a few degrees deviation in temperatures from carefully set rules in the handling of chill rooms shows excess per cent of sour meat found thirty to sixty days afterward when the meats are brought from the curing cellar. This, therefore, is a department that should receive the most careful attention. A wrong start here can never be righted afterward.

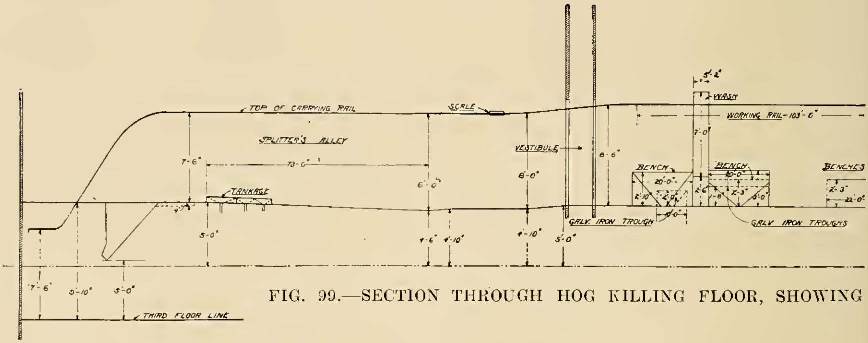
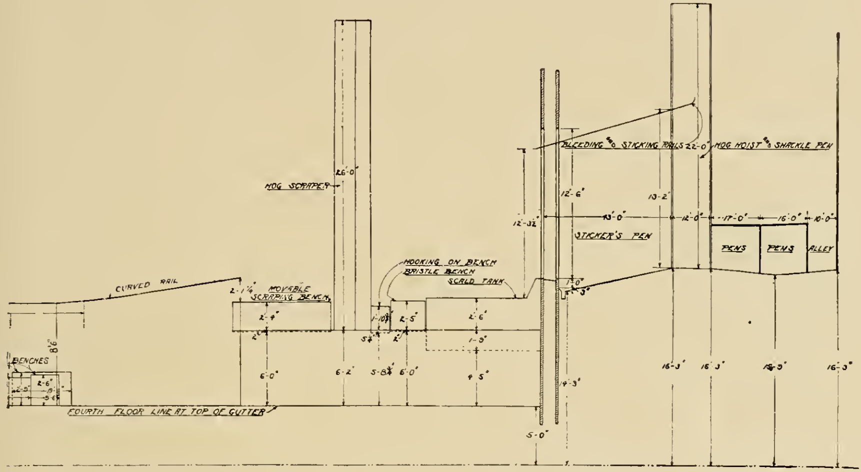


FIG. 99.—SECTION THROUGH HOG KILLING FLOOR, SHOWING

It was formerly considered an absolute necessity to have an open-air hanging room where hogs could first be left to dry after slaughtering, in many cases allowing them to hang over night in the outside air; the object being to save refrigeration. It is the author's opinion that the economy thus obtained is anything but economy. Past experience has proved that there are certain conditions which must be adhered to closely in the safe handling and curing of pork products, and proper temperatures are among the most important of these. It is very rare that these temperatures prevail in the outside atmosphere, and hogs that are left on hanging floor over night are either insufficiently chilled or over-chilled the next morning. Many packers feel it advantageous, however, to run hogs into a hanging room, allowing them to dry out for one or two hours prior to putting them in the chill room. While this has no deteriorating effect on the



CARRYING RAILS, SCRAPING BENCHES, STICKING PENS, ETC.

product, the expense of handling them and the cost of labor incurred is much more than the saving would be in refrigeration, if they are put directly into the chill room.

The first essential feature in a chill room is that it be properly constructed and have sufficient refrigeration so that the temperatures can be controlled precisely as desired. It is advisable that the coolers be partitioned off on each line of posts lengthwise, making separate bays or tunnels. Into this the hogs are run as fast as they are killed, providing that in so doing the temperature is not run up too high. If the temperature goes above 50° F., the carcasses should be run into another tunnel, and sent back to the first one as the temperature goes down. A full head of refrigeration should be put on to prevent the cooler from going higher than 50° F. It should remain between 44° to 50° F., while being filled, and held at that temperature for about two hours after filling. It will be found by this time that the vapor has passed away, being taken up by the refrigerant, and that the carcasses show signs of drying. Then more refrigeration should be turned on and in twelve hours from the time this refrigeration is put on the temperature of the cooler should be 36° to 37° F. A higher temperature would mean delay in removing the animal heat and consequently a tendency to decomposition. A lower temperature chills the outside surface too rapidly, thereby retaining the animal heat next to the bone, with a similar result. The first twelve hours of the chilling of all kinds of meat containing animal heat is the most important part of it, the after chilling being of much less importance.

When the carcasses are to be cut after being forty-eight hours in the chill room, the cooler should be brought down gradually to a temperature of 28° F. If they are to be cut when seventy-two hours old, which from the author's experience is preferable, the cooler should be brought down gradually to a temperature of 30° F.; this would mean that they should be brought from 36° to 30° F., a lowering of six degrees in temperature, in practically fifty-eight hours. It would mean about one degree each eight hours, and held in this condition, not the six degrees in two hours, for in that case the meat would be frozen. With a cooler properly equipped, and a careful attendant, these instructions can be carried out in detail, and when thus followed the safe curing of the product will be found to be practically assured.

While there are other matters which need careful attention, if the chilling is not done properly, the rest of the operation will never save the product. The cooler should at all times be kept dry and clean with a sprinkling of dry sawdust on the floor, this having a tendency to absorb drippings, clots of blood, etc., from the carcasses, and keep the cooler clean and sweet, whereas if this accumulation is allowed to drop and remain on the bare floor it soon becomes soured and is a menace to the product being handled.

SHRINKAGE IN CHILL ROOM.

The question is often raised how much the hogs will shrink from dressed warm weight to chill weight in the cooler, and many people figure that this shrinkage represents a loss. While it may mean a loss in the weight of the product sold, if the cooler is so handled that the meat will not shrink, then there is trouble ahead for the producer, in the fresh as well as in the cured product. The excess moisture of the meat must be taken out in the process of chilling to handle them successfully afterward. The following figures will give an idea of the actual shrinkage of hogs run direct into the cooler. It will be noted the tests were made on light hogs used for shipping purposes. The percentage of shrinkage would not be as great on heavier carcasses:

TEST NO. 1 ON SHRINKAGE OF HOGS IN COOLER.

Forty-five hogs weighed in cooler direct from killing floor—Warm weight, 6,892 pounds; average, 153 pounds; temperature of cooler, 51° to 48° F.

Weight after hanging in cooler forty-eight hours, 6,682 pounds; shrinkage of 210 pounds or 3.04 per cent; temperature of cooler, 35° to 36° F.

Weight after hanging in cooler seventy-two hours, 6,570 pounds; shrinkage of 322 pounds or 4.67 per cent; temperature of cooler, 31° to 32° F.

Weight after hanging in cooler ninety-four and one-half hours, 6,552 pounds; shrinkage of 340 pounds or 4.93 per cent; temperature of cooler, 32° F.

TEST NO. 2.

Forty-five hogs weighed into cooler direct from killing floor —Warm weight, 6,970 pounds; average, 155 pounds; temperature of cooler, 54° F.

Weight after hanging in cooler forty-six hours, 6,660 pounds; shrinkage of 310 pounds or 4.45 per cent; temperature of cooler, 36° F.

Weight after hanging in cooler seventy-two hours, 6,623 pounds; shrinkage, 347 pounds or 4.97 per cent; temperature of cooler, 32° F.

Weight after hanging in cooler ninety-four hours, 6,613 pounds; shrinkage, 357 pounds or 5.12 per cent; temperature of cooler, 32° F.

LABOR AND WAGES IN HOG HOUSE.

The following is a list of wages and the number of men required in a well regulated house to handle a given number of hogs per hour. The wages paid are those in vogue at the present writing at the principal American packing centers.

The first table gives a list of men required and the wages paid same for handling hog heads:

COST OF HOG HEAD GANG HANDLING 400 PER HOUR.

No. men	Position	Rate per hour	Total
1	Foreman scaler	$0.20	$0.20
1	Tonguer	.25	.25
1	Head skinner	.20	.20
1	Templer	.17½	.17½
1	Chisler	.18½	.18½
1	Jaw bone puller	.17½	.17½
1	Jaw bone trimmer	.17½	.17½
1	Cheeker	.22½	.22½
1	Cutting out head meat	.15	.15
1	Cheek meat trimmer	.17½	.17½
2	Snouters (average 360 at 50c)	.18	1.80
3	Saving brains { two one	.17½ .15	.50
2	Laborers	.16½	.16½
2	Truckers	.17½	.35
19		......	$4.72½

Cost per head, $0.0118.

COST OF HOG KILLING, AVERAGE 400 HOGS PER HOUR.

No. men	Position	Rate per hour	Total
1	Foreman ($24.00 per week)	$0.40	$0.40
1	Scaler ($12.00 per week)	.20	.20
1	Driving up hogs	.17½	.17½
2	Shacklers	.27½	.55
1	Sticker	.35	.35
1	Operating levers	.20	.20
1	Dropping in tub	.20	.20
1	Scalder	.35	.35
2	Holding down backs	.17½	.35
2	Foot pullers	.20	.40
1	Ham scraper	.17½	.17½
1	Hooking on hogs	.32½	.32½
1	Tripper	.16½	.16
1	Header	.32½	.32½
1	String cutter	.20	.20
1	Hanger off	.32½	.32½
2	Ham scrapers	.17½	.35
2	Shoulder "	.16½ .17½	.34
2	Belly "	.16½	.33
3	Ham shavers	.25	.75
2	Belly "	.22½	.45
3	Shoulder "	.25	.75
1	Brisket opener	.22½	.22½
1	Belly " Eich "	.25	.25
1	Rimmer	.25	.25
1	Snatcher	.27½	.27½
1	Dropping off heads	.20	.20
1	Ham facer	.27½	.27½
2	Lard pullers	.27½	.55
1	Kidney boy	.15	.15
2	Splitters	.35	.70
2	Neck washers	.17½	.35
2	Belly shavers in run	.22½	.45
1	Caller to scale	.17½	.17½
4	Cooler men	.17½	.70
2	Leaf lard truckers	.17½	.35
2	Pluck and paunch trimmers	.22½	.45
1	Gall puller	.17½	.17½
2	Gut cutters	.22½	.45
2	Ruffle pullers	.15 .17½	.32½
3	Fat washers	.17½	.52½
1	Janitor	.17½	.17½
1	Truck oiler (also works on gam sticks)	.17½	.17½
68			$15.01

Cost per head, $0.0375.

COST OF HOG CUTTING, AVERAGING 450 HOGS PER HOUR.

No. men	Position	Rate per hour	Total
1	Foreman ($24.00 per week)	$0.40	$0.40
1	Cooler foreman	.20	.20
4	Cooler men	.17½	.70
1	Cutting down	.17½	.17½
3	Ham sawyers	.22½	.67½
2	Cutting off hams	.20 .25	.45
1	Shoulder sawyer	.25	.25
1	Shoulder helper	.17½	.17½
1	Ham foot sawyer	.20	.20
4	Ham trimmers	.35	1.40
1	Tail trimmer	.17½	.17½
1	Passing to boners	.17½	.17½
3	Shoulder boners	.25	.75
1	Passing to shoulder sawyer	.15	.15
1	Shoulder sawyer	.20	.20
1	Passing from sawyer	.17½	.17½
2	Butt pullers	.20	.20
1	Pork trimmer	.20	.20
4	Shoulder trimmers	.30	1.20
2	Scribers	25	.50
2	Placing sides	.17½	.35
2	Loin pullers	.27½	.55
2	Loin passers	.17½	.35
2	Loin trimmers	.25	.50
1	Skirt trimmer	.20	.20
4	Ribbers	.30	1.20
2	Back fat trimmers	.22½	.45
2	Dry salt belly "	.25	.50
1	Passing to belly press	.17½	.17½
1	Feeding " "	.17½	.17½
1	Taking from " "	.17½	.17½
4	Belly trimmers	.27½	1.10
4	On trucks and gam sticks	.17½	.20
3	Laborers	.17½	.52½
2	Laborers	.16½	.33
69		......	$15.83

Cost per head, $0.0352.

CHAPTER XIV.

PORK CUTS AND YIELDS.

CUTTING FLOORS.

As soon as the hogs are thoroughly chilled they are ready for the cutting room. To be safe, however, the hogs should show a temperature of from 34° to 36° F. inside of the hams and shoulders. If this temperature in the meat has been reached by gradual chilling for about the time specified in previous chapter, very little trouble should be experienced in curing the meats. The proper cutting of the hog carcass is one of the most important items in the economical handling of hogs. The great variety of cuts and the percentages of yield of the various cuts are given on succeeding pages. For cutting and trimming economically it is essential that suitable facilities be provided. As a guide there are presented in Figs. 100 and 101 diagrams of one of the most modern pork cutting floors on which are used movable benches, power saws, etc. Fig. 100 gives the floor plan and Fig. 101 cross sections on lines A—B and C—D of same plan. This cutting room, it may be noted, occupies three different floors, one above the other, making use of the cheapest of all mechanical forces, gravity. The hogs are first laid on the bench on the top floor, where the hams are cut off, after which the remainder of the carcass is carried to the chopping block and the shoulders cut off, going through their respective chutes to the bench on the floor below. Here the loins are pulled, sides made into their respective cuts, hams and shoulders trimmed, the finished meats, as well as the trimmings, passing

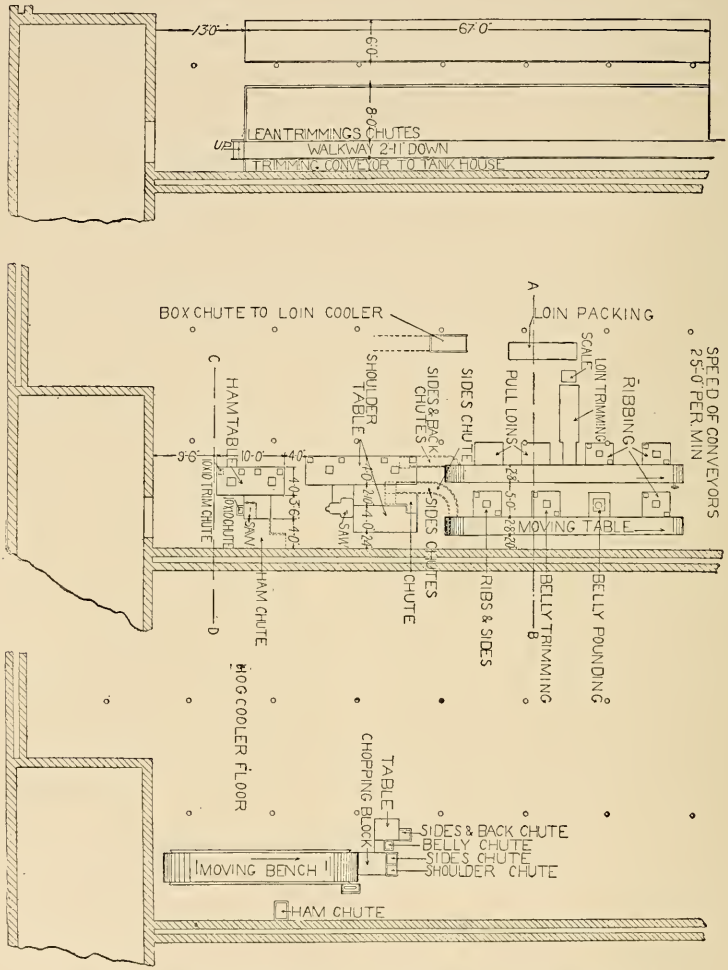


FIG. 100.—DIAGRAM SHOWING DETAIL OF HOG CUTTING ROOM.

through a chute to the floor below. The meats are graded from there to be put into the various assortments, the trimmings going on to a large bench. When the lean

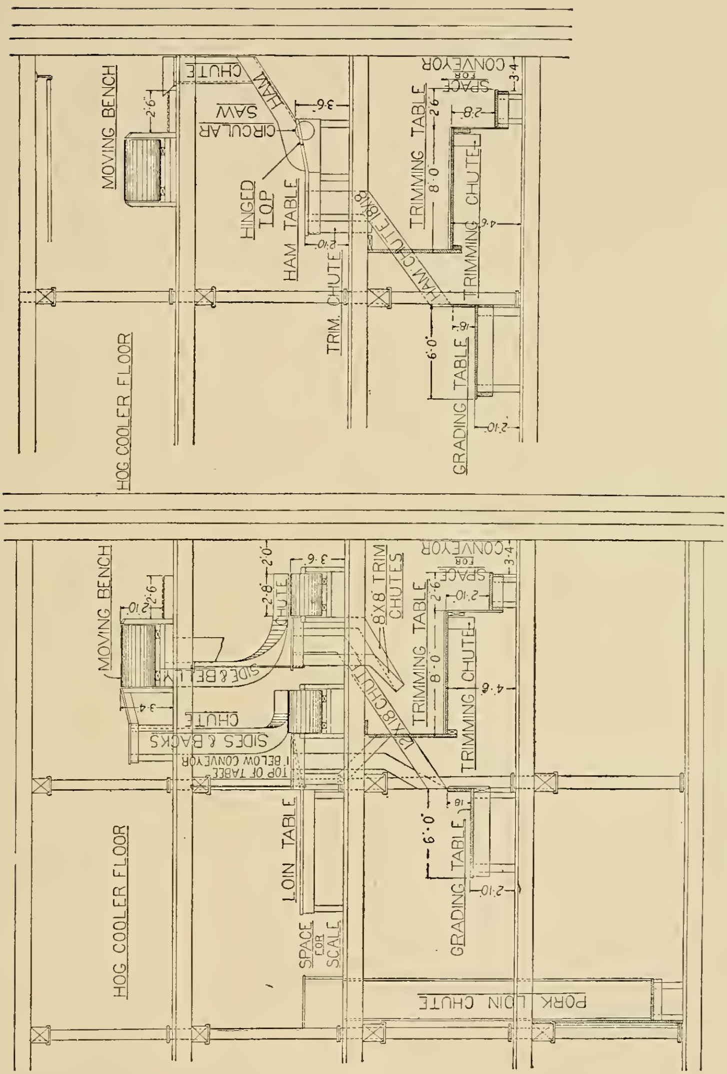


FIG. 101.—SECTIONS ON A-B AND C-D OF FIG. 100, HOG KILLING ROOM.

trimmings have been removed, the lard trimmings are thrown behind the operators on to a conveyor which takes the trimmings directly to the tank house. A careful study of this plan will be interesting, and while it may not be adapted, in full, to any one particular house, some of the features can be worked to advantage almost anywhere. The equipment here shown represents a cutting capacity of 500 hogs per hour.

PERCENTAGES OF YIELD.

The variety of cuts into which a hog can be divided are many and the tables following indicate the percentages of yield of the different cuts, based on the live weight of the hogs. The percentage of yield of lard includes both prime steam lard and leaf. It should be understood that the total yield of the various cuts mentioned will vary slightly in different markets, and in the same market at different seasons of the year, according to the quality of the hog. These variations will not be more than 2 per cent, probably, on the total yield.

The percentages here given are about an average, or possibly a little under the average, and are based on hogs averaging from 240 to 275 pounds live weight. Extra short clears, extra short ribs, pork loins, fat backs and bellies are made out of mixed packing hogs, averaging 220 to 300 pounds; at some seasons of the year averaging twenty-five to thirty pounds heavier.

A hog cut into extra short clears will yield the following percentages of live weight:

	Per cent.
Extra short clears	26
Loin	9
Ham	12½
Shoulder	9
Lard	13
Total	69½

A hog cut into extra short ribs will yield the following percentages of live weight:

	Per cent.
Extra short ribs	26½
Loin	9
Ham	12½
Shoulder	9
Lard	13
Total	70

A hog cut into pork loins, belly and short fat backs will yield the following percentages of live weight:

	Per cent.
Loin	9
Belly	12
Backs	12
Shoulders	9
Hams	12½
Lard	13
Total	67½

Regular short ribs and rough ribs are made from mixed heavy packing hogs, ranging from 300 to 350 pounds, or even a little heavier. Hogs cut into regular short ribs will yield the following percentages of live weight:

	Per cent.
Ribs	37
Hams	12½
Shoulders	8
Lard	14½
Total	72

A hog cut into rough ribs will yield the following percentages of live weight:

	Per cent.
Rough ribs	37½
Hams	12½
Shoulders	8
Lard	14½
Total	72½

Regular short clears are made from mixed and rough heavy packing hogs, and will yield the following percentages of live weight:

	Per cent.
Short clears	36
Hams	12½
Shoulders	8
Lard	14½
Total	71

Mess pork is made from rough heavy packing hogs averaging about 300 to 350 pounds, and hogs cut into mess pork will yield the following percentages of live weight:

	Per cent.
Mess pork	38
Hams	12½
Shoulders	8
Lard	14½
Total	73

Cumberlands are made from smooth light hogs, either barrows or good fair sows, and will yield as follows for the different average live hogs:

120-lb. LIVE HOG.

	Per cent.
Cumberlands	37
American cut hams	14
Lard	10
Total	61

145-lb. LIVE HOG.

	Per cent.
Cumberlands	38
American cut hams	14
Lard	11
Total	63

170-lb. LIVE HOG.

	Per cent.
Cumberlands	39
American cut hams	14
Lard	11½
Total	64

190-lb. LIVE HOG.

	Per cent.
Cumberlands	40
American cut hams	14
Lard	12½
Total	66½

English long clears usually made from hogs that will average 185 to 200 pounds alive, are about the same quality as Cumberland hogs, and will yield as follows:

	Per cent
Long clear	38
American cut hams	14
Lard	12½
Total	64½

In the percentages given it is estimated that the offal, such as hair, blood, fertilizer, casings, blade bones, etc., will cover the cost of killing and cutting and in figuring these tests prices of green meat should be used. In figuring boxed meats from these green prices allowance must be made for shrinkage from green weight to cured, cost of boxing, labor, etc. The percentages given are accurate on hogs made into these cuts.

The following tables are based on tests where one side of the hog, weighing forty-four pounds, was made into the different American cuts, showing the weights of

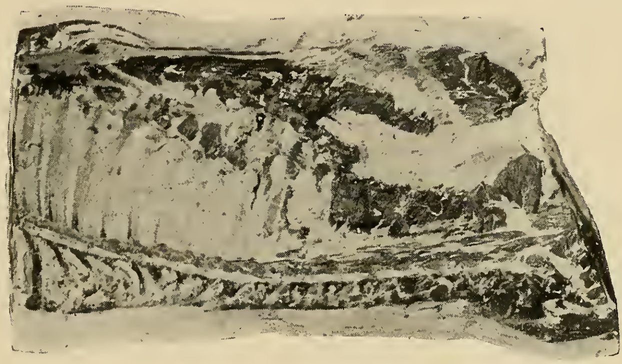


FIG. 102.—HARD SHORT RIB.

same, and the prices at time tests were made, also showing the variations of the same piece or side meat in different cuts. A careful study of these tests will show that it is of the greatest importance to figure and cut the hogs to the best advantage. Taking into consideration the current prices of the different cuts and to see that they are converted into the cuts for which they are best adapted.

TESTS SHOWING YIELD OF SIDES.

Hard short ribs are made the same as standard cut short ribs, except that the back bone is left in. Hard short cut ribs cannot be delivered as "regular" on the Board-of-Trade, but it is a cut that is made very extensively for southern sale, there being practically no waste to the meat cut in this manner:

Yield	Lbs.	Per lb.	Value
Hard short ribs	43	$0.09675	$4.1603
Lean trimmings	¼	.07	.0175
Fat "	½	.065	.0325
Tenderloins	¼	.13	.0325
Totals	44	......	$4.2428

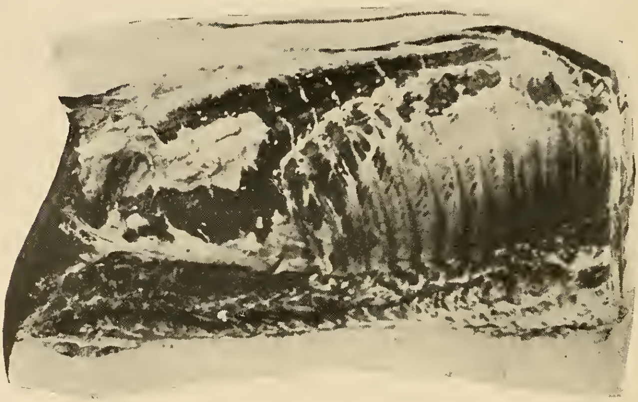


FIG. 103.—REGULAR RIB.

Yield of standard short ribs, which is the standard Board-of-Trade cut:

Yield	Lbs.	Per lb.	Value
Standard short ribs	41¾	$0.097	$4.0498
Lean trimmings	½	.07	.0350
Fat "	½	.065	.0325
Tenderloins	¼	.13	.0325
Back bone	1	.015	.0150
Totals	44	......	$4.1648

Short clears same as short ribs with the spare rib removed:

Yield	Lbs.	Per lb.	Value
Short clears	39¾	$0.10025	$3.9497
Lean trimmings	½	.07	.0350
Fat "	½	.065	.0325
Tenderloins	¼	.13	.0325
Back bone	1	.015	.0150
Spare ribs	2	.055	.1100
Totals	44	......	$4.1724

Clear back, same as short clears, with the exception of the belly cut off:

Yield	Lbs.	Per lb.	Value
Clear back	21¾	$0.10075	$2.1914
Clear bellies (dry salt)	17½	.1045	1.8288
Lean trimmings	¾	.07	.0525
Fat "	¾	.065	.0488
Tenderloin	¼	.13	.0325
Back bone	1	.015	.0150
Spare ribs	2	.055	.1100
Totals	44	......	$4.2790

This test same as preceding one, excepting the bellies are ribbed instead of leaving in the spare rib.

Yield	Lbs.	Per lb.	Value
Clear back	21¾	$0.10075	$2.1903
Rib bellies (dry salt)	19½	.102	1.9890
Lean trimmings	¾	.07	.0525
Fat "	¾	.065	.0488
Tenderloin	¼	.13	.0325
Back bone	1	.015	.0150
Totals	44	......	$4.3281

This test is the same as the previous one, except clear bellies made for sweet pickle instead of dry salt:

Yield	Lbs.	Per lb.	Value
Clear backks	21¾	$0.10075	$2.1903
Clear bellies (sweet pickle)...........	15¼	.105	1.6013
Lean trimmings......................	1	.07	.0700
Fat "	2¾	.065	.1788
Tenderloin..........................	¼	.13	.0325
Back bone	1	.015	.0150
Spare ribs	2	.055	.1100
Totals..........................	44	......	$4.1979

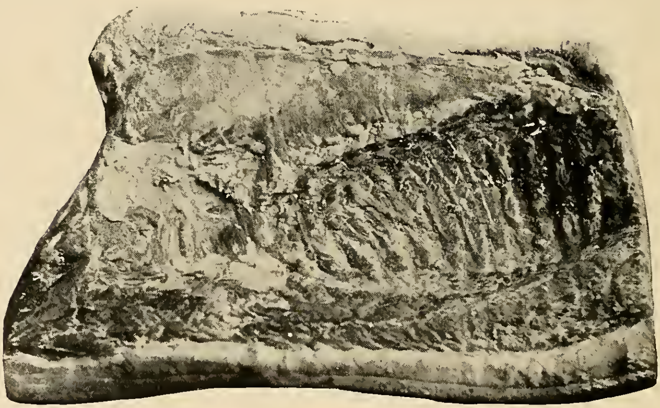


FIG. 104.—SHORT CLEAR.

Extra ribs same as extra clear, with the exception that the pork loin is taken out:

Yield	Lbs.	Per lb.	Value
Extra ribs..........................	34½	$0.0965	$3.3293
Pork loin..........................	8½	.105	.9031
Lean trimmings......................	¼	.06625	.0175
Fat "	¾	.0965	.0244
Totals..........................	44	......	$4.2743

Extra short clears same as extra ribs, except spare rib is taken off the belly.

Yield	Lbs.	Per lb.	Value
Extra short clears....................	33½	$0.097	$3.2495
Pork loins..........................	8½	.10675	.9031
Lean trimmings......................	¼	.07	.0175
Fat "	¾	.065	.0488
Spare ribs	1	.055	.0550
Totals..........................	44	......	$4.2739

Dry salt fat-backs and dry salt rib-belly constitute the cuts in the following test:

Yield	Lbs.	Per lb.	Value
Rib bellies (dry salt)	16¾	$0.10275	$1.7203
Fat backs "	16½	.09525	1.5716
Pork loin............................	8½	.10675	.9031
Lean trimmings	¼	.07	.0175
Fat "	2	.065	.1300
Totals...	44	.....	$4.3435

This following test is the same as the previous one, except that the belly has been cleared of the spare rib:

Yield	Lbs.	Per lb.	Value
Fat backs (dry salt).................	16½	$0.09525	$1.5716
Clear bellies "	15¾	.10275	1.6175
Pork loin............................	8½	.10675	.9031
Lean trimmings	¼	.07	.0175
Fat "	2	.065	.1300
Spare ribs..........................	1	.055	.0550
Totals..........................	44	......	$4.2947

The following test is the same as the previous one, except that the belly is cleared and used for sweet pickle:

Yield	Lbs.	Per lb.	Value
Fat backs (dry salt)	16½	$0.09525	$1.5716
Clear bellies (sweet pickle)	14	.105	1.4700
Pork loins	8½	.10675	.9031
Lean trimmings	¾	.07	.0525
Fat "	3¼	.065	.2113
Spare ribs	1	.055	.0550
Totals	44	......	$4.2635

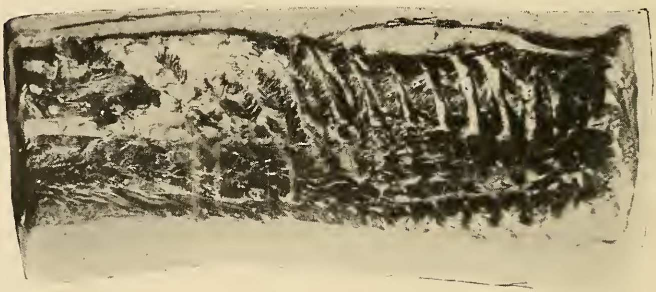


FIG. 105.—CLEAR BACK.

The following test is the same as for dry salt fat-backs and dry salt rib-bellies, except that fat backs are sent to tank for lard:

Yield	Lbs.	Per lb.	Value
Fat backs, tank	15¾	$0.07975	$1.2561
Pork loins	8½	.10675	.9031
Lean trimmings	1	.07	.0700
Fat "	2	.065	.1300
Rib bellies (dry salt)	16¾	.102	1.7085
Totals	44	......	$4.0677

The following test indicates fat backs to tank and the belly clear of spare ribs:

Yield	Lbs.	Per lb.	Value
Fat backs, tank....................	15¾	$0.07975	$1.2561
Pork loins..........................	8½	.10675	.9031
Lean trimmings....................	1	.07	.0700
Fat "	2	.065	.1300
Clear bellies (dry salt).............	15¾	.10275	1.6175
Spare ribs..........................	1	.055	.0550
Totals...........................	44	......	$4.0317

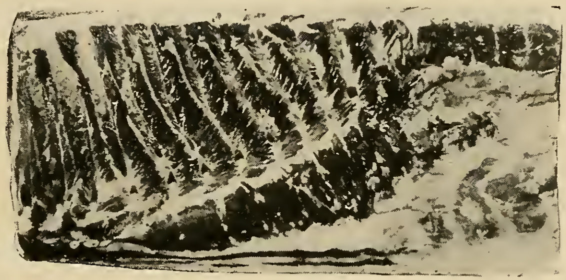


FIG. 106.—CLEAR BELLY.

The following test is the same as previous one, except that the bellies are cleared for sweet pickle:

Yield	Lbs.	Per lb.	Value
Clear bellies (sweet pickle)..........	14	$0.105	$1.4700
Pork loins..........................	8½	.10675	.9031
Lean trimmings....................	1½	.07	.1050
Fat "	3¼	.065	.2113
Back fat, tank......................	15¾	.07975	1.2561
Spare ribs..........................	1	.055	.0550
Totals...........................	44	......	$4.0005

The following recapitulation will show the value of the different cuts into which one side of a hog can be made the same day. There is not always this variation, possibly, but there is always a great advantage in having hogs cut into the cuts for which the carcass is best adapted, as well as in watching the market closely and having on hand the cuts for which there is the greatest demand. It will be noticed from the foregoing tests that

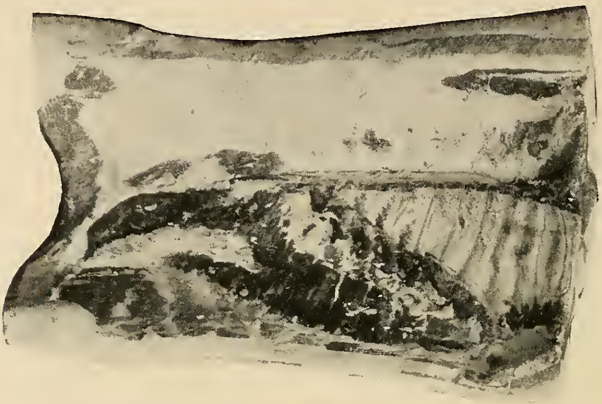


FIG. 107.—EXTRA SHORT RIB.

the same weight side of meat made into different cuts varies in value all the way from $4.00 to $4.34:

RECAPITULATION.

Product	Value
Hard ribs	$4.2488
Standard ribs	4.1648
Short clear	4.1724
Back and dry salt bellies	4.2790
Back and dry salt rib bellies	4.3281
Back and sweet pickle bellies	4.1979
Extra rib	4.2743
Extra clear	4.2739
Dry salt fat backs and dry salt rib bellies	4.3426
Dry salt fat backs and dry salt bellies	4.2948
Dry salt fat backs and sweet pickle clear bellies	4.2635
Fat back (tank) and dry salt rib bellies	4.0677
Fat back (tank) and dry salt clear bellies	4.0317
Fat back (tank) and sweet pickle clear bellies	4.0005

TESTS ON YIELD OF DIFFERENT CUTS.

There being such a variety of cuts into which hogs can be made, and the prices on the various cuts varying at all times, it requires very close attention to see that the hogs are cut to the best advantage consequently a thorough knowledge of the yield of each kind of cut is desirable. While it is not possible at all times to carry the percentages in one's mind, it is wise to have them available.

The following tests show five sides of hogs of different weights, with the back bone and tenderloin in, cut into various cuts, the percentages in this case being figured on the weight of the sides of meat:

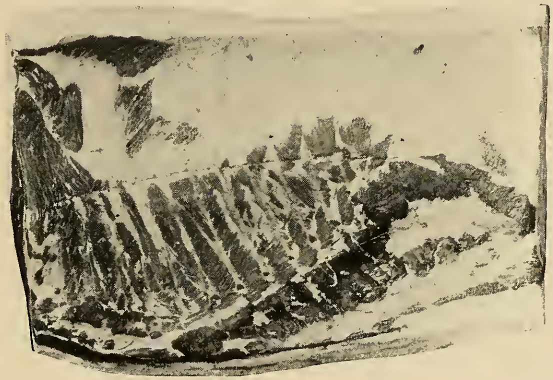


FIG. 108.—EXTRA SHORT CLEAR.

Five rough ribs, weighing 260 pounds, tenderloin in, made into extra short clears (Fig. 108):

Yield	Lbs.	Per cent.	Per lb.	Value
Five extra short clears	189	72.69	$0.09875	$18.66
Spare ribs	5	1.93	.08	.40
Five pork loins	57	21.92	.1075	6.13
Fat trimmings...............	8	3.08	.0625	.50
Lean "	1	.38	.0775	.08
Totals...	260	100.00	.....	$25.77

Value, $9.91 per 100 pounds.

Five rough sides, weighing 260 pounds, with the tenderloin in, made into extra short ribs and pork loins:

Yield	Lbs.	Per cent.	Per lb.	Value
Five extra short ribs......	194	74.62	$0.09875	$19.15
Five pork loins...	57	21.92	.1075	6.13
Fat trimmings	8	3.08	.0625	.50
Lean "	1	.38	.0775	.08
Totals	260	100.00	......	$25.86

Value, $9.946 per 100 pounds.

Five rough rib sides, weighing 365 pounds, made into short clears:

Yield	Lbs.	Per cent.	Per lb.	Value
Short clears	330½	90.55	$0.10125	$33.46
Spare ribs	16	4.38	.08	1.28
Tail bones..................	3½	.96	.03	.10
Back bones	8	2.19	.02	.16
Tenderloins	5	1.37	.19	.95
Fat.......................	2	.55	.0625	.12
Totals....................	365	100.00	......	$36.07

Value, $9.88 per 100 pounds.

Five rough ribs, weighing 365 pounds, tenderloin in, made into regular ribs:

Yield	Lbs.	Per cent	Per lb.	Value
Five regular ribs....	350	95.89	$0.0980	$34.30
Back bones	8	2.19	.02	.16
Tenderloins	5	1.37	.19	.95
Fat...........	2	.55	.0625	.12
Totals..................	365	100.00	......	$35.53

Value, $9.734 per 100 pounds.

Five rough sides, weighing 280½ pounds, made into pork loins, clear bellies, from which have been taken out the spare ribs and fat backs:

Yield	Lbs.	Per cent.	Per lb.	Value
Five pork loins	63½	22.64	$0.1075	$ 6.82
Five clear bellies............	101	36.01	.1025	10.35
Spare ribs............... ...	8½	3.03	.08	.68
Five fat backs	85	30.30	.09	7.65
Fat trimmings..............	18½	6.59	.0625	1.16
Lean "	½	.18	.0775	.04
Blade bones................	3½	1.25	.07	.24
Totals....................	280½	100.00	......	$26.94

Value, $9.60 per 100 pounds.

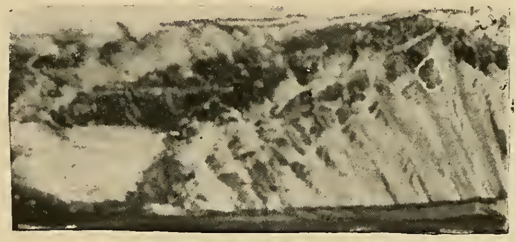


FIG. 109.—RIB BELLY.

Five rough ribs, weighing 280½ pounds, with the tenderloin left in, made into rib bellies, pork loins and fat backs:

Yield	Lbs.	Per cent.	Per lb.	Value
Five pork loins	63½	22.64	$0.1075	$ 6.82
Five rib bellies	109½	39.04	.101	11.06
Five fat backs	85	30.30	.09	7.65
Fat trimmings	18½	6.59	.0625	1.16
Lean "	½	.18	.0775	.04
Blade bones	3½	1.25	.07	.24
Totals....................	280½	100.00	......	$26.79

Value, $9.614 per 100 pounds.

Five rough ribs, weighing 268 pounds, made into short clear backs (by removing spare rib), leaving pork loin on back, and leaving the spare ribs in bellies:

Yield	Lbs.	Per cent.	Per lb.	Value
Five short clear backs	128	47.76	$0.0975	$12.48
Five rib bellies	112	41.79	.101	11.31
Tenderloins	4	1.49	.19	.76
Ribs	6½	2.42	.08	.52
Fat trimmings.............	9	3.36	.0625	.56
Blade bones	3	1.12	.07	.21
Back "	5	1.87	.02	.10
Lean trimmings	½	.19	.0775	.04
Totals	268	100.00	......	$25.98

Value, $9.70 per 100 pounds.

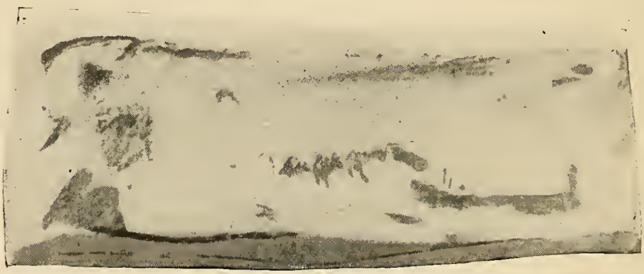


FIG. 110.—SHORT FAT BACK.

Same except removing spare rib from bellies, making them clear bellies:

Yield	Lbs.	Per cent.	Per lb.	Value
Five short clear backs.......	128	47.76	$0.0975	$12.48
Five clear bellies	105	39.18	.1025	10.76
Spare ribs	7	2.61	.08	.56
Tenderloins	4	1.49	.19	.76
Ribs	6½	2.42	.08	.52
Fat trimmings	9	3.36	.0625	.56
Blade bones	3	1.12	.07	.21
Back "	5	1.87	.02	.10
Lean trimmings	½	.19	.0775	.04
Totals....................	268	100.00	......	$25.99

Value, $9.70 per 100 pounds.

RECAPITULATION.

	Value per cwt.
Five rough ribs, tenderloin in, made into extra short clears	$9.910
Five rough sides with the tenderloin in, made into extra short ribs and pork loins	9.946
Five rough sides made into extra short clears, this cut being the same as the previous one, except that the spare rib is removed from the side	9.880
Five rough ribs, tenderloin in, made into regular ribs	9.734
Five rough sides made into pork loins, clear bellies, which consist of taking out the spare ribs and fat backs	9.600
Five rough ribs with tenderloin in, made into rib bellies, pork loins and fat backs	9.614
Five rough ribs made into short clear backs by removing spare rib on loin and leaving spare ribs in bellies	9.700
Five rough ribs made into short clear backs, removing the spare rib from the bellies, making them clear bellies	9.700

In the foregoing tests the prices were those that were in vogue at the time the tests were made. The percentages, however, are accurate. It will be noted that the different cuts vary in value from $9.60 to $9.91, a variation of 31c per hundred pounds on the different cuts made. From this will readily be seen the advantage of cutting hogs into the most desirable cuts, according to the market variations.

SPECIAL TEST ON 1,265 MIXED HOGS. AVERAGE LIVE WEIGHT 245 POUNDS.

In all well-regulated packing houses a test is made at least weekly, carrying everything through separately, to determine the actual profit or loss. These weekly tests are of great value as a guide to the purchaser when buying hogs of a quality best adapted to the requirements of his trade and in making the different cuts and weights that are selling to the best advantage. The following tests on 1,265 live hogs, averaging 245 pounds, shows the method in use. It will be noted that this test is carried through carefully, taking the market price on all the various cuts. The recapitulation shows the actual results at the time the test was made. All percentages of cuts of meats shown in the following tables are figured on the live weight of hogs:

FIG. 111.—AMERICAN SHORT CUT HAM.

FIG 112.—SKINNED HAM.

HAMS.

Product	Average Wt. Lbs.	No. of Pieces	Green Weight Lbs.	Average Price Per lb.	Value
Amer. cut hams...	10 and under	68	616	$0.11375	$ 70.07
" " " ...	11—13	143	1,740	.0975	169.65
" " " ...	14—16	658	9,965	.0925	921.76
" " " ...	18 and over	590	11,114	.0925	1,028.04
" " " ...	(skinned)	415	7,503	.1025	769.06
Special hams	11—13	223	2,892	.10	289.20
" "	14—16	337	5,187	.095	492.77
Face and cushion bruised hams..	......	9	145	.085	12.33
No. 2 hams.......	14 and under	63	933	.0925	86.30
No. 2 "	15 and over	24	288	.0875	25.30
Totals.........	......	2,530	40,383	$0.0957	$3,864.48

SHOULDERS.

Product	Average Wt. Lbs.	No. of Pieces	Green Weight Lbs.	Average Price Per lb.	Value
N. Y. shoulders. . .	. . . . . .	77	680	$0.0675	$ 45.90
Rough	. . . . . .	8	202	.07375	14.90
Skinned.	. . . . . .	283	2,731	.075	204.83
Three rib	. . . . . .	18	250	.08	20.00
California hams. . .	5½ and under	929	4,705	.06125	828.90
" " . . .	5½—7	856	5,838		
" " . . .	8 —10	324	2,532		
" " . . .	10 and over	45	458		
Clear plates	. . . . . .	. . . .	890	.05775	51.40
Boneless ham butts	. . . . . .	. . . .	382	.075	28.65
Jowl "	. . . . . .	. . .	214	.0425	9.10
Rough "	. . . . . .	. . . .	245	.07675	18.07
Boston "	. . . . . .	. . . .	6,703	.075	502.73
Barrel pork.	. . . . . .	. . .	1,110	.06025	66.88
Totals.	. . . . . .	2,530	26,940	$0.0664	$1,791.36

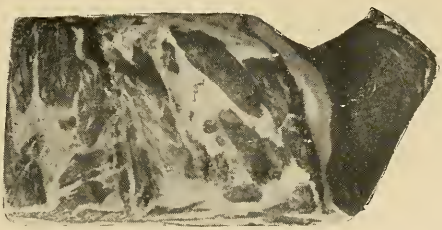


FIG. 113.—NEW YORK SHOULDER.

MISCELLANEOUS.

Product	Green Weight Lbs.	Average Price Per lb.	Value
Spare ribs	1,474	$0.04	$58.96
Tenderloins	75	.15	11.25
Tails	96	.02	1.92
Neck bones	1,012	.01	10.12
Blade "	296	.04	11.84
Trimmings	7,383	.04	295.32
Feet	4,803	.01	48.03
Totals.	15,139	$0.0289	$437.44

SIDES.

Product	Average Wt. Lbs.	No. of Pieces	Green Weight Lbs.	Average Price Per lb.	Value
Dry salt fancy bellies......	4— 6	85	383	$0.11	$ 42.13
Sweet pickle clear bellies..	6— 8	53	275	.1075	29.56
" " " " ..	8—10	252	2,158	.1025	221.19
" " " " ..	10—13	274	3,059	.095	288.70
" " " " ..	13—15	67	893	.0875	78.13
Dry salt clear bellies	18—20	144	2,803	.07775	217.93
" " " "	25—30	135	3,711	.076	282.04
Regular short ribs.........	60—70	116	7,731	.072	556.63
Extra " "	30—40	1,404	52,600	.069	3,629.40
Fat backs	10—12	110	1,246	.057	71.02
" "	25—30	10	260	.065	16.90
Back pork	......	....	3.330	.0585	194.80
Back fat (fifty K. R. lard)..	......	....	5.100	.057	290.70
Brisket pork	... ..	....	245	.08	19.60
Regular loins..............	......	2,414	27,268	.1025	2,794.97
Totals..................	......	5,064	111,042	$0.0787	$8,733.70

FIG. 114.—REGULAR DRY SALT SHOULDER.

LARD.

Product	Green Weight Lbs.	Average Price Per lb.	Value
Prime steam lard (killing)......	16,075	......	... ...
" " " (cutting)...	17,059	......	....
Totals..........................	33,134	$0.07125	$2,289.55
Leaf lard	7,965	$0.07	$ 557.55

OFFAL.

Product	No. of Pieces	Green Weight Lbs.	Average Price Per lb.	Value
Cheek and head meat	....	1,664	$0.02	$ 33.28
Tongues	...	950	.055	52.25
Hearts	....	335	.01	3.35
Kidneys	....	380	.01	3.80
Brains	....	46	.02	.92
Plucks	600	.....	.02	12.00
Heads	....	102	.035	3.57
Ears	...	25	.02	.50
Snouts	....	985	.02	19.70
Totals	....	4,487	......	$129.37

Estimated value of blood and casings at 6c per head, $77.10. Added to $129.37, the value of the offal, makes a total value of $206.47.

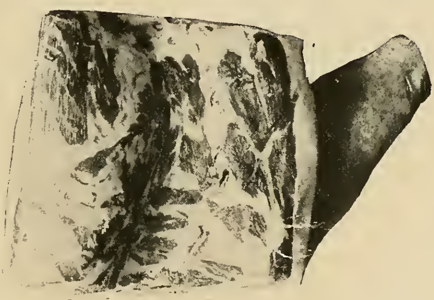


FIG. 115.—SQUARE SHOULDER.

RECAPITULATION.

Product	Per cent Yield.	Lbs. Weight	Average Price Per lb.	Value
Hams	13.04	40,383	$0.0957	$3,864.38
Shoulders	8.70	26,940	0665	1,791.36
Sides	35.86	111,042	.0787	8,733.70
Prime steam lard	10.38	32,134	.07125	2,289.55
Leaf "	2.57	7,965	.07	557.55
Miscellaneous	4.89	15,139	.289	437.44
Offal ($0.167 per head)	....	......	......	206.47
No. 1 grease	....	1,281	.07125	91.27
Total yield	75 44	234,884	......	$17,971.72

NET RESULT:

1265 hogs—Net live weight 309,925 pounds at average $0.0533 per lb	$16,518.90
—Killing expense	642.50
13 condemned for No. 1 grease, weighing 3158 lbs. and 7 condemned for No. 2 grease, weighing 1908 lbs. at average, $0.0150 per lb.	75.99
Total	$17,237.39

Gain, $733.33, or 58c per hog, or 23c per 100 pounds alive.

BARREL PORK.

This is a part of the packing house business which is becoming of less importance year by year. Under former methods it was necessary to cure nearly all parts of the

FIG. 116.—BOSTON SHOULDER AND CALIFORNIA HAM.

animal, owing to lack of facilities for handling it fresh. At that time a great deal of the product was cured in packages and disposed of to the consumer in this manner. But with the increased facilities for handling the material fresh, and for getting the meats to their destination in a more palatable and salable condition, the barreled part of the product has grown materially less and will probably continue to do so. There are, however, for certain trades, some cuts, still put into barrels.

MESS PORK.

Mess pork (Figs. 117 and 118) is a standard Board-of-Trade cut, and although there is comparatively little of it made, it is quoted daily in the market quotations and according to its rules and regulations, mess pork packed during the season from October 1 to March 31 is known

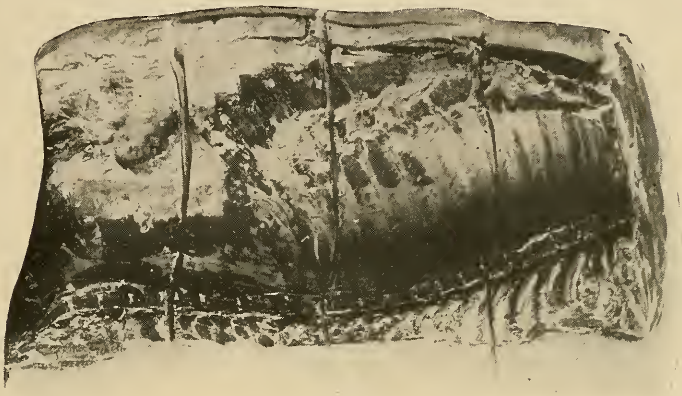


FIG. 117.—MESS PORK.

as " new pork," until the first of January the following year. After that date such pork is known as " old mess pork." Mess pork is made from the sides of very fat

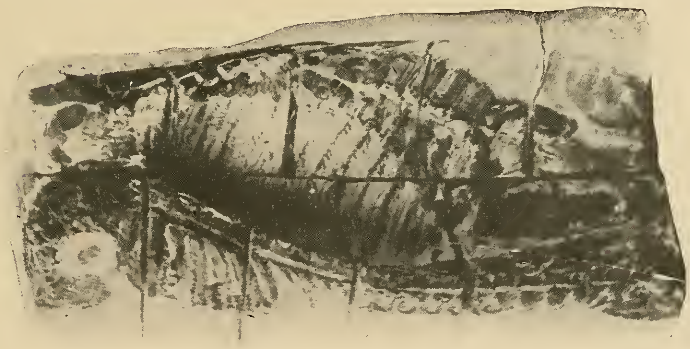


FIG. 118.—PRIME MESS PORK.

hogs, usually the heaviest and roughest animals being used for this purpose. The hog is split through the center of the backbone and after the shoulders and hams are removed, the sides are cut into strips crossways of the backbone, about 6 inches wide, and are packed 190 pounds to the barrel, but it is supposed to weigh 200 pounds when sold, the gain of pickle making up the difference in weight. When it is six months old, it will weigh more than 200 pounds, and if repacked will make 104 to 105 barrels per 100 barrels when packed, and should be repacked at 200 pounds. When number of pieces is not specified, mess pork is packed from eleven to fifteen pieces per barrel.

Short cut mess pork is made from the sides of hogs split through the backbone, the bellies having been removed. It is cut into pieces 6 inches wide and packed

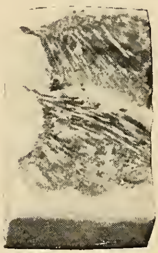


FIG. 119.—CLEAR BACK PORK.

four tiers to the barrel. This pork consists of the loin and fat back and is generally sold for family use. This cut is also known as "New York family pork," "family back pork" and "regular back pork." It is packed as follows:

Heavy grade	25 to 34 pieces
Next grade	35 " 47 "
Medium light grade	48 " 55 "
Extra light grade	56 " 65 "

CLEAR BACK PORK.

Clear back pork (Fig. 119) is made from the fat backs of prime hogs, being free from lean and bone and even in thickness. Pieces are cut 6 inches wide at each end and packed four tiers to a barrel. Among the trade in some sections this particular cut is called " clear fat backs " and " short clear fat backs " and is a very popular cut of fat back pork. It is packed as follows:

Extra heavies	30 to 35 pieces
Heavies	41 " 50 "
Medium	51 " 65 "
Lights	71 " 90 "

A second grade of fat back pork is made from the shoulder and from the fat backs with the blade bone and lean removed, trimmed smooth on the edges. It is somewhat similar in shape to " Keystone " and is packed as follows:

Extra heavies	19 to 35 pieces
Heavies	36 " 45 "
Medium	46 " 60 "

This same cut is also used when a California ham has been cut from the shoulder, leaving the blade bone on the pork and making a very desirable piece of meat. It is graded practically the same as second grade fat back pork.

BRISKET PORK RIB.

Brisket pork rib is made from the briskets of medium weight hogs. The pieces are cut 5 inches in width and have the rib left in, and is usually packed fifty pieces to the barrel. This pork is generally sold for family use and is made at times when light bellies sell at a premium over heavy ones, the first cut being taken off heavy bellies, reducing the average weight, thereby increasing the value, the piece cut off being used in making this pork. It usually runs fifty pieces and upwards to a barrel.

LOIN PORK.

This is made from the end of the pork loin next to the hams, having a portion of the tail bone left on it. It is generally packed fifty pieces and upwards to the barrel. This cut is also known as " rump pork " and " ham butt pork." This is the cut that is taken off the end of very heavy pork loins to reduce their average weight, thereby enhancing their value.

BELLY PORK.

Belly pork is made from a heavy quality of bellies and has the ribs left in. Pieces 5 inches in width are packed fifty-one to sixty per barrel. Heavy rough bellies are used for this at times when they will net more in this manner than when sold as dry salt bellies. There is comparatively little demand for this cut.

BACK PORK.

Back pork is made from clear fat backs from hogs that are free from lean and bone pieces. It is cut 5 inches wide and packed five tiers to the barrel, as follows:

Heavies	35 to 50 pieces
Mediums	51 " 65 "

LOIN CLEAR PORK.

Loin clear pork is made from the sides of hogs with the loin and backbone removed and the belly ribs left in, in other words an extra short rib cut into 5-inch widths and packed five tiers to the barrel. In the New England trade this is known as " clear pork." Packed as follows:

Extra heavies	19 lbs. to 23 lbs.
Heavies	24 lbs. to 30 lbs.

DRY SALT MEATS.

Short Ribs.—This is a regular Board-of-Trade cut and is quoted on the market daily. The price of same is used as a basis of value for other cuts of dry salt meats.

Short ribs are made from the sides of the hog between the ham and shoulder, having the loin and ribs in, and the backbone removed. Graded usually as follows:

40 to 45 lbs. average	55 to 60 lbs. average
45 " 50 " "	60 " 65 " "
50 " 55 " "	

Prices vary according to weight. This cut is known as " regular short ribs " and is delivered on Board-of-Trade transactions.

Hard Ribs.—These are the same as regulars, except that the backbone is not removed. This cut cannot be delivered on the Board-of-Trade without the removing of the backbone. This is a cut sold largely in the south and is made out of the heaviest, roughest hogs.

Short Clears.—These are the same as short ribs, but have the spare ribs and backbone removed. They are cut square at each end and graded as to average weight, same as short ribs.

Short Clear Backs.—These are made from the backs of hogs with the loin left in, the ribs and backbone removed. This cut is also known as " lean backs " and " loin backs." Values vary according to average weight as follows:

14 to 16 lbs. average	20 to 25 lbs. average
18 " 20 " "	25 " 30 " "

Extra Short Clears.—These are made from sides of hogs between the ham and shoulders with the rib and loin taken out. They are sold on an average from—

35 to 40 lbs. average	45 to 50 lbs. average
40 " 45 " "	

Extra Short Ribs.—These are the same cut as extra short clears, in every respect, except that the spare ribs are left in the belly.

Short Fat Backs.—These are made from back pork of prime hogs, being free from lean and bone, properly squared on the edges. They are generally quoted as follows:

10 to 12 lbs. average	25 to 30 lbs. average
14 " 16 " "	30 " 35 " "
18 " 20 " "	35 " 40 " "
20 " 25 " "	

These cuts may be used for the domestic trade and are usually under twenty-five pounds average in weight. The heavier backs are, however, in general practice used mainly for the export trade.

FIG. 120.—LONG CLEAR.

Long Clears.—These are made from the sides, hams being cut off, backbone and ribs removed, shoulder blade taken out, the leg cut off close to the brisket; being the entire side of the hog, with the ham and the bones removed.

Extra Long Clears.—These are trimmed the same as long clears, except that the loin is cut out.

Bellies.—These are cut with the sides squared and well trimmed on all edges. Graded generally, as follows:

10 to 12 lbs. average	20 to 25 lbs. average
14 " 16 " "	25 " 30 " "
18 " 20 " "	

They are cured in sweet pickle, plain pickle or dry salt.

FIG. 121.—EXTRA LONG CLEAR.

Regular Plates.—These are made from the end of the shoulder when this is cut into California hams, and have half of the blade bone with a facing of lean left on. The usual weight averages six to eight pounds.

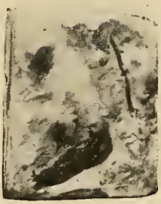


FIG. 122.—JOWL (DRY SALT BUTTS).

Clear Plates.—These are the same as regulars except blade bones are never trimmed out.

Dry Salt Butts.—This is a cut made from the fat cheek or jowl, trimmed to average from three to four pounds each and is a uniform cut of the hog.

CHAPTER XV.

CURING OF HAMS AND DRY SALT MEATS.

CUTTING AND TRIMMING OF HAMS.

As shown by the tests given on a previous page, American hams run from 12 to 13½ per cent of the live weight of the hog. In the handling of the product there is no part of the animal that requires as close and as skillful attention as does the ham during the curing process. One reason for this is that it is a thick, compact body of meat and it takes considerable time to chill it properly; the stifle joint, having a large amount of joint water, becomes tainted very soon if the animal heat is not properly removed. Another reason is that even if the heat is removed, and the curing agent does not get to the interior of it promptly, decomposition sets in. As before stated the first chilling of the carcass has everything to do with the curing of this meat. If hams are properly chilled in the cooler, the balance of the process is comparatively simple. If they are only partially chilled from lack of proper attention or because of improperly constructed coolers, no curing agency in the world will bring the hams out in a satisfactory condition.

When hogs are cut, the bone of the ham should be sawed. In some packing houses they are cut off with a cleaver, but the general practice is to saw them, on account of the danger of splintering the main bone when they are chopped. The foot is next cut off; this operation should also be done with a saw, the bone being sawed so as to expose the marrow. On the long cut export hams the foot is disjointed.

The ham is next trimmed, and it requires very skilled labor to trim them evenly and regularly. The error that is too often made in trimming is that an insufficient amount of flank is left on, the result being that when the ham is brought out of the smoke-house the heat will have shrunk the flank, thus greatly injuring its appearance. From one-quarter to one-half per cent can be made in the trimming of hams if the flank is left long, and the fat is left on the ham instead of being cut off and sent to the lard tank. The same is true of the cushion of the ham. The knife should be carried around on an angle, taking off as little fat as possible so as to make a properly shaped ham and at the same time make it look as lean as is possible. The hams should then be graded for average and quality, after which they are ready for the curing cellar. Several methods are adopted for curing.

In some instances where hogs are chilled seventy-two hours in the cooler, hams go directly from the grading bench into the curing vats or tierces. This is not generally done, however, as there is always more or less chance taken that the cure will not be satisfactory when handled in this way, because the hams after being in the chill-room seventy-two hours are hard and firm, still they are so thoroughly chilled that the pickle cannot penetrate quickly enough to prevent decomposition, and the fraction of one per cent of sour meats in a house where a large volume of business is done runs into money rapidly, causing pecuniary loss, also a loss of reputation.

Another method, and one which is very generally in use, is to shelve hams in a chill room which is held at a temperature of 33° to 34° F. and kept there for forty-eight hours to fully eliminate all the animal heat. They are then taken from this room and put into vats or tierces and the curing agency applied. Better success is attainable in this manner, to the author's knowledge, than in the method previously described.

In some instances they are handled successfully by pumping the hams with a pickle before it goes into this chill room. The pickle used for this purpose is made by taking 150 gallons of plain pickle, adding fourteen pounds of saltpetre and four gallons of sirup, or its equivalent in sugar, making the pickle a gravity of 95 degrees. In this case it being believed that the process of curing should start immediately after the meats are chilled.

PUMPING HAMS.

On the question of pumping hams there are a variety of opinions, but on one point everybody seems agreed, namely, that the very highest grade of hams should not be pumped, and the author believes it is universally acknowledged in all packing houses that the special, or leader, brands are cured without pumping, with a correspondingly increased percentage of damaged meats. A pump similar to that shown in Fig. 123 is used, the pickle being inserted around the joint by means of a hollow nickel needle. The needle is put in where the pickle is wanted, and with one stroke of the pump the pickle is forced into the inside of the ham. It is advisable to use a strong pickle, getting as much of the curative properties as possible into the ham with a minimum amount of water. The following formula is used:

80 pounds sugar,
15 pounds saltpetre,
5 pounds boracic acid,
5 pounds glycerine,

with just enough full strength plain pickle added to dissolve these ingredients, making the mixture about the consistency of thick molasses. The hams are pumped with about five strokes of this, viz.:

Three round the joint,
One in the body of the ham,
One near the aitch bone.

It will be noted from this formula that there is very little liquid matter and that nearly the whole amount pumped into the hams is of a curing nature.

FIG. 123.—HAM PUMP.

In pumping hams care should be used not to pump them heavy enough to burst the tissues, and to get as much as possible of the ingredient pumped in around the stifle joint, as this is the point where decomposition first sets in. Each day's cutting of hams should be tested internally with a thermometer made especially for this purpose to find the internal temperature. Light hams averaging from twelve to fourteen pounds should run from 33° to 34° F., heavy hams from 35° to 37° F. Temperatures higher than those designated are not safe, from a curing standpoint, and should be reduced to these points before the hams can be safely cured. What is meant by "safely cured" is the minimum percentage of sour, which should run less than one ham in 1,000 pieces. If previous directions as to refrigeration, handling, etc., are followed closely this condition is possible.

Another, and in the author's opinion, a very satisfactory method of handling hams, before beginning to pickle is (providing the hogs have been properly chilled in the cooler for from sixty to seven-two hours), as soon as they are inspected and graded, to spread them on the floor, piling them up carefully, shank down, about 2½ to 3 feet high, salt each ham slightly with fine salt, and let them lie packed over night in the cooler at a temperature of from 36° to 38° F. The next day they are put into process of curing. When hogs are properly chilled in a dry cooler, they come out more or less dried, and the surface of the ham, as well as the rind, is not sufficiently porous and open to absorb the pickle promptly, the meat being cooler than the curing room. When, however, it comes in contact with the fine salt, this causes moisture to form on the meat, which opens up the pores, in which condition the ham readily absorbs the pickle.

FORMULA FOR PICKLE WHERE HAMS HAVE BEEN PILED IN SALT.

Inasmuch as the hams have been salted on the floor, the pickle should carry correspondingly less salt in curing. Otherwise the meat will be too salty. A 75-degree plain pickle is as strong as should be used for hams thus handled.

To a tank holding 1,680 gallons, filled with 75-degree pickle, should be added:

475 pounds granulated sugar,
90 pounds saltpetre,
25 pounds bicarbonate of soda.

This makes a very safe and effective cure. The hams when being put down should be pumped as follows:

Five stitches in the shank;
One on the shank joint;
One on the aitch bone;
One on top of the shank;
Two in the body;

making a total of ten stitches per ham. The meat should be overhauled from one vat to another at the end of five days, second overhauling ten days later, pumping at that time with three stitches,

One in the shank,
One in the body,
One in the aitch bone.

It adds greatly to the certainty of the cure of meats to be thus pumped.

FORMULA FOR HAM PICKLE, WHERE HAMS HAVE NOT BEEN PILED IN SALT.

To a vat containing 1,500 gallons of 78-degree plain pickle add:

400 pounds sugar,
88 pounds saltpetre,
25 pounds borax.

The foregoing formula is used where hams are chilled before going into the vats, but are not subjected to any salting before being put in pickle. If hams are packed in a fine sprinkling of salt, a great deal of the salt adheres to the ham and this will materially strengthen the pickle. This must be taken into consideration in making pickle for curing the hams, otherwise they would be too salty.

CURING HAMS.

There are a variety of " cures " as well as methods of handling hams while in course of curing, one of them being to put the hams in a tierce and when filled, to add the following mixture:

25 pounds salt,
4 4/10 pounds sugar,
12 ounces saltpetre,
4 ounces bicarbonate of soda.

The tierce after being headed is filled with water at a temperature of 38° F. and rolled at least a hundred yards before being piled. It should be rolled every five, fifteen and thirty days thereafter.

While this method has been used quite extensively, the best results have not been obtained by handling meats in this manner. In the first place, tierces are not used to the extent that they were a few years ago, curing vats having been substituted for them. The vats largely in use today are made as follows:

For 1,500 pounds capacity, 42 inches high, 42 inches in diameter at the head, 48 inches in diameter at the bilge or center of vat. Thickness of stave 1 inch. Heads 1½ inch yellow pine; five galvanized iron hoops, 2 inches wide, made from No. 12 iron. Heads to be set flush with the chime, so that the weight of the contents comes directly on the floor.

Vats of this kind seem to last indefinitely and are much cheaper to handle than tierces, saving a large expense in coopering, and making it possible to use the space in the curing houses to better advantage. Cold storage houses should be sufficiently high under the joists, so these vats can be double-decked, one setting on top of the other, leaving about 20 inches of space. When handled in this manner the space in the cellar is used to much better advantage with vats than tierces.

Into a vat of the dimensions named, should be put 1,450 pounds of meat. It will take practically sixty-eight gallons of pickle to fill the vat on a basis of twenty one and one-third pounds of meat to be cured, to each gallon of pickle.

A safer method of curing hams and one which turns out the product in a more even and satisfactory manner is to make the pickle in large receiving vats, where the volume of business will warrant, thereby having an even and regular pickle and cure.

FORMULA FOR PUMPING PICKLE.

To a vat holding 1,500 gallons of 80-degree pickle add:

400 pounds granulated sugar,
80 pounds saltpetre,
12 pounds borax,
12 pounds boracic acid.

The sugar has the effect of toning down the brash salt effect in the meat, giving it a more palatable flavor, also to a certain extent it aids in curing, although it is of small value in that respect. The saltpetre aids in curing the meat, and gives it a bright, attractive color. Meat which is cured without the use of saltpetre has a dead, slatish appearance, which is very unattractive. The borax and boracic acid act as adjuncts in this case, the borax having the tendency to whiten the meat, giving it a bright, attractive appearance. The boracic acid has the effect of preserving the pickle, preventing it from becoming ropy or out of condition.

In making the pickle in this manner the vat should first be filled with a 78-degree brine by a salometer test.

The other ingredients should be dissolved in a small vat with the same strength brine, it being necessary to heat the pickle to dissolve properly the different ingredients. When thoroughly dissolved the contents should be emptied into the vat of brine, as above stated, and thoroughly stirred before using. The pickle should then be chilled down to a temperature of 40 degrees F., when it is ready for use. Care should be taken in making the pickle, to see that the required strength on the salometer is in the salt pickle and not in the total strength of pickle. After the other ingredients are in, for instance, a 78-degree salt pickle with the above ingredients will show 85-degree strength, whereas if it were a 78-degree pickle which was desired, and the test on the pickle was made after the other ingredients were in, there would be, practically, only a 71-degree salt pickle, which would be too light for safe curing.

The ingredients added in making the pickle have comparatively little preserving properties, the salt being the real preservative.

SIRUP CURING.

The best flavored meats are produced with sirup, instead of sugar, but meats handled in this way have not the keeping qualities that meats have when cured with a granulated or light sugar. The sirup also has a tendency to discolor the meat, making it look less attractive, and this, coupled with its tendency to cause fermentation, has made the curing of meat with sirup, in large concerns at least, undesirable.

A formula for the use of sirup in a 1,500-gallon vat would be as follows:

88 gallons sugarhouse sirup,
75 pounds saltpetre,
25 pounds borax.

This will make a dark-colored pickle. Hams turned out in this manner are of a very delicate flavor.

COST OF PICKLE.

Plain pickle, 78-degree, contains nominally two and one-half pounds of salt per gallon, therefore a 1,500-gallon vat of pickle would contain:

3,750 pounds of salt, at $3.10 per ton (figured time test was made)	$ 5.81
400 pounds sugar at 5c per pound	20.00
75 pounds saltpetre at 4½c per pound	3.38
25 pounds borax at 7½c per pound	1.85
Total cost	$31.04

Cost per gallon, $0.0207.

Changing prices for the ingredients will, of course, alter this cost.

USING SECOND HAND PICKLE.

A very wasteful practice in all packing houses, which has been done for years, is to throw away pickle as soon as the meat is cured. A pickle which will show 78-degree strength, to which has been added five to seven degrees of sugar, saltpetre, etc., making it 83- to 85-degree when used, if tested after meats have been cured, will still show a strength of from 52 to 58 degrees, the meat having absorbed the balance of the curative ingredients. The remaining ingredients in this pickle, are, however, just as good, when purified—salt and sugar being the same under all conditions—hence when meats are fully cured the pickle should be pumped into a vat, in the bottom and sides of which are galvanized iron coils. Steam should then be turned on these coils heating the pickle by the radiation from the pipe.

After the pickle has been thoroughly boiled for an hour or so, it should be allowed to settle, when the particles of grease, as well as all the albuminous parts, which the pickle has drawn from the meat cured, will rise to the surface in the form of a thick heavy scum; this should be carefully skimmed off and the pickle again boiled, when a second skimming is necessary, after which it should be drawn off and cooled and sufficient fresh ingredients added to give it its original strength, when it is as useful as ever. For instance, to a vat of 1,500 gallons of old pickle, 50-degree strength, add:

200 pounds sugar,
38 pounds saltpetre,
15 pounds borax.

Figuring on about 2,200 pounds of salt necessary to bring the pickle back to its original strength, on the basis of the figures in the former test, this pickle will cost a little over 1c per gallon, hence it will be seen that, where large amounts are used, it is advisable to use the pickle over and over until it is used up.

CALIFORNIA HAMS.

This is a style of cut made from the shoulder of a hog and on the live weight the percentage of shoulder meat is about 8½ to 10, this being a less valuable part of the hog than the ham. It is generally handled in a somewhat cheaper pickle; for instance in a formula for ham pickle using 400 pounds of sugar to 1,500 gallons, 300 pounds of sugar would be ample for California ham curing. It is a very difficult piece of meat to cure, especially if the hogs are not properly chilled. As the shoulder is one of the thickest parts it is the last to chill through. It is the general practice to pump California hams before curing and in so doing they should be pumped very heavily in the veins and under the shoulder blade, this being the two places where the meat first shows symptoms of trouble. Otherwise the chilling and general handling is practically the same as with other hams.

SWEET-PICKLE CALIFORNIA HAMS AND SHOULDERS.

A successful method of handling and formula for curing sweet-pickle California hams and shoulders is as follows:

When green, leach forty-eight hours with sprinkle of salt. Pump three times, once in shank, once on top of blade, and once below blade. Pump on second overhauling with two stitches, once in shank and once in body; overhaul same as other hams. For making the pickle for California ham use the following formula. To 1,500 gallons of pickle 75-degree strength, add:

300 pounds sugar,
88 pounds saltpetre,
25 pounds borax.

COST MAKING ABOVE PICKLE.

Salt	$ 6.84
Sugar	13.50
Saltpetre	3.86
Borax	1.93
Labor	.50
Total cost of 1,500 gallons	$26.63

Average cost per gallon, $0.0178.

SKINNED HAMS.

These are hams usually made from very heavy hogs, which are undesirable on account of their weight and extreme fat. The fat is skinned off these hams, reducing the weight and making them more desirable. Generally speaking, hams shrink from 14½ to 17 per cent in skinning. In deciding to do this, of course, the price of heavy hams, skinned hams and lard, enter into the question, consequently only a careful test, figuring the different values of the three items, as well as the weight of hams to be skinned, can determine the profit to be made in skinning them.

The following table shows the ages, in days, at which different kinds and weights of sweet pickled hams and sides are cured sufficiently to smoke; also at which different kinds of barrel pork are cured sufficiently to be sold; also the cuts which should and should not be pumped:

Product	Average wt. lbs.		Days to smoke	Days to ship	Pumped
S. P. hams	10	and under	30	30	Yes
" "	10¼—14		35	35	Yes
" "	14 —18		50	50	Yes
" "	18 —23		70	70	Yes
" "	24	and over	80	80	Yes
" " skinned	14 —16		50	50	Yes
" " "	18	and over	70	70	Yes
" " fancy	11 —13		60	60	No
" " fancy skinned	14 —16		65	65	No
" " export	10 —14		30	30	Yes
" " "	14 —18		35	35	Yes
" California hams	8		30	30	Yes
" " "	8 —10		35	35	Yes
" " "	10 —14		50	50	Yes
" N. Y. shoulders	12	and under	50	50	Yes
" " "	13	and over	55	55	Yes
Bellies	6 — 8		20	20	No
"	8 —10		22	22	No
"	10 —12		25	25	No
"	12 —14		30	30	No
"	14 —16		35	35	No
" rib	....		25	20	No
Bacon backs	....		30	30	No
Belly pork	....		..	15	....
Bean "	....		..	15	....
Loin "	....		..	15	....
Fat back pork	....		..	15	....
Short cut "	....		..	15	....
S. P. pork trimmings	....		..	15	....
Brisket pork	....		..	15	....

BOILED HAM.

Boiled ham is one of the finished products or, in other words, products that are ready to be used without additional manipulation by the consumer. There is nothing that determines the cost of the finished product as much as the shrinkage, hence the method that will produce the least loss in weight from original to finished product is the process desired.

There are two methods of cooking hams, one is to steam them in a retort or some receptacle where they are cooked by the heat generated by steam; another is to cook them in water. The latter process, from careful observation, seems to be the one that gives the best results as regards the shrinkage, although steaming makes the ham more palatable. Many people wrap the hams tightly in cloths or sacks for this purpose, feeling that this prevents, in a measure, some of the shrinkage. However, the results thus obtained are thought by many not to warrant the extra labor and the maintaining of the cooking sacks. The hams before being cooked should be bound and wrapped with twine, which holds them in shape. A form is also used successfully, made of galvanized iron or tin, having round plates which are put into a press, with the ham tightly clamped on the inside. The ham is cooked and chilled in this mold.

The cure of the ham has much to do with the shrinkage and it is therefore preferable to use fully cured hams instead of old cured hams, as the shrinkage is much greater on over-cured meats. It is also advisable to sort the hams as to size, having each vat or tank of hams uniform. If not uniform in size there is an excessive shrinkage on small hams which are overcooked, if put in the same vat with large hams. In all cases the hams should be soaked, thereby removing the surplus salt. The length and time of soaking depends altogether on the age of the meats. The hams should be thoroughly washed and if they are to be branded this should be done before they are boned or cooked. The method most commonly adopted is to cook the hams first, then smoke very little. Some smoke first, boiling afterwards, which is a very expensive method owing to the excessive shrinkage.

RULES FOR BOILING HAMS.

When hams are boned (if desirable) and wrapped, they should be put into a vat of water, temperature about 70° F., and the steam turned on slowly until it reaches 160° to 165° F. The hams are held at this temperature until they are cooked, which requires somewhat longer time than when they are cooked by steam at a higher temperature. A twelve-pound ham will require from four and one-half to five hours cooking in this manner. After the hams are cooked they should be allowed to cool off in the water in which they were cooked; not taken out, or drained, or set in the cooler, for in the water in which they are cooked are many of the juices of the meat, which are again absorbed by the hams as they cool, and the shrinkage is much less than if taken out immediately. The hams should then be taken to the smoke house, laid on racks and given a very light smoke.

SHRINKAGE IN BOILING HAMS FROM SWEET PICKLE WEIGHT TO SHIPPING WEIGHT.

Hams taken out of pickle and drained for twelve hours will show the following shrinkages under favorable circumstances:

	Per cent.
Hams not boned, smoked after cooking	9 to 12
Hams with bone out, including the shank bone, skin on, not fatted	12½ to 18
Hams with bone out, skin lifted, fat removed	18 to 23
Hams with bone out, the skin and fat removed	33 to 40
Hams skinned, fatted, bones left in	28 to 35
Skinned shoulders, bone out	30 to 35

ROLLED BONELESS PORK LOINS.

Use loins cut from stags or heavy loins, the tail bone being taken out without cutting through the layer of tissue and fat. They should be trimmed and all bones removed.

Cure.—For 400 pounds of meat, use fifteen pounds of Deacon salt, four pounds sugar, four pounds borax, one pound saltpetre, to one and one-half gallons old ham pickle. Have the loins rubbed lightly with the above powder and packed in a tierce as tight as possible; the one and one-half gallons old ham pickle referred to being sprinkled over each layer of loins as the tierce is filled. Loins should be held until they are forty-five days old and should be kept at a temperature of from 38° to 40° F.

Wrapping.—From two to three pieces of loins (according to size) should be wrapped together. They are wrapped with seine twine No. 39, with same size double hitch as is used for boiled hams.

Smoking.—Loins are smoked from two and one-half to three hours at a temperature of 140° to 180° F.

Cooking.—Loins are cooked for three hours at a temperature of 165° to 175° F. They are then placed in the cooler, where the temperature is held at 36° to 38° F. for twelve hours, after which they are ready for use.

DRY SALT MEATS—BELLIES.

This particular part of the animal is cured either in dry salt or sweet pickle, according to the requirements of the trade and the grade or quality of the meat. The highest class bacon used in this country is generally "dry salt," being specially handled and prepared to make the most attractive appearance. A much sought for point in bacon is to so prepare it that when fried it is of a light color. The only way to obtain this color is to use less sugar in curing, as it causes discoloration in cooking; but at the same time it greatly adds to the flavor, hence curing by the dry salt method adds to the looks, but detracts somewhat from the flavor. When it is cured in this way it should be dry packed in air-tight boxes lined with galvanized iron, or other material, the meat being put down with a fine salt combination, thoroughly mixed as follows:

75 pounds English salt,
25 pounds sugar,
6 pounds saltpetre.

The meat should be held in this cure about twenty days.

The meats are packed with the rind down, and thoroughly salted, the salt being spread between the layers, the top layer being put on with the rind up and the box closed, keeping the air from it as much as possible; meat must not be overhauled. It should be fully cured in thirty-five days. Meat handled in this manner, as stated before, when fried cooks white; it also has a very bright appearance when smoked, but lacks, from an American standpoint, at least, the flavor which is obtained in sweet pickled bacon.

In sweet pickled bacon the cure is practically the same as for hams, the bellies being put into vats or tierces, the ingredients of the pickle being practically the same. Heavy or ribbed bellies are cured in dry salt by being stacked on the floor, the salt thoroughly rubbed about the edges and put on sufficiently heavy for the protection of all parts of the meat in the course of curing. Meats dry salted should be overhauled in five, ten and thirty days after being put down.

The following table shows the age, in days, at which dry salt meat should be cured in order to smoke safely;

also at which to ship safely; also the cuts that should and should not be pumped:

Product	Average wt. lbs.	Days to smoke	Days to ship	Pumped
Extra short clears	......	25	15	Yes
Short clears............	45—55	50	40	Yes
Extra short ribs........	......	25	20	Yes
Short ribs..............	45—50	55	55	Yes
" "	50—80	75	70	Yes
Bellies	15—17	25	25	Yes
"	18—21	30	27	Yes
"	18—22 and over	35	32	Yes
" fancy	4— 6	20	20	No
English bellies.........	......	15	20	No
Shoulders..............	......	30	30	Yes
" English	......	25	30	Yes
Cumberlands	......	20	30	Yes
Dublins................	......	20	20	Yes
Long cut hams	......	20	25	Yes
Fat backs..............	......	20	25	No
Jowl butts— 10 days in brine, 10 " " salt	......	20	20	No
Backs..................	......	25	25	Yes
Plates.................	......	10	10	No

Meats put into a smoke house before they are sufficiently cured develop a condition known to the trade as "puffy," which means that the meats being insufficiently cured when submitted to the heat of the smoke house, decompose and a gas forms which produces the condition referred to.

COST OF CURING DRY SALT MEATS.

The following basis was arrived at after the handling of several million pounds of product, the market values of the year 1900 regulating the price: Labor cost for all dry salt meats handled, ten cents per 100 pounds; curing materials, five cents per 100 pounds; insurance taken into consideration at $1.50 per $100 on 80 per cent of valuation; interest at 5 per cent on total valuation.

The various shrinkages taken into consideration on each cut of meat, the cost on the foregoing basis is as follows on the different cuts held the number of days shown:

Product	Average wt. lbs.	Days held	Cost per 100 lbs.
Dry salt short ribs	60	60	$0.2864
" clears	60	50	.3029
" extra short clears	(heavy)	35	.1119
" Cumberland bellies	14 —16	25	.3327
" " "	30—35	35	.1255
" fat backs	18—20	25	.0480
" clear plates	....	20	.0529
" regular "	....	25	.1724
" neck fats	....	15	.0524

Oftentimes in shipping pickled hams in bulk, where they are to be for some time on the road, it is advisable to use a preservative of some nature to prevent their turning slippery or moldy. The following will serve for this purpose:

75 pounds rice flour
25 pounds powdered borax } Thoroughly mixed.

The hams should be rolled and rubbed in this powder and afterwards brushed off with a large varnish brush. Sufficient of the powder will adhere to the meats to prevent their becoming slippery during any reasonable length of time necessary for shipment.

CURING OF ENGLISH MEATS.

There is, at times, a great demand in England for American pork products, and the English cuts, as well as their methods of curing in many cases, vary from the American methods. Comparatively little sweet pickle meat is shipped to England, the English taste preferring meat cured in dry salt. The following instructions will be found useful in curing and preserving different cuts of English meats:

For a pumping pickle use a plain salt brine 100-degree strong, containing three ounces of saltpetre to the gallon. In pumping Cumberlands (Fig. 124) and shoulders pump into the blood vein and under the blade, using one and one-half to two ounces of pickle in each place, and exercising care to lodge the pickle near the bone and away from the fat on the side of the meat.

CURING OF LONG CUT HAMS.

It is unnecessary to pump long cut hams from October 15 to March 1. From March 1 to October 15, pump under the shank and in the top. Use care to lodge the pickle near the bone and away from the fat on the back

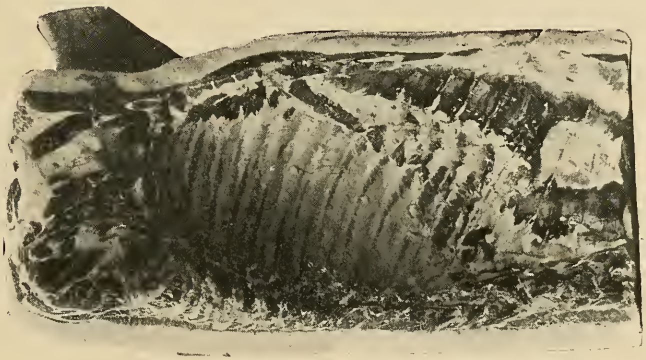


FIG. 124.—CUMBERLAND CUT.

side of the ham. Views of hams that are included in this heading are shown in Figs. 125, 126 and 127.

COLOR OF ENGLISH MEATS.

As a great deal depends upon the color of English meats, and the trade demands a bright, attractive appearance in same, considerable saltpetre is necessary. Therefore, from four ounces of saltpetre to the 100 pounds of meat on cuts weighing from three to five pieces per 100 pounds, to as high as six ounces per 100 pounds

FIG. 125.—LONG CUT HAM.

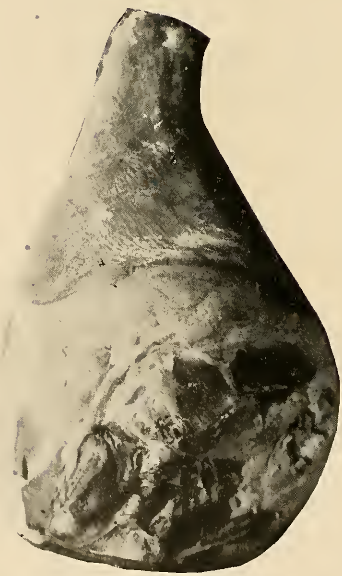


FIG. 126.—MANCHESTER HAM.

FIG. 127.—STAFFORDSHIRE HAM.

on smaller cuts, should be used. The salt and saltpetre should be thoroughly mixed before applying.

FIG. 128.—WILTSHIRE SIDE.

SALTING.

On meats not to be overhauled not less than four and one-half nor more than five and one-half pounds of salt to the 100 pounds on all cuts excepting long cut hams, should be used. On the latter from five to six pounds of

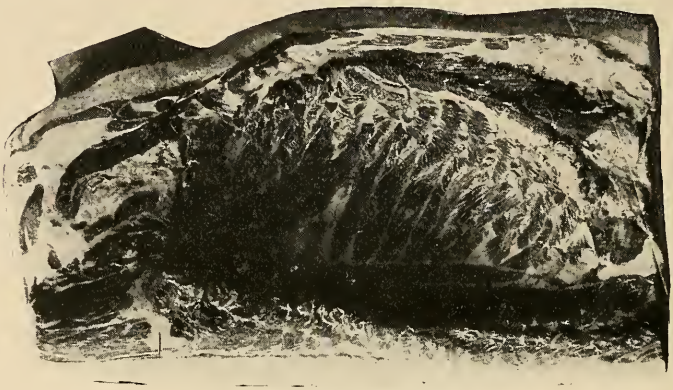


FIG. 129.—YORKSHIRE SIDE.

salt per 100 pounds of meat should be applied. In the summer months the maximum amounts heretofore described should be used.

FIG. 130.—STAFFORDSHIRE SIDE.

On meats overhauled three to three and one-half pounds of salt per 100 pounds when putting down, and three pounds per 100 pounds when overhauling, should be used. Rub salt in well under the sides of shanks of shoulders, and use plenty on the top of shanks of both.

In salting sides (this applies to all the various cuts shown in Figs. 128 to 134 inclusive), salt the heaviest on

FIG. 131.—DUBLIN CUT.

the shoulder and along the loin, rubbing the edges of all cuts carefully, seeing that the salt adheres to all parts of the meat before it is piled, for if there are places where there is no salt on the meat, it will discolor and eventually become slippery and out of condition.

FIG. 132.—ANTWERP BACK CUT.

In stuffing the pockets of long clears and long ribs, do not use more than one and one-half times the amount of salt on the same area of shoulder or loin. Too much salt used in the pockets of the sides gives the meat a burned salty appearance and condition. In rubbing the salt into the pockets with the hand, be careful to put the salt into every part, otherwise meat will spoil in places missed before the pickle reaches them.

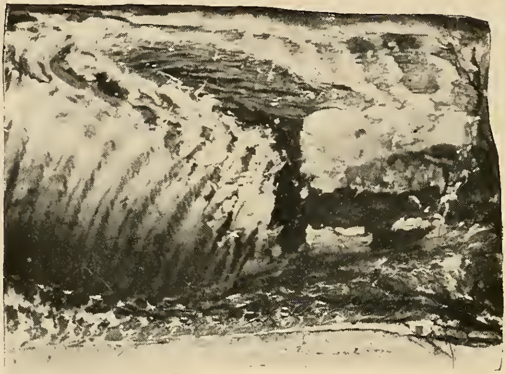


FIG. 133.—SQUARE EXPORT SHORT RIB.

PILING.

Use extra care to pile meats closely and exclude the air, for they will not develop a desirable color when they are exposed to the air. After the meats are all piled

FIG. 134.—SQUARE SHORT CLEAR.

evenly, the edges should be gone over, and any exposed parts covered with a fine sprinkling of salt.

OVERHAULING.

English middles weighing from twenty-three to thirty pounds average, and long cut hams from twelve to fourteen pounds and heavier, should be overhauled at from eight to twelve days old, salting them as before described. Do not overhaul English meats unless necessary in order to hold them after they are cured.

SHIPPING AGES FOR ENGLISH MEATS.

The following table shows the ages at which English meats can be safely shipped during the seasons from October 15 to March 1, and from March 1 to October 15:

Product	Average wt. lbs.	Oct. 15 to March 1 Days	March 1 to Oct. 15 Days
Bellies	......	15 to 25	15 to 25
Boneless backs	......	15 to 25	15 to 25
Cumberlands	20—24	20 to 25	20 to 25
"	24—30	20 to 25	25 to 30
"	30—40	25 to 30	25 to 30
Long clears	under 30	20 to 25	20 to 25
" "	over 30	20 to 25	25 to 30
Dublins and long ribs	......	20 to 25	20 to 25
Long cut hams	10—14	20 to 25	20 to 25
" " "	14—18	25 to 30	25 to 30

These ages for shipping should be followed closely, but when necessary the following exception may be made without detriment.

From October 15 to March 1, shortest shipping age may be reduced five days.

PACKING OF ENGLISH MEATS.

Meats to be packed in borax, cured as above, should be put in a plain cold pickle 100-degree strong, then scraped on the skin side and wiped with cloths wrung out of hot water. If the meats are old and have a slippery appearance, they should be scrubbed with a brush in warm pickle and wiped afterwards. They should then be rubbed in borax with the rind placed upon a grating and the surplus borax brushed off the skin side of the meat, using a fine brush for so doing. It is customary to use from five and one-half to six and one-half pounds of borax per 300 pounds of meat. Meats to be packed in salt should not be washed. The skin and edges of the meat should be thoroughly scraped and then rubbed in fine salt before being put in the boxes. For sizes and styles of shipping boxes see Chapter XXIII—"Boxes and Cooperage."

YIELDS LONG CUT HAMS AND CUMBERLANDS.

The following table shows the percentages of yields of different weight hogs made into long cut hams and Cumberlands, also average weights:

Av. wt. live hogs, lbs.	Average weight cuts, lbs.	Per cent hams	Per cent Cumberlands	Per cent miscellaneous	Per cent total
190	Long cut, 16–18 Cumberlands 36–42	18.37	40.43	P. S. lard 9.86 Raw leaf 3.59 Trimmings 1.92	73.97
168	Long cuts 14–16 Cumberlands 32–38	18.66	39.17	P. S. lard 7.42 Raw leaf 3.30 Trimmings 1.92	70.47
136	Long cuts 12–14 Cumberlands 24–28	18.45	37.48	P. S. lard 8.48 Raw leaf 3.38 Trimmings 1.55	69.34

CHAPTER XVI.

THE SMOKE HOUSE.

THE HANDLING OF MEATS IN THE SMOKE HOUSE.

The smoking of bacon meats is the last process through which they are put before placing them upon the market, the term "bacon," applied to any brand of meat, meaning that it is smoked.

The smoking of meats is a very ancient method adopted for their preservation for future use. All meats which are smoked are more or less impregnated with saltpetre. The saltpetre lies dormant to a certain extent after penetrating the meat, but as soon as the latter is exposed to the warm temperature in the smoke house its curing properties become active. This, in connection with the tannic acid which is developed in the smoking process and deposited on the meats, forms a preserving agency which prevents decomposition for a considerable period, varying according to the temperature and conditions to which the meat is subjected. The methods used in smoke houses are practically unchanged today, except in a mechanical way, as compared with former times.

SOAKING MEATS FOR THE SMOKE HOUSE.

When meats are ready for the smoke house, they are first soaked in fresh water. This is done to remove the surplus salt, making the meat more palatable, and also to give it a better appearance, for if it is not properly soaked the salt leaves a white crust on the surface. Meat over-soaked has a water-logged condition and often becomes water-sour when exposed to the necessary heat for smoking, also moulds quickly after smoking, hence it is essential that this part of the work receives careful attention.

The best results from soaking are obtained by using soaking water at a temperature of 65° F., for at this temperature the salt is dissolved to the best advantage, without unduly softening the meat. A soaking schedule that will be found to give excellent results is as follows:

TIME REQUIRED TO SOAK MEATS.

Hams at full cured age..	2	hours	(3 min. for each day older)
Bellies, 8-10 lbs., 20 days	1½	"	(3 " " " " ")
Bellies, 10-12 lbs., 25 days	1½	"	(3 " " " " ")
Bellies, 12-16 lbs., 30 days	1½	"	(3 " " " " ")
Dry salt meats..........	½	"	(except bellies, two hours)

If meats still show salt after smoking change water once, as the fresh water will take up salt rapidly. It will be found better to change water than to soak longer.

METHOD OF HANDLING MEATS IN A SMOKE HOUSE.

After the meats have been soaked and hung in the smoke house, they should be allowed to hang from three to seven hours, or until they have stopped dripping, for if the smoke is applied while the meats are still dripping, wherever one piece of meat is subjected to the dripping of another, the smoke fails to take effect, giving the meats a striped and discolored appearance. After the meat has had time to thoroughly dry, fire should be built in the smoke house with either maple or oak wood (partially green being preferred) and the temperature brought up to from 112° to 118° F., and maintained until the surface of the meat has become thoroughly dried and has a partially glazed appearance. As soon as this effect is noticed, which will be in five to eight hours, hardwood sawdust should be added, which will form a dense, penetrating smoke. At the same time the temperature should be gradually increased in the smoke house, or brought up to from 115° to 120° F.

A pile of sawdust, quantity depending upon the size of the smoke house used, should be raised in the center of the house and a few burning brands of wood laid around it. These will cause the sawdust to ignite and a small fire, producing a great deal of smoke, will result therefrom. If the sawdust is put on a fire already burning much of the sawdust will go up through the house in the form of a light ash, which is deposited upon the meat, injuring its appearance.

A house of sweet-pickle meats should be smoked for about twenty-four to thirty hours, to get good results, and afterwards be allowed to stand for twelve hours with the ventilators open, to give the meat a chance to thoroughly cool off.

TEMPERATURES IN SMOKE HOUSE.

The following temperatures will be found to give very satisfactory results in smoking and while it will be found impossible to adhere to them absolutely, it is advisable to do so as closely as possible during the smoking period:

3 hours in smoke	...107°F.	18 hours in smoke	...118°F.
6 " " "	...114°F.	21 " " "	...120°F.
9 " " "	...116°F.	24 " " "	...118°F.
12 " " "	...118°F.	27 " " "	...119°F.
15 " " "	...119°F.	30 " " "	...115°F.

It should be the aim to have the house at a temperature of 118° F. after twelve hours, and it should be held at that if possible.

Meats thus handled will be found to have a light amber color which indicates a light smoke, whereas a dark

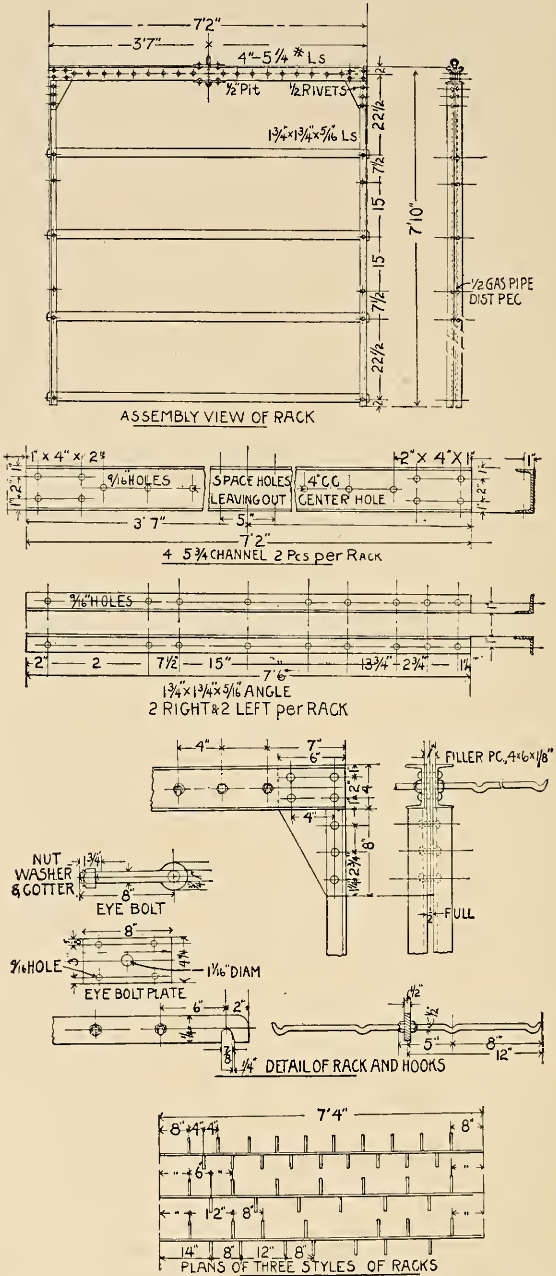


FIG. 135.—DIAGRAM SHOWING DETAIL SMOKE HOUSE RACK.

amber would indicate a heavy smoke. The color of the meats should be regulated by the requirements of the trade.

When the meats are smoked, the fire should be put out, the house opened up, giving it a free circulation of air, and the meats allowed to thoroughly dry and cool before being removed. Smoked meats should be handled as little as possible, for every time they are handled or piled on trucks, it detracts somewhat from their appearance. They become greasy and soon lose their bright, attractive appearance. Intelligent and up-to-date smokers, recognizing this condition, are fitting their houses largely with what is known as a "trolley system"; the meats being hung, when soaked and washed, on a rack which is operated by this system, and are run from there directly into the smoke house.

Fig. 135 illustrates a conveniently arranged smoke house rack and Fig. 136 gives details of a double truck for smoke house racks where a heavy load is to be carried on trolley.

After being smoked and cooled, the meats are run to the packing bench, and are never handled from the time they are washed, ready for smoking, until they are inspected and packed ready for shipment, thereby preserving a very desirable appearance, as well as greatly reducing the cost of labor in operation.

SHRINKAGE IN SMOKE HOUSE.

Shrinkage is a matter which requires a great deal of attention. The aim is to smoke out the meat as near green weights as possible, the amount of shrinkage depending largely upon the requirements at points to which meats are to be shipped and the conditions to which they are to be subjected. For instance, hams and shoulders which are to be used for immediate consumption should smoke out 98½ to 100 per cent green weight, whereas meats which are to be held for some length of time after being smoked, or which are intended for a warmer climate, will smoke out from 95 to 97 per cent of the green weight. Meats, which are to be shipped south or to a warmer

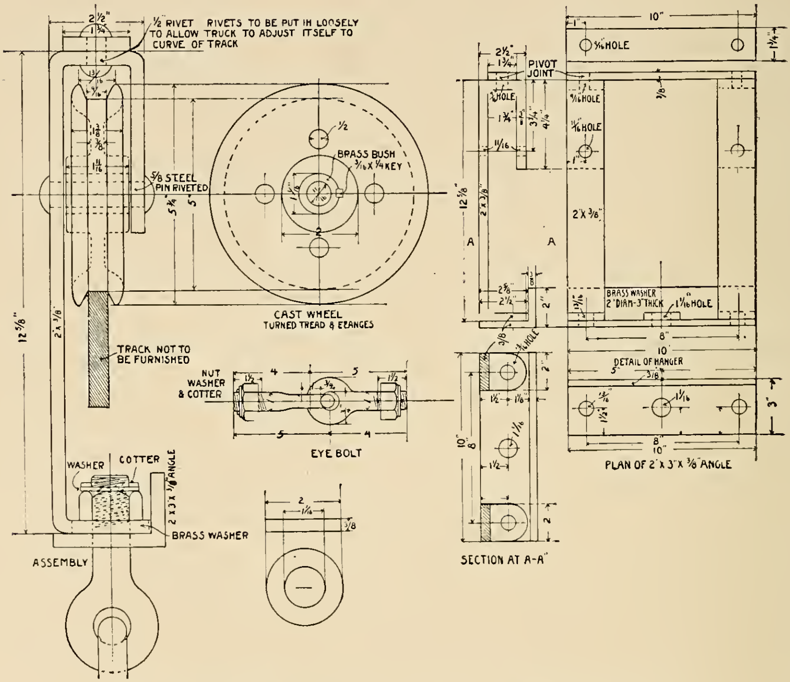


FIG. 136.—DIAGRAM SHOWING DETAIL OF DOUBLE TRUCK FOR SMOKE HOUSE RACK.

climate, or are to be held for a considerable length of time before being consumed, should be smoked dark, with a correspondingly heavy shrinkage. Excess shrinkage merely means the evaporation of an additional amount of moisture, thereby preventing early decomposition.

Meats, which are to be consumed immediately and not shipped to a warm climate, may carry more moisture and hence show less shrinkage. At the same time they have a much finer and more attractive appearance. This is a matter to which an owner or manager of a smoke house must necessarily give minute and close attention in order to obtain the best results.

In many cases, where meats are to be used immediately and consequently a light shrinkage is desired, they are colored, giving them an appearance of a heavy smoke, whereas they are smoked comparatively little. In this

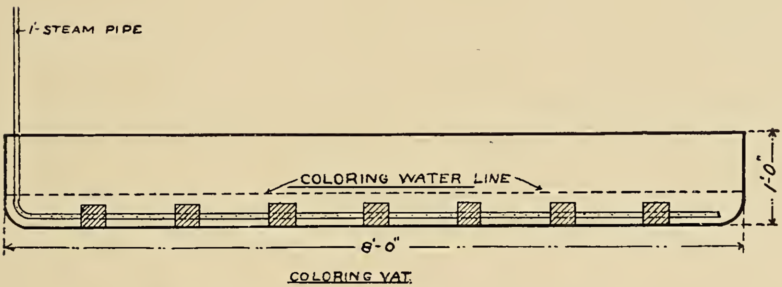


FIG. 137.—OUTLINE SKETCH OF COLORING VAT.

case the meats are dipped in a colored water composed of the following ingredients:

FORMULA FOR COLORING SWEET PICKLE MEATS.

2 ounces boracic acid,
2 ounces alum,
½ pint alcohol,
8 ounces carbon.

Mix in thirty gallons of hot water. Use sufficient to color immersing water the desired shade for the meats to be dipped.

By simply immersing the meat to be smoked in this water before it goes to the smoke house, gives it the appearance of having been heavily smoked, thereby saving the shrinkage which would otherwise follow. The coloring water should be used according to color desired for meats, by putting a small amount of it into a tub of clear water and immersing each piece of meat in the tub before hanging it in the smoke house. Do not allow the meat to soak or lie in the water; immerse it and hang it up immediately.

FORMULA FOR COLORING SWEET PICKLE SIDES TO AVOID SMOKING.

This formula is used for coloring skins only, consequently is used almost exclusively on bacon, sides and bellies:

2 quarts alcohol,
10 ounces Massaka E.

Mix well and let stand twelve hours, then cook well and add—

3 quarts glycerine,
50 gallons water.

About two quarts of this mixture is required to a coloring vat or tub that will hold three barrels of water, the water being held at a temperature of 90° F. by using a steam coil in the tub. The vat shown in Fig. 137 consists of a shallow basin a foot deep with a perforated steam coil in the bottom. The coloring water which is used to color the rind of the meat, comes about an inch above the wooden rack shown in bottom of vat. The meats are laid on this rack and only the rinds of the meat come in contact with the coloring water.

SHRINKAGE IN SMOKE HOUSE TEST.

The following table shows the result of actual tests on 1,136 pounds of meat hung in smoke house for seven consecutive days, temperature of smoke house about 90° F.:

	Lbs.
Weight when fully smoked	1,136
24 hours later	1,129
24 " "	1,121
24 " "	1,114
24 " "	1,108
24 " "	1,105
24 " "	1,100

Thirty-six pounds shrinkage in seven days' hanging.

PAPER FOR WRAPPING SMOKED MEATS.

Another very important item is the paper used for wrapping smoked meats. A desirable paper is one which will keep out the air and moisture, thereby preventing molding and at the same time will not absorb the grease from the meat, which would cause shrinkage—nor should it stick to the meat when taken off. Papers having these qualities can be bought in sheets, 28 x 32 inches in size, desirable paper generally running about seven sheets to the pound. Where meats are wrapped they are sold gross weight, paper and meat.

CANVASING MEATS.

The methods employed in the process of canvasing cured meat requires careful supervision in order to preserve it in a satisfactory manner. Meats which are to be shipped a long distance, or which are to be used in a warmer climate, or must necessarily be exposed to a high temperature for some time before being used, should in all cases be protected by a covering. If not they will mold or become fly-blown and thereby become valueless. A method has therefore been adopted of covering the meat with canvas, and either yellow- or white-washing same.

Many experiments have been tried in late years to make a gelatine solution into which meats can be dipped after being canvased, thereby forming an absolutely air-tight encasement, but these experiments have not resulted satisfactorily and the use of the older and well tried remedy of white-washing, or yellow-washing, is still followed.

WHITE WASH FOR MEAT CANVAS.

The meats to be white-washed should be thoroughly cooled and dried after coming from a smoke house. They are then wrapped in regular ham paper, next in white parchment paper and then sewed up in a cheese cloth covering (using a strong cheese cloth for this purpose). Canvasing cloth should be 36 inches wide and weigh one-quarter pound per yard. The hams are then dipped in a solution composed of the following:

1,200 pounds floated barytes,
90 pounds flour,
140 pounds water,
63 pounds white ham wash glue,
1 teaspoon blueing.

The glue should be cooked and strained through a piece of cloth before being added to the solution, as there is liable to be more or less sediment in the glue, which should be removed, after which mix with the flour; let stand about twelve hours, then add the barytes, using hot water in mixing. After it is mixed add the blueing.

This material should be put in a tub, held at a temperature of 90° to 100° F., into which the canvased meats are to be immersed. After being dipped they are hung up over the tub while an attendant rubs his hand over them, taking off the surplus material which has adhered to the package, and at the same time forcing the openings in the cloth full of the wash. They should next be brushed over with a heavy paint brush, smoothing off the surface, and then hung in a dry-room to dry.

After being allowed to hang for eight to ten hours, until the wash is thoroughly dry and has hardened, they are ready for shipment. This method is adopted in the largest packing houses for the handling of hams, shoulders, and bacon, for shipment to the Philippines and the far east, and has been found to be the safest and most satisfactory one yet discovered.

YELLOW WASH FOR MEAT CANVAS.

This is practically the same as white wash, except that a chrome yellow color is used, and the mixture will have a yellow instead of a white shade when finished. Handle same as white wash for meats. A formula for yellow wash is given as follows:

1,200 pounds floated barytes,
210 pounds whiting,
195 pounds water,
114 pounds lemon yellow,
35 pounds joiner's glue.

This is used at a temperature of from 90° to 100° F. As all meats canvased are sold gross weight, the barytes is added to give an additional weight to the meats which are canvased.

The following tests will show the cost and gain in yellow washing:

CANVASING 1,031 HAMS.

325 yards sheeting at 4⅞c	$15.84	
3¾ yards Andover twine at 30c	1.12	
274 yards paper at 1¾c	4.32	
One man three hours at 17½c per hour	.52	
Sewing at $1.10	11.34	
Cost of canvasing		$33.14
445 pounds wash at 2.1c	$ 9.34	
1,031 labels at $1 per 1,000	1.03	
Eight men two hours twenty-eight min., seven men thirty-five min.	4.11	$14.48
Total actual cost		$47.62
Weight before canvasing		10,550 lbs.
Weight after canvasing		11,041 lbs.
Weight after washing		11,486 lbs.

It will be noted from the previous test that there was a gain of 936 pounds in canvasing these hams, at a cost of $5.09 per 100 pounds. As hams always sell at a much higher price than this, the difference would represent the profit in this operation.

SMOKING DRIED BEEF.

Dried beef is an article which has to be smoked heavier, consequently dried more, than pork hams, and unless the moisture is well evaporated the time it may be kept will be short. An approved method for handling dried beef is as follows:

Steam coils should be placed at the top and also at the bottom of the smoke house. The steam should be turned on until the temperature of house is between 130° and 140° F. After the meat has hung in this temperature about thirty hours, a light fire should be started, by using two or three sticks of wood, and plenty of hard wood sawdust scattered close to the fire, so as to form a dense smoke. It is very essential that dried beef should have a strong smoked flavor. Steam should be kept on the house all the time the beef is being smoked and it will require eighty to ninety hours under these conditions to bring the beef out in the best condition.

Beef can be smoked in a regular house, but it takes much longer and it cannot be handled as satisfactorily as with steam heat in connection with the smoking process.

After the meat is sufficiently smoked the house should be allowed to cool off, and the meat to hang for about twenty-four hours before being handled. It is then ready for packing and shipping. Dried beef thus handled will shrink about 28 to 33 per cent from the cured weight to the smoked weight.

The following test will show the shrinkage on 100 pieces of dried beef hams, also the shrinkage each twenty-four hours after:

SHRINKAGE ON DRIED BEEF.

100 pieces, cellar weight	1,184 lbs.
After smoking 85 hours	812 lbs.
24 hours later	806 lbs.
24 " "	793 lbs.
24 " "	781 lbs.
24 " "	762 lbs.
24 " "	755 lbs.
24 " "	750 lbs.

CHAPTER XVII.

DOMESTIC SAUSAGE.

INTRODUCTORY.

There is probably no department in the packing house where there is more diversity of methods followed than in the sausage room. The business of sausage making is a very old one, and was largely developed in European countries, where on account of the extremely low wages and the high prices for meats it was necessary for the poorer classes to make the cheaper meat products into an edible article. A good sausage maker is much like the frugal wife, both make very palatable dishes out of scraps that would otherwise be useless.

In the handling of animals in large numbers, many wholesome meat products are left which are not palatable in their original condition. Cheek meat, hearts and various trimmings are as wholesome as a porterhouse steak, but not so palatable, at least, in their original condition; hence, the art of sausage making consists in taking these low priced products and making from them a palatable, wholesome and at the same time economical article.

It is the author's intention to go into this department in detail, giving the most minute and practical instructions in the general handling of all kinds of sausage, including the curing and handling of the fresh products and also the preservatives that are used in their manufacture, as well as formulas giving the different kinds of meat, seasonings, etc., and the most modern devices for the economical and profitable handling of the product in this department.

PRESERVATIVES.

One of the most important items entering into the preparation of sausage meat is the addition of some preservative or preventive of decomposition or fermentation, which, while it serves to keep the meat in a wholesome condition, is at the same time perfectly harmless, tasteless and odorless. Preparations for this purpose are known under the general term of "preservatives." There are many opinions as to the ingredients which should be used in preservatives, and there is no doubt that, at least in some cases, ingredients are used which are detrimental to health, but generally speaking, those used for purposes of this kind consist of borax, boracic acid and common salt, and many preservatives which are offered for sale on the market are nothing more than the mixture in various degrees of these three ingredients. The use of improper ingredients is a serious detriment to the sausage, and the formulas hereinafter given are some that have been compiled after years of careful study and experimenting.

In order to prepare preservatives special care should be taken to obtain pure chemicals. A great saving can be made, and better results usually obtained from one's own compositions.

The following is a very reliable formula for a preservative for all kinds of cooked sausage, including New England pressed ham:

72 pounds powdered borax,
10 pounds boracic acid,
18 pounds very fine salt.

The foregoing formula should be mixed thoroughly and four to six ounces used to 100 pounds of meat.

PRESERVATIVE FOR PORK SAUSAGE.

One of the best preservatives for pork sausage known is prepared by using one and one-quarter ounces of sulphite of soda, mixed with the salt required, to 100 pounds of sausage meat. It not only preserves the meat, but also the color, and prevents the sausage to a greater extent than any other preservative from turning dark inside or near the casing. In buying this article, it should not be purchased in large quantities and should be kept in air-tight packages, such as a screw-top jar, for if exposed to the air, it will turn to sulphate of soda and produce the opposite effect upon the meat.

There are many pork sausage preservatives sold on the market that are nothing else than the above under a fancy name. This preservative is used for pork sausage only and should never be used for cooked sausage.

PRESERVATIVE FOR PACKING FRESH BEEF, PORK HEARTS, ETC.

A preservative for packing fresh beef and pork hearts, head meat, beef and pork cheek meat, giblets and weasand meat is made according to the following formula. For one tierce, or 400 pounds of meat, use the following ingredients, thoroughly mixed:

15 pounds salt,
2 pounds sugar,
4 pounds borax,
1 pound boracic acid,
1½ pounds saltpetre (no pickle).

The beef and the pork hearts and other meats mentioned above should be thoroughly washed in a mild pickle so as to remove the blood and slime before packing in the tierce, as the above formula is used for dry packing only. Head, cheek and giblet meat should not be put into ice water when cut off on the killing floor, but should be promptly removed to a cooler where the temperature is 36° to 40° F., and spread or hung up on racks made for the purpose, to refrigerate.

Care must be taken not to allow these meats to accumulate in any bulk while warm.

All dry packed meats should be packed tightly enough in the tierce to entirely exclude the air regardless of weight. This is a very particular point and should be observed closely.

After the trimmings or offal have been washed and chilled, the preservative or mixture, as described above, should be mixed thoroughly with the trimmings. This is accomplished more satisfactorily by mixing them in a box or on a table where fifty to one hundred pounds of meat can be handled at a time. When this quantity has been mixed with the preservative, the trimmings should be put in a tierce (first seeing that both tierce and trimmings are absolutely dry), and pounded down as tightly as possible with a mess pork pounder and the operation continued until the tierce is as full as possible, allowing for the head to be put on. Before heading up spread a cheese cloth or thin cotton cloth over the top to protect the trimmings from the head and also from any air that might leak through from poor coopering.

The tierce is then headed up and removed to cold storage, where the temperature must be kept as near 40° F. as possible from thirty to forty-five days, when the trimmings are ready for use. If it is desirable to keep the product four to six months, after it has been in the temperature above mentioned for thirty to forty-five days, remove to a lower temperature; 32° to 34° F. If trimmings are properly handled in the above manner, they can be kept from one season to another without spoiling.

PRESERVATIVE FOR PORK AND BEEF TRIMMINGS.

For one tierce of 400 pounds use the following mixture:

15 pounds salt,
4 pounds sugar,
4 pounds borax,
1 pound saltpetre,
2 quarts old ham pickle, which must be sweet and in good condition.

Pork and beef trimmings should be fresh, and if they have been packed in barrels, the blood should be allowed to drain off before being packed in the preservative, as above mentioned. They should not be washed in pickle before being used, but should be handled dry if possible and packed the same as described in the foregoing formula for other trimmings and handled the same in regard to temperatures, etc.

The two quarts of old ham pickle mentioned in the above formula should be sprinkled through as uniformly as possible when pounding the trimmings down into the tierce.

CURED PRODUCTS USED IN MAKING SAUSAGE.

The following products are used in sausage making after they have been pickled or cured. They have little value except in the cured condition, hence it is necessary, in order to make use of them and put them in a marketable condition, to first cure them:

Pork snouts,	Pork ears,
Pork hearts,	Pork tails,
Pork cheeks,	Beef hearts,
Pork skins,	Beef cheeks,
Pork heads,	Ox lips,
Pork hocks,	Sheep hearts.

These products should be thoroughly chilled by spreading them out on racks and placing them in a chill room having a temperature of from 35° to 38° F. They should be turned over while being chilled, so that the animal heat has a chance to get out of them. After being thoroughly chilled for from twenty-four to thirty-six hours, they should be put into vats or tierces with an 80-degree plain pickle, sprinkling the meats with about eight ounces of saltpetre to the 100 pounds.

A wooden frame or weight is placed on the product in order to keep it immersed in the pickle. It is customary to cure these meats in vats or hogsheads, using the following quantities of pickle:

1,400	pounds	of	meat	will	require	54	gallons	of	pickle
1,000	"	"	"	"	"	42	"	"	"
800	"	"	"	"	"	36	"	"	"

The meats should be kept in a cellar during the pickling process, with the temperature ranging from 38° to 40° F., and overhauled every five, ten and fifteen days in order that all the pickle may thoroughly penetrate the meats. The different kinds of meats will be found to be sufficiently cured after being in pickle the following number of days:

Pork snouts	25 to 30	days
Pork hearts	25 to 30	"
Pork cheeks	25 to 30	"
Pork skins	10 to 15	"
Pork heads	35	"
Pork ears	10	"
Pork hocks	25	"
Pork tails	10	"
Beef hearts	25 to 30	"
Beef cheeks	25 to 30	"
Ox lips	20	"
Sheep hearts	25 to 30	"

SAUSAGE FILLERS.

This is a very important factor in the manufacture of sausage. The province of "fillers" is to absorb water, thereby preventing shrinkage, and while this is advisable to an extent, if it is overdone, it detracts from the quality of the product. The main base ingredients for fillers are rice flour, corn flour and potato flour. There are many sausage fillers on the market but the foregoing ingredients are most frequently used.

Potato flour or starch is not used to any extent today, manufacturers finding that there is a great deal of trouble attached to the manufacture of sausage containing these ingredients, on account of the liability to sour and spoil. Corn flour is the best filler that can be used, being less liable to ferment, while it absorbs the water quickly. Some of the best known fillers are nothing more or less than corn flour under another name. While fillers are used to a great extent, the sausage manufacturer should remember that the quality of sausage is deteriorated proportionately to the amount of water that is worked in. Hence fillers should be used with discretion by manufacturers who aim to make a reputation for their goods.

SMOKE HOUSE ARRANGEMENTS FOR SMOKING DOMESTIC SAUSAGE.

The smoking of sausage cuts a very important figure in its manufacture. A great deal of bad sausage on the market is so because it is injured in the smoking and it is particularly essential that this part of the work be given careful attention. There are some mechanical improvements which have been adopted of late years which aid materially in reducing the expense of manufacture, but the original principles involved are not in any way changed. The methods in vogue today for the economical handling of the smoke house are illustrated in Figs. 138, 139 and 140.

The arrangement of the smoke house used for smoking domestic sausage is, of course, the first important feature. The house should be constructed so that the sausage can be smoked with a great deal of heat or with

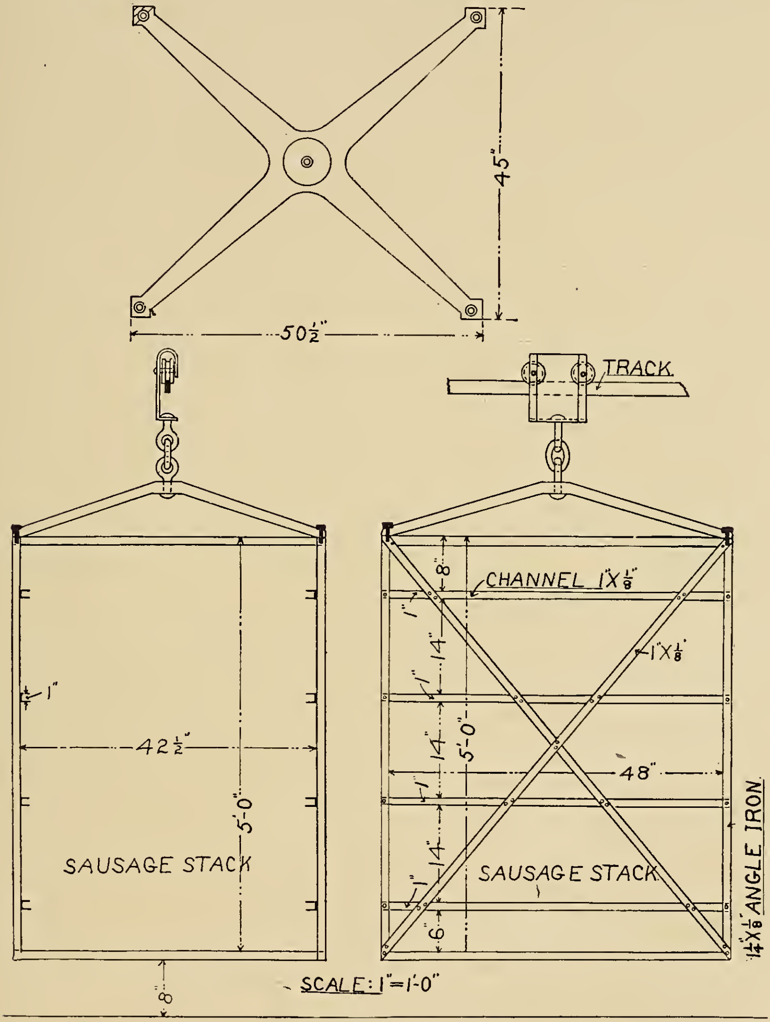


FIG. 138.—DIAGRAM SMOKE HOUSE SAUSAGE STACK.

cold smoke. However, in the manufacture of this product the major part of the sausage is smoked with a moderate heat.

The modern smoke houses that are used for this purpose are built so that the sausage can be removed from the house, as necessity requires, on a track system of rails sufficiently far apart as not to interfere with the hanging of the different lengths of sausage.

These sections or tracks are generally about twenty-eight inches apart. The lower track, or section nearest to the fire, should not be closer than eight feet and the house should be built high enough so that there will be sections of tracking which can be used for cold smoke, which should be from fourteen to eighteen feet above the fire. This, of course, necessitates a very high smoke house.

The modern houses are built of brick, about 54 inches in width, which will allow, in the clear, over the track, 42 or 44 inches, the usual length of the smoke stack. In depth the houses vary and can be from 10 to 16 feet. In height the houses also vary, but for the ordinary packing house the height of the smoke house compartments should be from two to three stories, and should be built exclusively of brick, as it has been shown by numerous experiments with sheet iron and iron lined houses that these are not a success for smoking all kinds of sausage. The draft of the houses is, of course, regulated by ventilators at the top.

In smoking domestic sausage, it is always preferable to use hard wood and never to put green or unsmoked sausage into a cold smoke house. In other words, the house should be warmed by first building a fire in it, in case it has not been recently used. In hot weather or in the summer time this is not so important, as smoke houses then are sufficiently warm at all times. In cool weather or during the winter, the smoke house should either be kept warm by constant usage or by warming up before using, in case the house is empty and has become cold. If this is not strictly adhered to, the Bologna or other sausage, which is usually wet before it is hung in the house, will come out of smoke with a dark ring around the inside next to the casing, which is extremely detrimental to its appearance and keeping qualities.

The smoking and handling after smoking of the different kinds of domestic sausage are described under their respective formulas.

DEVICES FOR RUNNING SAUSAGE INTO SMOKE HOUSE.

All domestic sausages, except pork, are cooked and smoked. This necessitates a considerable amount of

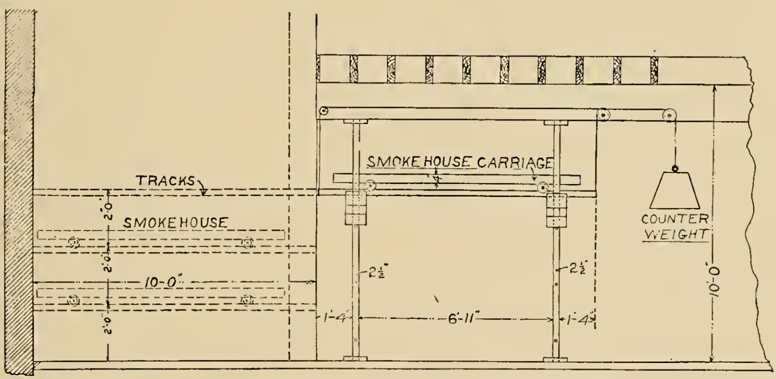


FIG. 139.—DEVICE FOR RUNNING SAUSAGE INTO SMOKE HOUSE.

handling, as the sausage, as fast as stuffed, is hung on stacks and each stack must be run separately into the smoke house, from there on to the trucks and into the cooking vats, cold storage, etc. The stack, as shown in Fig. 138, is used to hang the sausage on as fast as it is stuffed or linked. It is then run to the smoke house, where the sausage is smoked; from there to the cooking vats, which are set even with the floor, and, with either hand or power hoist, the stack is lifted off the rail and lowered into the vats. When cooked it is again hung on the rail and run into the chill rooms. When the sausage is chilled and ready for shipment it is run to the packing room, and the stack, when empty, is returned to the sausage department again to be filled. This equipment is a great labor saving device and worthy the consideration of all sausage manufacturers doing a large volume of business.

In Figs. 139 and 140 is shown a simple device for running sausage into the smoke house, by means of which

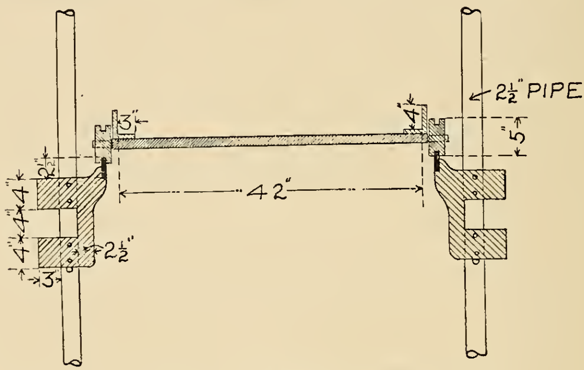


FIG. 140.—DETAIL OF SMOKE HOUSE CARRIAGE.

the smoke house is used to the best advantage, as the smoke can be left on the house continually and the different kinds of sausage run in and out as desired. This smoke house carriage is made of angle irons and is run on a track which is supported by vertical columns. The outside tracks can be raised to any height desired to match the tracks in the smoke house. The sausage is hung on this carriage and run into the smoke house, and when it is sufficiently smoked the carriage can be drawn out on the movable rails, the sausages taken off, others put in their place and the operation repeated. This device necessitates a carriage for each set of tracks in the smoke house. It is not as easy a method as the one first explained, that is, hanging them on stacks, but is better adapted to houses of small capacity.

For detailed plan of double trolley truck, such as is used for sausage stacks, ham house racks and any other purpose where heavy weights are to be run upon overhead rails, see Fig. 136. In hanging a heavy weight on a single truck there is always a jerking or unsteady motion when being pushed along the rail. The double trucks, made as shown in the illustration, run evenly and smoothly, one man being able to push a very heavy load.

INSIDE WATER COLOR FOR DOMESTIC SAUSAGE.

In order to give sausage an attractive appearance a coloring is used in the meat before stuffing. The formulas which follow will indicate its use. The first item in a coloring mixture, "W. Maroon," is a vegetable coloring, manufactured in Germany, and to the best of the author's knowledge can be purchased only from Messrs. Kuttroff, Pickhardt & Co., 209 Michigan St., Chicago, Ill. While the price for this is quite high, namely, $2.50 to $3.00 per pound, so small a quantity is used that it is of little consequence. While there are several different colors offered for sale a consumer will find it cheaper to buy this coloring and prepare his own mixture. The formula referred to is:

3 1/3 ounces "W. Maroon,"
2 pounds granulated sugar,
8 ounces saltpetre,
2 ounces of boracic acid.

Mix thoroughly and dissolve in forty-five gallons of water. This mixture must be stirred until all particles of the ingredients are thoroughly dissolved. The solution is known as "color water," and it is advisable to keep it in a cool place. It will be found in Bologna and other sausage formulas hereafter given and referred to as "color water," which means this formula, and should be handled accordingly.

INSIDE DRY COLOR FOR DOMESTIC SAUSAGE.

Many sausage makers prefer a dry color for the inside of sausage. When such is the case the author recommends the following:

72 pounds borax,
10 pounds boracic acid,
18 pounds fine salt,
1 pound and 4 ounces W. Maroon.

This combination makes not only an excellent coloring, but makes the preservative and coloring combined, and is used in the same proportions as preservative, namely, four to six ounces per 100 pounds of meat.

OUTSIDE COLOR FOR SAUSAGE CASINGS.

There are a number of excellent carbons used for coloring sausage casings, the purpose for using these colors being to give the sausage a heavy, smoked appearance, at the same time leaving it dry and wholesome appearing. Among the principal carbons used are those known to the trade as "Zanzibar" carbon, "Zulu" carbon and "French" carbon. Any of these may be purchased from reliable butchers supply houses, the directions for using being very explicit. It is advisable to use an outside coloring for casings, as this also acts as a preservative from mold. These carbons have been exhaustively examined chemically and found absolutely harmless.

VARNISH FOR BOLOGNA SAUSAGE.

This is a very important feature in the manufacture of sausage, both as intended to improve its appearance and to insure against shrinkage. As considerable water is used, in addition to the natural moisture in meats composing the sausage, there is, after it is manufactured, considerable shrinkage, and if it is allowed to hang for any length of time, the casings become wrinkled on account of the evaporation of this internal moisture. The varnishing of the sausage creates a cuticle on the outside which prevents this wrinkled appearance, thereby improving its looks, and retarding or preventing the evaporation of moisture from the sausage. The formula is as follows:

6 pounds white shellac,
1 pound boracic acid,
2 pounds aqua ammonia,
14 pounds of water.

This mixture should be put into a vessel and heated to a point where the shellac is well dissolved. When this is accomplished, add four gallons of water. This varnish, in order to be ready for use at any time, must be kept lukewarm. It should, therefore, be kept in a jacketed pan, surrounded by either hot water or steam, to hold it at the proper temperature. The sausage should simply be immersed and immediately hung up to dry.

This varnish can be used without any detrimental effect whatever on all kinds of smoked Bologna sausage or smoked cooked pressed ham. It preserves the sausage, also keeps it from molding, and is especially effective where it is necessary to pack Bologna in boxes for shipment long distances.

Where the dipping pan is used, it is only necessary to dip the sausage in the above solution a few seconds before hanging on racks to dry. The sausage is usually ready for shipment in one hour after it is dipped, if the preparation is properly made, and where a large amount of Bologna is being dipped it is, of course, necessary to have a larger dipping pan and a larger quantity of varnish. Therefore, the proportions should be increased according to the quantity desired.

It is also important that, after the varnish has stood from one period of dipping to another, care should be taken to skim the grease off the top of the varnish before again using it, and the Bologna should always be dipped immediately after it is taken from the cooking vats; in other words, while *hot*.

PORK SAUSAGE.

This is a sausage which is generally considered the finest domestic sausage made and upon the quality of which all manufacturers pride themselves. It is possible to use many adulterations in the making of this sausage and still have it passably good, but generally speaking, there is less chance for manipulation of this sort in this kind of sausage than in many of the others. The best pork sausage is that which is made of clear pork trimmings with little water added, and properly seasoned. Various formulas are made by using this as a base and adding cheaper articles to reduce the cost. The following formulas make a cheap and palatable pork sausage:

FORMULA A.	FORMULA B.
75 pounds pork trimmings,	90 pounds regular pork trimmings,
19 pounds potatoes,	10 pounds tripe,
6 pounds beef suet,	6 pounds corn flour,
13 pounds water,	15 pounds water,
2 pounds, 5 ounces salt,	2 pounds, 3 ounces salt,
4 ounces sage,	4 ounces sage,
11 ounces white pepper,	11 ounces white pepper,
3 ounces sugar,	3 ounces sugar,
1 pound, 3 ounces color water.	1 pound, 8 ounces color water.

The above formulas are for sausage meat, which is often sold loose or without stuffing, also for sausage stuffed in hog casings. Many sausage manufacturers grind their pork trimmings through a moderately fine plate on an Enterprise chopper and mix the seasoning and water mechanically. Many use the "Buffalo Silent Cutter." Either way is proper and gives good results.

The following formula is for an extra choice pork sausage: Select moderately lean ham trimmings. To 100 pounds of meat use one pound eight ounces of cracker meal and two pounds of water, three pounds of salt and fourteen ounces of Oxford seasoning.

There are many different kinds of pork sausage seasoning on the market and many that are manufactured ready for use. One of the principal seasonings and one that is used quite extensively is known as "Oxford seasoning." This is especially good for high grade sausage, and at the same time a very economical one. Pork sausage should be stuffed in large sheep casings. When possible the sausage meat should be chopped on a steam rocker, which gives it a better texture than is secured by grinding.

BOLOGNA SAUSAGE.

Bologna is one of the most common and generally used types of sausage manufactured. It derives its name from the town of Bologna in Italy, and is used very extensively by the people coming from that country, as well as by other foreigners. It is very palatable and in nearly every locality in good demand. In the modern manufacture of Bologna, ingredients are used which are not in themselves palatable, but are wholesome and nutritious. The seasoning of Bologna is what makes it palatable, and it is at the same time an economical diet.

The formulas which follow, if they are accurately followed and fresh and wholesome material carefully prepared is used, will make a sausage which is very acceptable to the trade and to the consumer and will sell equally as well as Bologna which is made solely from fresh pork and beef trimmings. In the formulas given tripe and potatoes are used. These, as will be understood, are used to cheapen the product, although they are both wholesome and nutritious. Both are thoroughly cooked before being used and the potatoes should in all cases be peeled. Both the tripe and the potatoes are then ground through an Enterprise machine with the beef or beef trimmings that are to be used in the sausage. This process mixes them thoroughly with the meats. The ideal formula for Bologna sausage is:

60 pounds of pork trimmings,
30 pounds of beef trimmings,
10 pounds of pork fat.

Other formulas are simply a modification of this, in which the object desired is to make a good sausage at a lower cost. It is not intended to give a long list of formulas, as the variation of the values of the different products might make them impracticable when it was desired to use them. A few formulas, however, will be presented, to indicate the different products that can be used to make a satisfactory sausage, and at the same time cheapen the cost. These formulas will show the different kinds of pork and beef trimmings that may be used to advantage. The seasoning, color water, preservative, etc., can be used in connection with any formula.

FORMULA A.

100 pounds beef cheek meat,
80 pounds warm bull's beef, or beef trimmings,
20 pounds pork shoulder fat,
6 pounds corn flour,
40 pounds water,
1 pound, 2 ounces black pepper,
1 pound sugar,
5 pounds color water,
4 ounces coriander,
4 ounces saltpetre,
1 ounce cloves,
¼ ounce cinnamon,
1 ounce allspice.

FORMULA B.

180 pounds fresh beef cheek meat,
20 pounds pork shoulder fat,
8 pounds corn flour,
30 pounds water,
1 pound, 2 ounces black pepper,
1 pound sugar,
4 pounds color water,
4 ounces coriander,
4 ounces saltpeter,
1 ounce cloves,
¼ ounce cinnamon,
1 ounce allspice.

FORMULA C.

30 pounds cooked tripe,
30 pounds dry salt or pickled pork trimmings,
20 pounds pork head meat,
20 pounds pork hearts,
15 pounds fat pork trimmings
70 pounds fresh beef cheek meat,
10 pounds potatoes boiled,
10 pounds corn flour,
40 pounds water,
1 pound black pepper,
2 pounds salt,
4 pounds color water,
2 ounces saltpetre,
3 ounces coriander,
1 ounce allspice,
1 ounce cloves,
¼ ounce cinnamon.

FORMULA D.

15 pounds potatoes boiled,
65 pounds fresh pork hearts,
20 pounds pickled pork trimmings,
80 pounds beef cheek meat,
20 pounds fat fresh pork trimmings,
9 pounds corn flour,
20 pounds water,
4 pounds color water,
4 pounds, 4 ounces salt,
1 pound, 4 ounces black pepper,
8 ounces sugar,
2 ounces saltpetre,
1 ounce allspice,
2 ounces mace,
1½ ounces cloves.

FORMULA E.

65 pounds fresh pork hearts,
35 pounds fresh beef cheek meat,
80 pounds fresh pork cheek meat,
20 pounds pork shoulder fat,
8 pounds corn flour,
30 pounds water,
1 pound, 2 ounces black pepper,
1 pound sugar,
5 pounds color water,
4 ounces coriander,
4 ounces saltpetre,
1 ounce cloves,
¼ ounce cinnamon,

The above formulas can be used for long Bologna, round Bologna, large Bologna and bag Bologna, or for Bologna stuffed in beef middles.

The modern way of manufacturing Bologna is to grind the meats, with the exception of fresh pork trimmings and possibly fresh lean pork cheek meat, through an Enterprise grinder or hasher, being usually a 7/64th-inch plate. The meat is then put into the bowl of the "Buffalo Silent Cutter," where the seasoning, color, and most of the water is added, when the pork trimmings, or pork cheek meat, as the case may be, is added and chopped until the required fineness and consistency is obtained.

It is always a good plan to mix the corn flour, salt and other seasoning before using. Also work in the water from the start by degrees, and the color water immediately after the seasoning.

After the Bologna is chopped, it is a good plan to allow the meat to stand in a cooler where the temperature is from 40° to 42° F. for twenty-four hours. The meat should be spread on tables or benches or left in movable trucks made for that purpose.

To insure the prevention of mold to a great extent in Bologna and other sausage stuffed in casing, it is a good plan to soak the casing in a solution of lukewarm water the required length of time, say thirty minutes, with a proportion of eight ounces of powdered borax and one ounce boracic acid to fifty gallons of water. The sausage casings in all cases should be prepared at least twenty-four hours before stuffing, and in all cases the casing should be thoroughly cured with salt before using.

After the Bologna is stuffed, it is customary, in some cases, to allow the sausage to stand in the casings a few hours before being smoked. In fact, in some cases, it is absolutely necessary to do this, especially where it is impossible to take care of the sausage in the smoke houses as fast as it is smoked. It is, therefore, best in this case to remove the sausage from the stuffing room immediately after it is stuffed to a cool place or a cooler where the temperature is between 42° and 45° F. A lower temperature, or a very cool temperature after the sausage is stuffed (if it is allowed to remain in this temperature very long), will cause a dark ring to form inside of the casing, which is very detrimental to the appearance and sale of the product.

Smoking Bologna Sausage—A smoke house for this purpose must be in proper condition to receive the sausage, which means that the house should be warm. A moderate fire should first be started, sufficient to dry the casing, after which hard wood sawdust should be used, so as to give the casings the proper color. The sausage should be hung far enough away from the fire to avoid blistering. In any case the fire should not be closer than from 6 to 8 feet. For time required for smoking long Bologna, see "Cooking and Smoking" schedules at the end of this chapter.

After Bologna is smoked, it is immediately cooked, the time and temperature required in cooking being given in schedules referred to. After the Bologna is cooked, it should be varnished. (See instructions in formula for Bologna varnish.) Bologna should hang several hours after it has been varnished before being packed into boxes for shipment (if packed warm it soon molds), and it is always a good plan to use straw paper or veneer between each layer of sausage.

Large Bologna—Formulas A and B are the most desirable to use in making what is known as large Bologna. Beef bungs are used for casings. Process of manufacturing and handling is the same as in long Bologna, except as to smoking and cooking. (See Cooking and Smoking schedules.)

Round Bologna—Formulas A, B, C, D and E can be used for round Bologna. Beef rounds are used as casings. Making and handling is same as for long Bologna, except in smoking and cooking. (See schedules.)

Bag Bologna—Formulas A and B can be used for this Bologna. However, the quantity of water must be reduced at least 50 per cent. Strong cloth bags are used as casings. Process of manufacturing and handling is the same as for long Bologna, except as to cooking and smoking. (See schedules.)

Weasand Bologna, or Bologna Stuffed in Beef Weasands—Formulas A, B, C, D and E can be used for this Bologna. Beef weasands are used as casings. Process of manufacture and handling are the same as for long Bologna, except the weasands are skewered with wooden skewers instead of being tied. For cooking and smoking see schedules.

KNOBLAUCH SAUSAGE.

FORMULA.

30 pounds pork knuckle meat,
65 pounds very lean pork trimmings,
50 pounds back fat trimmings or moderately fat trimimngs,
22 pounds pork neck fat,
8½ pounds corn flour,
55 pounds water,
5 pounds salt,
1 pound white pepper,
3 ounces mace,
2½ ounces saltpetre,
12 ounces sugar,
2 ounces grated onions,
3 ounces garlic,
8 ounces color water.

Stuff in beef rounds and tie with twine every five inches. Knuckle meat may be ground through a moderately fine plate. Balance of pork should be chopped in a "Buffalo Silent Cutter." Corn flour and seasoning should be added to the knuckle meat after it is put into the Buffalo chopper and the machine has made two or three revolutions. Manufacture and handle the same as Bologna, except do not cook in color water. The casings should not be colored. Cooking and smoking as per schedule given.

LEONA (LONG) SAUSAGE.

FORMULA.

30 pounds pork knuckle meat,
65 pounds lean pork trimmings,
50 pounds back fat trimmings or moderately fat trimmings,
22 pounds pork neck fat,
8½ pounds corn flour,
55 pounds water,
5 pounds salt,
1 pound white pepper,
8 pounds color water,
3 ounces mace,
2½ ounces saltpetre,
12 ounces sugar,
2 ounces grated onions,
½ ounce garlic.

Uniform beef middles are used as casings. Knuckle meat may be ground through a moderately fine plate. Balance of pork should be chopped in the "Buffalo Silent Cutter." Corn flour and seasoning should be added to the knuckle meat after it is put into the Buffalo chopper and the machine has made two or three revolutions. This product should be manufactured and handled in the same way as Bologna, except that it should not be cooked in color water. The casing should not be colored. Smoking and cooking as per schedule.

LEONA (LARGE) SAUSAGE.

The same formula as that of Leona long applies. Beef bungs are used as casings and this sausage is also wrapped with twine. Manufacture and handle same as Leona long, with the exception of smoking and cooking, which is done as indicated in the tables.

POLISH SAUSAGE.

FORMULA.

100 pounds beef cheek meat,
50 pounds dry salt or pickled pork trimmings,
50 pounds pork trimmings,
9 pounds corn flour,
30 pounds water,
1 pound white pepper,
1 pound salt,
3 pounds color water,
6 ounces saltpetre,
6 ounces coriander,
3 ounces garlic.

Beef rounds are used for casings. Grind the beef cheek meat through a 7/64th plate, add corn flour and seasoning, work in as much water as possible and then add the pork trimmings. This is a very coarse chopped sausage and the pork trimmings should be chopped about as fine as small dice. Beef is the binder of this sausage, and must be handled according to instructions. The meat, after it is chopped, can be handled the same as Bologna and Frankfurt meat by putting in a cooler for a few hours before stuffing. After the sausage is stuffed, it can also be handled as Bologna and Frankfurts, if desired, before smoking.

This sausage should be smoked carefully and strictly in accordance with the smoking schedule, as it is not cooked, this being done practically in the smoke house, during the process of smoking. After it is smoked it has a very wrinkled appearance, which is essential for this article. In fact, it is not Polish sausage unless it has this appearance. It is never advisable to varnish this sausage, or to place it in a cooler after it is smoked. A great many manufacturers color the casing before stuffing, which can be done a few moments before they are used, by soaking in a solution of carbon, which is used in the cooking vat to color Bologna and Frankfurts; however, if the sausage is properly smoked it is unnecessary to color the casings.

FRANKFURTS.

There are as many different formulas for Frankfurts as for Bologna. While a variety of trimmings and offal can be used in the manufacture of Frankfurts, it is not safe to use too cheap an article, as this sausage is stuffed in sheep casings and the ingredients must necessarily be of better quality in order to get the desired results in appearance and taste. Practically the same process of manufacture will apply to Frankfurts as to Bologna, viz., grind the beef and other material, except the pork, which is chopped in the "Buffalo Silent Cutter." It is unnecessary to use a mixer for this article if properly handled and mixed in the cutter. Always add the corn flour and seasoning and as much water as possible to the mass after it is put in the cutter before adding the pork trimmings.

FORMULA A.

57 pounds regular pork trimmings,
65 pounds beef cheek meat,
15 pounds cooked tripe,
25 pounds pork kidneys,
20 pounds dry salt or pickled pork trimmings,
9 pounds corn flour,
45 pounds water,
1 pound, 4 ounces white pepper,
3 pounds salt,
2 pounds color water,
4 ounces saltpetre,
3 ounces allspice,
3 ounces mace,
3 ounces coriander,
1½ ounces cloves.

Stuff in large sheep casings. It is well to handle the meat for Frankfurts by allowing it to stand in a cooler for a moderate length of time, the same as Bologna. Also handle the stuffed product practically the same as Bologna, except less color is used, as is explained in the directions given for using the carbon color which it may be desired to use for this purpose. Care should also be taken in preparing the smoke houses, as for Bologna. The cooking and smoking should be done as indicated in schedules given.

FORMULA B.

90 pounds lean pork cheek meat,
60 pounds regular pork trimmings,
9 pounds corn flour,
60 pounds water,
5 pounds salt,
2 pounds, 7 ounces color water,
12 ounces sugar,
3 ounces saltpetre,
1 pound black pepper,
2 ounces mace.

In making up this formula the pork cheek meat can be ground through a coarse plate, but care must be taken to work in all the water with the pork cheek meat after the corn flour and spices have been added in the "Buffalo

Silent Cutter" before adding the pork trimmings. To one who is not familiar with working-in a large quantity of water in this manner, the mass would seem very thin. In fact it will be, but after adding the pork trimmings proper and satisfactory results will be obtained. Use large uniform sheep casings and handle the same as formula A, but use discretion about cooking them in color water. A great many manufacturers prefer to use no color water with this grade of Frankfurts, as the pork and proper smoking will give sufficient color without artificial means. The smoking and cooking is done as indicated in appended schedules.

Vienna Frankfurts—The following is the formula for making this type of Frankfurts:

20 pounds pork knuckle meat,
60 pounds back fat trimmings or moderately fat trimmings,
70 pounds lean shoulder trimmings,
9 pounds corn flour,
40 pounds water,
1 pound white pepper,
5 pounds salt,
1½ pounds color water,
12 ounces sugar,
2 ounces mace,
3 ounces saltpetre.

The knuckle meat can be ground through a coarse plate if desired. Work the water in with the knuckle meat and shoulder trimmings before the back fat or fat trimmings are used. Stuff in large sheep casings and handle in every respect the same as formula B. For smoking and cooking see schedules.

BLOOD SAUSAGE.

FORMULA.

205 pounds shoulder fat,
54 pounds pig skins,
47 pounds beef blood,
5 pounds onions,
7 pounds salt,
1 pound white pepper,
3 pounds corn flour,
8 ounces marjoram,
4 ounces cloves.

Use pickled shoulder fat and skins, cook for one hour at a temperature of 210° F. and run through fat cutting machine or cut into size of small dice. Pass the beef blood through a fine sieve in order to separate foreign matter. Cook pig skins for about two hours at a temperature of 210° F. and grind through a 7/64th plate. Mix the shoulder fat, skins, blood and seasoning thoroughly together and stuff in cap end bungs. Smoking and cooking as indicated in schedules.

TONGUE SAUSAGE.

FORMULA.

50 pounds hog or sheep tongue,
130 pounds shoulder fat,
34 pounds hog skins,
30 pounds blood,
8 pounds salt,
1 pound, 4 ounces white pepper,
2 pounds onions,
10 ounces marjoram,
4 ounces cloves.

Use pickled shoulder fat, skin and cook for one hour at a temperature of 210° F., run through a fat cutting machine or cut into size of small dice. Use beef blood, passed through a fine sieve in order to separate any foreign material. Cook hog skins for about two hours at a temperature of 210° F. and grind through a 7/64th-inch plate. Pickled sheep tongues are preferable to pickled hog tongues, as they are smaller and make a better appearing sausage when cut. The tongue should be cooked one and three-quarter hours at a temperature of 210° F.

Before mixing the above ingredients, rinse the fat off the tongues with hot water in order to remove as much grease as possible. Mix the ingredients thoroughly with the seasoning by hand. When stuffing put about four pieces of tongue to each bung. However, this varies according to the size of the bungs used. Cap end bungs should be used in all cases. Smoking and cooking to be done as indicated in appended schedules.

LIVER SAUSAGE.

FORMULA.

20 pounds cooked lean pork trimmings,
20 pounds cooked pork cheek meat,
20 pounds cooked pork skins,
10 pounds cooked hog livers,
50 pounds cooked tripe,
6 pounds cooked shoulder fat,
3 pounds salt,
3 pounds onions,
9 ounces white pepper,
2 ounces marjoram,
2 ounces cloves,
1½ ounces allspice.

Above is all ground through a 7/64th inch plate except the shoulder fat, which is run through a fat cutting machine or cut into size of small dice. It is necessary to mix this sausage in a sausage mixer. The seasoning should be put into the mixer when starting to mix, but the shoulder fat should not be put in until about half through. Stuff immediately into hog bungs, or beef middles, as desired. Cook immediately as per cooking table and then place in cooler, at a temperature of 36° to 40° F. until thoroughly chilled, when it is ready for shipping.

BONELESS PIGS FEET.

FORMULA.

25 pounds fresh pigs feet,
30 pounds fresh pigs skins,
15 pounds fresh pigs snouts,
15 pounds fresh pigs ears,
20 pounds fresh pork trimmings,
15 pounds fresh beef trimmings,
10 pounds white pepper,
50 pounds water in which meat has been cooked,
4 pounds, 1 ounce salt,
4 ounces cloves.

Use one gallon (45-grain) vinegar to 500 pounds of the above mass. Cook all of the meats in one vat, thoroughly, in pudding nets, and chop up same as is done with head cheese and mix seasoning, water and vinegar with the meat in a large tub or tight-bottom truck.

It is necessary to use tin molds for this sausage and they are generally of one size, shaped as a ten-pound wooden bucket or other sized packages which may be intended to be used for shipping purposes. Fill these molds with the mixed mass and put on top of each a wooden block the size of the mold and about 3 inches thick. Then remove to a cooler and press tightly by placing on top a board with a weight. In order to obtain the best results, the molds or cans should be cooled quickly, therefore a temperature of about 36° F. is desirable. To remove the contents from the cans or molds, submerge in hot water for a few seconds, when the meat will loosen from the sides of the molds and can be turned out readily.

After the product has been removed from the molds allow it to stand for a short while in the cooler before placing in shipping packages.

This sausage can be made without using wooden tops on the cans or molds and without pressing it. If the pig skins, after they are cooked, are ground through a 7/64th-inch plate and then mixed with the mass, more of a jelly formation will be produced and they will not require pressing.

HEAD CHEESE.

FORMULA.

44 pounds cooked pig skins,
55 pounds cooked pig snouts,
33 pounds cooked pig ears,
55 pounds cooked beef hearts,
51 pounds cooked neck fat,
20 pounds water in which the meat has been cooked,
1 pound white pepper,
10 pounds onions,
4 ounces allspice,
2 ounces cloves,
3 ounces marjoram,
3 ounces carroway seeds.

The cooked meats are chopped by hand with a knife until reduced to the proper size, except the skins, which are ground through a 7/64th-inch plate after being cooked. The mass usually is mixed by hand and stuffed into cured hog paunches or beef bungs and cooked as per cooking schedule appended hereto. After the sausage is cooked, it is taken to a cooler and usually pressed by laying the paunches or bungs side by side with a board between each layer and a moderate weight on top of the last board. However, if properly made this is unnecessary as the gelatine from the skins and the water in which the meat has been cooked will bind the other ingredients together sufficiently without much, if any, pressing.

MINCED HAM.

FORMULA.

50 pounds beef trimmings,
20 pounds pork cheek meat,
80 pounds regular pork trimmings,
7 pounds corn flour,
30 pounds water,
5 pounds salt,
8 ounces sugar,
3½ ounces white pepper,
4½ ounces dry color preservative,
3½ ounces saltpetre.

Use small calf bladders as casings. Many manufacturers, especially those who are in a position to make summer sausage, chop this meat on a steam rocker and grind the beef through a 7/64th-inch plate, rocking this with the seasoning until very fine before adding the pork trimmings. However, this ham can be made by grinding the beef as mentioned and using a "Buffalo Silent Cutter." In fact, better results have been obtained by using the latter method than by the former, for if the steam rocker is used, the water would have to be mixed in with a mixer after the mass has been chopped. This meat can be handled the same as Bologna and Frankfurts as to cooler process after the bladders have been stuffed. They may be left in the cooler for several hours before smoking, if desired.

In tying the bladders, it is best to use a wooden skewer instead of twine and it is also preferable to use small calf bladders in place of large ones, as the time required for smoking and cooling is so long that if large bladders are used the weight of them would break the bladders where they are skewered or tied and would result in shrinkage or loss. Follow the smoking and cooking schedules closely. Cook in color water same as Bologna.

COOKED PRESSED HAM, OR HAM SAUSAGE.

This ham is made from preservative or "Curene" pork trimmings put down under the same formula as given under the head of preservatives for pork and beef trimmings. The best and leanest trimmings obtainable are cured for this purpose. Shoulder blade trimmings or lean shoulder trimmings are more desirable than any other kind.

After the trimmings have been cured and are ready for use, which is after they show a bright cured color throughout and are without any dark spots in the center of the meat, the trimmings are weighed up in 100 pound batches, and about 10 per cent of Curene lean beef trimmings, ground through a 7/64th inch plate, is mixed thoroughly with them by hand.

Some manufacturers use a "Zimmerman" mixer and mix up from 300 to 400 pounds at a time. However, this is unnecessary and good results can be obtained in mixing by hand. Immediately after the trimmings are mixed the mass should be stuffed into large beef bung ends, usually from 14 to 16 inches long. To obtain the best results a steam stuffer arranged with a large sized filler is necessary. However, a hand stuffer arranged with a large sized filler, about 3 inches at the small end, or opening, can be used. Care should be taken to stuff the bungs as tightly as possible. They should be skewered instead of tied at the ends and should be wrapped with heavy twine, each piece having from four to six wrappings of the twine, which should terminate with a hanger for the ham. The pieces are very heavy and will break during the processes of smoking and cooking unless they are properly wrapped or tied.

This ham is smoked five hours at a temperature of from 130° to 140° F. and the house should be moderately warm before the ham is hung in the smoke. A small fire should be started to dry off the casings, after which the house should be smoked the same as for Bologna. Cook at least two hours and thirty minutes at a temperature of 180° F. in same color water as for Bologna.

This ham may be varnished but it is not necessary, and it is not recommended. After it has been cooked it is taken immediately to a cooler, where the temperature is from 38° to 40° F., and put under a press made for the purpose. If no press is obtainable place the ham in layers, putting a board between each layer with a weight on the top board. Place the hams in a pile or under the press so that they can be skewered with a long, thin skewer about one-half the thickness or size of a common ham tryer in order to permit the water which is in the hams from cooking to escape. After they have been under pressure for twelve hours, take them out and hang them up so that boiling hot water can be thrown on and over them to wash off the grease. After they have been thoroughly washed in this manner remove to a dry cooler and allow them to remain in a cool temperature until shipped.

TEST ON SKINNED SHOULDERS (HOCK AND FAT ON) FOR COOKED PRESSED HAM.

Debits:

9,276 pounds shoulders at 5¾c per pound	=$533.37
Labor at 20c per hour	= 19.82
Total	$553.19

Credits:

5,663 pounds sausage meat at 7 1/5c per pound	=$407.73
2,689 pounds fat at 4¾c	= 127.72
630 pounds bones at ½c	= 3.15
278 pounds trimmings at 5¼c	= 14.95
Total	$553.55

TEST ON SKINNED SHOULDERS (HOCK OFF) FOR COOKED PRESSED HAM.

Debits:

8,000 pounds shoulders at 6¼c per pound	=$500.00
Labor at 35c per hour	= 17.57
Total	$517.57

Credits:

5,021 pounds sausage meat at 7 9/10c per pound	=$399.16
2,105 pounds fat at 4¾c	= 99.99
516 pounds bones at ½c	= 2.58
302 pounds trimmings at 5¼c	= 15.24
Total	$516.97

RECAPITULATION.

Cost of lean meat when bought hock on, per pound	$0.0720
Cost of lean meat when bought hock off, per pound	$0.0794
Gain by purchasing hocks on, per pound	$0.0074

NEW JERSEY HAM.

New Jersey ham is made according to the following formula:

60 pounds lean ham trimmings,
80 pounds lean back trimmings,
10 pounds lean beef chucks or shank meat,
4 pounds salt,
3½ pounds cracker meal,
6 ounces formula "A" preservative,
12 ounces sugar,
¾ ounce red pepper.

Beef is ground through an Enterprise 7/64th-inch plate and rocked about five minutes, when the pork trimmings are added with the seasoning. The seasoning should all be mixed thoroughly and added to the meat. The whole is then chopped about as coarse as summer sausage, or about twenty to twenty-five minutes. It is taken to a cooler after being rocked and spread on a table, about 6 or 8 inches thick, where it is allowed to remain about three days at a temperature of from 38° to 40° F.

It is then stuffed by hand stuffers into bags, which will weigh after being stuffed and dried about five pounds. These bags are made of heavy drilled cloth and should be stuffed as tightly as possible. They should be kept very clean during the process of stuffing, as any sausage meat which may stick to the cloth will leave a bad appearance after the sausage has been smoked.

After the ham has been stuffed, it should be taken to the dry room, where the temperature can be kept at all times between 46° and 55° F., 50° being preferable. The room must be airy and dry and it will take at least ten days under favorable circumstances to get the ham in proper condition to smoke. It should be smoked about four hours in as cold a smoke as possible, 70° to 75° F. being as hot as it is safe to smoke it, 60° F. being nearer the proper temperature. After it has been smoked, it should be again hung in a cool temperature for three days, when it will be ready for shipment.

This sausage is manufactured very extensively in New Jersey and the east. It is also manufactured in Chicago to a great extent and shipped east, as there is a greater demand for it there than in Chicago and the west, but it is becoming a popular sausage everywhere.

BERLIN HAM.

Berlin ham is made by mixing seventy pounds regular "Curene" pork trimmings and thirty pounds "Curene " pork cheek meat or bone meat. Small beef bung ends are used as casings. Handle in every respect the same as cooked pressed ham, or ham sausage. For cooking and smoking see appended schedules.

BONELESS HAM.

This is made from pork shoulder butts, cured in sweet pickle and stuffed in small No. 2 beef bungs. Smoke forty-eight hours at a temperature of 120° F. The bungs may be slightly colored, the same as Polish sausage casings, before stuffing, if desired. Not cooked.

COTTAGE HAM.

This is made from boneless ham butts or shoulder butts, cured the same as boneless ham butts. It is not stuffed but strung from the large end of the butt and smoked thirty-two hours at a temperature of 120° F. and not cooked.

STUFFED HOGS HEADS.

Select a well shaped head, cut off about three to four pounds behind the ears and remove the bones. Care should be taken in entering above the eyes, where the skin is thinnest and lies directly on the bone. Do not remove the snout bones, but saw off the hindmost jaw bone right behind the mouth. Remove the cheek meat on either side until with the skin it is about ½ inch thick. Cut off about 3 inches square from the lower cheek at the back to make the head more shapely. Sew from the snout up to the back bone, where the head is to be filled and cut around cover from the skin to fit the back opening. Prepare the stuffing as follows:

Good firm young pork, moderately fat, is coarsely chopped with the required quantity of salt and allowed to stand twenty-four hours. Use about ten pounds, chopped fine, spiced with five and one-quarter ounces of salt, one-half ounce of ground white pepper, seventy-seven grains of finely ground mace, mixed with one pound of boiled tongue meat cut into shape of dice, one-half the size of a walnut. Mix all thoroughly and fill head with the mass. Sew the cover on and smoke for two hours until it turns to a yellow brown color. After it is smoked, tie the head up in a cloth, wrapping a string around it very evenly from front to rear. Cook in boiling water from three to three and one-half hours, and then allow to cool. The head must be a chestnut brown when thoroughly smoked, and cooked.

SCRAPPLE.

For making scrapple use two pig heads, two pig tongues, and two pig livers. These should be cooked in an iron-jacketed kettle that will hold about forty-five gallons. After being thoroughly cooked, the mass is taken from the kettle and is cut up the same as for head cheese. After the heads, tongues and livers are taken out of the water, skim the grease off and add forty pounds of corn meal and five pounds of buckwheat in this same water, putting in a little at a time, and handle the same as in making mush. Must cook slowly for five hours. Seasoning should be added before buckwheat and corn meal are put in, consisting of:

2 ounces white pepper,
1 ounce red pepper,
8 ounces sage,
4 pounds salt.

After the scrapple has been cooked about four hours and forty-five minutes, add the heads, tongues and livers, stir thoroughly about fifteen minutes, then shut off steam and put into a pan provided for the purpose. After it is about two-thirds cooled put on about one ounce to each pan of the grease which was skimmed off the kettle after cooking the meat. This is to give it a wholesome appearance on the top.

BOLOGNA SAUSAGE IN OIL.

This is a sausage that is manufactured quite extensively by large packers, who find the principal markets for same in the south. In fact, it is not used anywhere but in warm climates and it is usually put up in twenty-pound and fifty-pound tin packages.

Much experimenting has been done to ascertain the best size for packages to put up this sausage in oil, and there has been considerable loss experienced by the different manufacturers on account of fermentation and consequent spoiling of the product. A vast amount has also been expended in fitting up processing apparatus.

Secrecy has been maintained in regard to the nature of the formula used in the preparation of this sausage. However, experience has proved that the more processing and secrecy obtained in the manufacture of this article, the greater the percentage of loss. The following formula is generally considered to be the best method for making this sausage:

20 pounds fresh head pork meat,
50 pounds fresh pork hearts,
30 pounds fresh regular pork trimmings,
15 pounds fat pork trimmings,
80 pounds fresh beef cheek meat,
1 pound, 8 ounces corn flour,
3 pounds, 8 ounces salt,
½ ounce cloves,
½ ounce coriander,
6 ounces formula "A" preservative.

Stuff in different sized beef rounds. The beef cheek meat, pork hearts, and pork cheek meat are ground through a 7/64th-inch plate, and afterward chopped with a "Buffalo Silent Cutter," the seasoning being added at the same time.

Use no water in this sausage under any circumstances. After the beef and beef hearts, also the pork cheek meat, have been chopped as fine as desired, add the pork trimmings and chop the same as any other Bologna.

It is desirable to stuff this sausage immediately after it is chopped, and if a steam stuffer is used care should be taken that no water from the evaporation of the steam is allowed to get into the sausage. The bench where the sausage is stuffed should be absolutely free from water or moisture. This is the principal factor in the successful manufacture of this product. It is the moisture that causes the trouble so frequently experienced.

After the sausage is stuffed, it is smoked about three hours at a temperature of 150° to 160° F., or until it is dry clear through. This sausage is not cooked. Keep it away from all water and moisture.

After the sausage is smoked allow it to cool in a dry airy room, but do not put it in a cooler. When it is thoroughly cool, pack into twenty-pound and fifty-pound packages, as desired, as follows: In twenty-pound cans, place sixteen pounds Bologna and four pounds oil. In fifty-pound cans, place thirty-six pounds Bologna and fourteen pounds oil.

In order to pack the cans properly, it is necessary to stuff different sized beef rounds, as mentioned above, so that they will fit in nicely without breaking the casings, and without filling the cans too full.

After the cans have been filled with the required amount of Bologna, crimp on the summer top, which has a 2-inch hole and a cap to fit. Fill the cans with deodorized cotton seed oil, which must be cold, as full as possible. Allow the cans to stand for thirty minutes, then refill so that the oil runs over the top through the hole, put on the cap immediately and solder right through the oil which will accumulate around the cap and on the top of the can. This will not hinder the process of soldering and it prevents the possibility of any air getting into the cans.

After the caps have been secured, solder around the crimps of the summer top. This can be done before the oil is put in if desired. Extreme care must be used in soldering the cans so that no air whatever gets in, or oil leaks out, as the sausage will spoil if this occurs.

The cans should also be fitted with the regular covers so as to protect the summer top. Pack in crates, the twenty-pound size, two to four to a crate; the fifty-pound size, one to two to a crate.

The crates should be large enough so as to admit of packing sawdust beneath the bottom, around the sides and on the tops. A crate large enough to permit ½-inch space around the cans is the size generally used and there should be a partition in the crates where more than one can is packed in a crate.

In freighting this class of merchandise in the south, in fact wherever it is shipped, it receives more or less rough handling and a great many freight handlers use box hooks, which they stick into the sides of the crates, and if there is not sufficient protection from the amount of sawdust put in, the cans are punctured, the oil leaks out and the sausage spoils. Sausage handled in the above manner has been known to keep two years in temperatures ranging from 40° to 100° F.

PORK SAUSAGE IN OIL.

Use the same formula as for regular pork sausage except that the trimmings must be moderately lean, and the sausage absolutely free from water. Use also the same spices. Stuff immediately after the sausage is chopped, using the same care as to moisture as for Bologna in oil, and smoke over a very cold smoke until the sausage seems dry all the way through. Allow it to cool, handling and packing in every other respect the same as Bologna in oil.

FRANKFURTS IN OIL.

Use any cheap formula for this article except pickled pork trimmings, or meat, tripe or potatoes. Use six ounces of dry preservative in addition to the regular seasoning, but omit the saltpetre. *Do not use any water* in the sausage. Use the same care in stuffing as in the other oil sausages. Smoke but do not cook; handling and packing in other respects the same as Bologna in oil.

SMOKING SCHEDULE FOR SAUSAGE.

As previously stated in this article, the smoking of sausage is a very important factor, and in the different formulas heretofore given in the instructions for handling, reference has been made to the "Smoking Schedule." This schedule has been carefully compiled and the time and temperatures given should be closely followed in order to get the best results:

Kind of sausage	Time hours	Temperature degrees Fahrenheit
Long Bologna	3	145 to 150
Large "	3	145 to 150
Round "	2	135 to 140
Bag "	1	140 to 145
Bologna in weasands	4	185
Knoblauch	1½	130
Leona Bologna long	3	145
" " large	3	145
Regular Frankfurts	2½ to 3	130 to 135
Vienna "	3	140 to 145
High grade "	3 to 3½	150 to 160
Blood	12	65 to 70
Tongue	12	65 to 70
Liver	1 to 1½	110 to 120
Polish	3 to 3½	150 to 160
Minced ham	3 to 3½	135
Berlin	5	130 to 140
Cooked pressed ham	5	130 to 140
Cottage ham	32	120
Boneless ham	48	80

COOKING SCHEDULE FOR SAUSAGE.

A very important factor entering into the successful manufacture of sausage is that it should be cooked properly. The following schedule gives the time and temperature of cooking different kinds of sausage, forming the "Cooking Schedule" referred tc in many of the foregoing formulas:

Kind of sausage	Time hours	Time minutes	Temperature degrees Fahrenheit
Long Bologna	..	30	160
Large "	2	..	160
Round "	..	20	155
Bag "	2	..	160
Bologna in weasands	..	45	155
Knoblauch	..	20	160
Leona Bologna long	..	40	155
" " large	2	..	160
Regular Frankfurts	..	7	160
Vienna "	..	7	160
High grade "	..	7	160
Blood	2	..	200
Tongue	2	..	200
Liver	..	30	160
Minced ham	4	..	150
Berlin "	2	..	170
Head cheese	..	45	180
Cooked pressed ham	2	30	180

SHRINKAGES OF DOMESTIC SAUSAGE DURING PROCESS OF MANUFACTURE.

As is known to all sausage makers it is in very rare cases that 100 pounds of meat makes 100 pounds of finished sausage; there is always a shrinkage or loss, and before the cost of the finished sausage can be determined one must know the shrinkage from original weights of raw materials.

The following tabulated statement is compiled from experience with very large amounts of the different kinds of sausage, extended over a year and a half of actual manufacture. The mean average of shrinkages given is accurate information and may safely be used as a guide. The author has not given the cost of the foregoing formulas, as there is such a variation in prices of ingredients induced by the fluctuations of the market prices that any figures that were given would be misleading in the future, hence to find out the cost of these different formulas, figure the given weights at market value, shrinking them according to the table below, adding cost for labor and supplies, and a very close approximate cost of the manufactured article will be obtained:

Kind of Sausage.	Per cent of shrinkage.
Long Bologna	8½ to 11
Large Bologna	7¼ " 10
Round Bologna	8½ " 11
Bag Bologna	6 " 9
Bologna in weasands	6 " 9
Knoblauch	10 " 11
Leona, long	10 " 13
Leona, large	10 " 12
Regular Frankfurts	11 " 13½
Vienna Frankfurts	19 " 22
High grade Frankfurts	18 " 20
Regular pork	2 " 4
Little pig pork	2 " 4
High grade breakfast	1½ " 3
Blood	31 " 36
Liver	12 " 14
Tongue	38 " 40
Polish	12 " 14
Head cheese	39 " 42
Luncheon beef	47 " 50
Boneless pigs feet	22 " 25
Minced ham	6 " 9
Berlin ham	22 " 27
Cooked pressed ham	15 " 17

CHAPTER XVIII.

SUMMER AND DRY SAUSAGE.

AIR DRYING AND SMOKING.

In the foregoing chapter on sausage, the author has treated entirely on the different varieties of domestic sausage, all of which, except pork sausage, are cooked and smoked. Under the head of "Summer Sausage" he takes up an entirely different article, this being a sausage that is dried and smoked, during the time of which the ingredients used for seasoning effect a cure. This sausage will keep for months without being cooked if properly handled. It is necessary, however, that every detail be very carefully watched, as a slight omission or error in its manufacture causes immense losses at times.

As this is strictly an air dried sausage, weather conditions have a great deal to do with its successful manufacture, and it is, therefore, necessary to have special facilities in the way of coolers, smoke houses and dry rooms, the proper arrangement of which is somewhat expensive at the start. It is impracticable for any sausage manufacturer to presume to make this article in large quantities unless he has the proper facilities, and it is the manufacturers who do make it in large quantities that generally make the most profit, because they are able to keep down their cost of producing per hundred weight to a minimum in handling a large quantity. This is why it is more profitable for small manufacturers to buy their cervelat, especially the high grade fine article, rather than to endeavor to manufacture it themselves.

PRESERVATIVE FOR DRY SAUSAGES.

To manufacture summer sausage successfully there is nothing of more importance than the selection of the proper preservative. There are many kinds offered for sale on the market, some of which are excellent and others to be avoided. Too much care cannot be taken in selecting this preservative, as the manufacturer does not know the effect this material will have on the sausage until a month or six weeks after it is manufactured, and if at that time it is found that a mistake has been made it becomes a very costly one. After a great deal of experimenting, covering a period of several years, the author recommends the use of the article known to the trade as "Diamond A" preservative, which may be obtained from all leading butchers supply houses. This preservative is compounded with a vegetable coloring matter and it therefore acts not only as an agent for preserving the sausage but also gives it a desirable color.

Absolutely fresh material is required in the manufacture of this sausage and much cooler space is necessary in order to allow the meat to stand, after rocking, from twelve to forty-eight hours, as the case may be, before stuffing, as it is necessary to give the seasoning, color and preservatives a chance to properly work through the meat and also to allow the meat to become firm. If the sausage is stuffed immediately after it is rocked, it is liable to wrinkle in the smoke house, which gives it an unsavory appearance.

A hanging room in which the temperature can be properly controlled should be available in which the sausage can be hung until the casings are sufficiently dried for the smoke house. While the sausage should be dry, it should not be allowed to become so dry that the casings are glossy or hard. This is a very important matter as the sausage will not take the correct color if the smoke does not penetrate the casings, or if they are allowed to become too dry. This applies particularly to sausage in beef middles, also to sausage stuffed in hog bungs, though not to as great an extent.

In preparing the casings for the smoking process by endeavoring to prevent the sausage from becoming too dry there is danger of their becoming slimy, which is even more detrimental than the over dryness. Slimy sausage will not take the smoke and will sour quickly if not properly handled. Sausage in both beef casings and hog casings should be dried before smoking, so that the outside will feel about like the back of one's hand.

In order to obtain this result it is necessary to have plenty of hanging room space so that the proper temperature can be given the entire lot of sausage which is being prepared for smoke. If the space is hung too closely with sausage, it should be moved about from the center to the sides of the room occasionally so that all the sausage receives the proper ventilation.

The manufacturer should have sufficient space to allow the sausage to hang after it is stuffed and before it is smoked, for from two to three days, and sometimes longer. In the winter season, which is the proper time for manufacturing high grade summer sausage, it is a good practice to allow it to hang as long as possible before smoking, but it must be watched to prevent sliming or becoming too dry.

SMOKING SUMMER SAUSAGE OR CERVELAT.

It is necessary to smoke different grades and kinds of this sausage in different temperatures and for different periods. Smoke houses used for smoking summer sausage or cervelat are entirely different from smoke houses used for smoking domestic sausage such as Bologna, Frankfurts, etc. Summer sausage has to be smoked over a cold smoke and for a very much longer period.

The rail or track system is used by a great many manufacturers of this article very satisfactorily, the arrangement of the smoke houses being on the same principle as those for the domestic sausage, except that the tracks or sections are farther apart and the houses fitted with two or three tracks, side by side, instead of the single track system. In other words, the houses are much larger, being practically square, or 12 x 14 feet in size and in all cases they should be built of brick.

The sheet iron houses which have been experimented with, especially for summer sausage, have proved to be complete failures. The bricks not only protect the house from the varying outside temperatures, but hold the heat, which is desirable and necessary in the successful smoking of this kind of sausage.

The distance from the fire should be in any case, whether the track system or the ordinary smoke house with the beam system is used, 12 feet, and in some cases, such as in smoking summer sausage in bladders, or Braunschweiger in hog casings, the distance from the fire should be 20 feet or more. This, however, will be explained in the formulas for making the different kinds of sausage.

The main point to be considered in the construction of a smoke house for summer sausage or cervelat is to have it so arranged that the heat can be regulated to different temperatures, also the amount of smoking, as each and every kind of sausage requires a different temperature. The ventilation of the smoke house should be perfect and absolutely controllable, as the weather conditions have a great deal to do with the successful smoking of sausage and the houses should be arranged so that they can be kept at a uniform temperature and humidity during any kind of weather.

As in the case of domestic sausage, no smoke house should be used for summer sausage or cervelat unless the temperature can be maintained uniform and the walls in proper condition.

Since, as is well known, summer sausage of all kinds is not cooked before it goes to smoke, a cold or damp smoke house will "ring" the sausage even quicker than a cold smoke house will "ring" Bologna, therefore extreme caution should be used in this particular.

Hardwood and hardwood sawdust are used exclusively in smoking summer sausage, and both wood and sawdust should be absolutely dry when the fire is started. In some cases, however, after the sausage is very nearly smoked, it is advisable to use a little damp sawdust before completing the operation.

After the smoking process is completed the sausage is taken to the dry room where the temperature can be kept at all times between 46° and 53° F., the proper temperature being 48° F., if it can be maintained. The dry room must be fitted with steam coils running underneath the sausage and around the sides of the room and underneath the windows in order to give the necessary heat. The room must be supplied with plenty of windows for light and ventilation and should be very high so as to permit of all the required overhead ventilation. At all times the windows must be kept open a little to allow fresh air to enter no matter how cold the outside temperature. If the weather is damp the windows nearest the top or the top ventilator of the room should be opened a little way.

Steam should always be turned on in damp weather to dry the air, providing, of course, the weather is not too warm and the temperature in the room can be kept as low as 53° F. The room should always be arranged in sections, so that there may be an empty section between each lot of new sausage. As the sausage becomes drier it can be hung more closely. It is well, however, to have plenty of space, so as to be able to regulate this according to the weather. The sausage, in any case, should not dry too quickly and too much air will dry it near the casing, which will cause the sausage to stick to it and become dry. In that case the inside will not dry uniformly and the sausage will wrinkle and in some instances become sour.

The different kinds of sausage require different places in the dry room. Some require an abundance of air and others, like "Holsteiner" and "farmer" sausage, if properly smoked, can be hung where it would not be policy to hang summer sausage in hog bungs. As both of these sausages are coarse chopped, they can be handled with much less fear of being spoiled than the finer chopped sausage. However, with every description of dry sausage, a great deal of care must be exercised and constant attention given it, or poor results will follow.

Summer sausage in hog bungs can be subjected to more draft or air than summer sausage in beef casings. Consequently beef casings are generally hung near the center of the room where they receive plenty of air but no draft. Summer sausage in both hog bungs and beef casings if properly handled can be shipped, in three stages of dryness, as follows: New, twenty to twenty-five days old; medium dry, forty to forty-five days old; dry, sixty to seventy-five days old.

The cheaper grades of summer sausage, many different kinds of which are manufactured, can be shipped in much less time than is indicated above. In fact there is sausage made which can be shipped almost immediately from the smoke house. This sausage is allowed to stand for some time before chopping and after stuffing, before being put in the smoke house. It is then smoked very hard, or with more heat than the better grades of this sausage. Some manufacturers use more heat than smoke, coloring their casings before smoking with the same Zanzibar coloring that is used for Bologna, but it does not produce a first-class article.

PREPARING CASINGS FOR SUMMER SAUSAGE.

In preparing casings for summer sausage of all kinds it is necessary, in order to insure good results, that casings be prepared, especially hog bungs, at least thirty days or even several months before they are used. There are always many fat bungs in hog casings and in preparing them and putting them down in salt brine for thirty days or longer, the fat on the casings becomes dry and there is less danger of the sausage becoming sour. Summer sausage will become sour as quickly from using fat hog bungs as from any other cause, therefore these must be thoroughly cured before using. Beef middles or rounds can be used almost immediately after they have been prepared. As they must necessarily be thoroughly fatted before they leave the preparing rooms they are generally in good condition in this respect when received, and therefore do not require as much time in the curing or preparing as do hog bungs. Fat beef middles or beef rounds spoil the appearance of the sausage when dry as the fat always shows through the casings.

DRY ROOM CAUTION.

Do not hang green and dry sausage in the same room. It is advisable to keep dry rooms for smoked sausage as free from mold as possible. While a slight mold does not hurt summer sausage (in fact some summer sausage requires this before it is ready for shipment), it will be found that smoked sausage drys better and quicker in a room that can be kept free of mold. Sausage that molds too much before it is dry necessarily has to be washed. This process does not hurt the sausage, and in some cases washing does it good, especially if by neglect or otherwise it has become greasy in the smoke house. Sausage will not dry as rapidly if greasy and the process of washing it quickens the drying. In washing sausage warm water, not *hot,* should be used. A little sal soda in the water is desirable.

FORMULAS FOR CERVELAT.

FORMULA A.

40 pounds beef chucks, very lean and entirely free from all sinews.
90 pounds pork trimmings, trimmed in same manner.
20 pounds shoulder fat, cut into strips about 2 inches square and cut into shavings as fine as it is possible to get them.
5 pounds, 12 ounces salt.
2 ounces whole white pepper.
6 ounces formula "A" preservative for summer sausage.

Whole white pepper is always thrown on the block five minutes before rocking is completed. The beef is first ground through a 7/64th-inch plate, after which it is placed on the rocker together with the fat and seasoning and rocked for about five minutes. Then the pork trimmings are added, the whole being rocked for from twenty-five to thirty minutes.

After this operation it is taken to the cooler where the temperature is not lower than 38° F., nor higher than

40° F. It is there spread upon benches provided for this purpose, about 10 or 12 inches thick, where it is allowed to remain for three days, after which it is stuffed by hand machines into either hog bungs or beef middles as required.

The sausage is then taken to the hanging room and allowed to hang for two or three days, according to the weather, at a temperature of from 48° to 50° F. If the weather is damp great care must be taken to prevent the sausage from sliming and it is sometimes necessary to keep the temperature up to 55° F. in order to keep the room as free from dampness as possible. If the sausage begins to slime as stated previously, there is great danger of its becoming sour or hollow in the center. It is always advisable, if it is impossible otherwise to keep the sausage from sliming, to put it into smoke as soon as the slime is detected, which puts a stop to it.

When the sausage is ready for smoke, which, as stated before, is, under favorable circumstances, from two to three days after it is dried, it should be hung in a smoke house where the temperature is as near 48° F. as possible and gradually heated until the temperature reaches 70° F. It must be kept at this point throughout the entire process of smoking, or for about twenty-four hours for beef middles and forty-eight hours for hog bungs.

In starting a fire in the smoke house as little wood should be used as possible, say one stick of ash cord wood, just enough fire to keep the sawdust smoking without blazing. Keep adding sawdust until there is sufficient fire to scatter it over the entire bottom of the smoke house, keeping the sawdust ignited only from the coals of the wood with which the fire was started and which generally lasts through the entire process of smoking. If the smoke houses are naturally cold it may be necessary to keep more fire than mentioned in order to keep the temperature up to 70° F.

The smoking of this sausage requires the greatest possible care. If the temperature is allowed to rise too high for any length of time, it will sour. If the fire is too low and smoke too dense there will be a smoke ring, especially so if the sausage is not properly dried before it goes to smoke. Many manufacturers dip their sausage in hot water, especially that stuffed in beef middles, after it has been smoked, some using a light color in the water. However, this is a poor practice and is not recommended. It is advisable, however, that the sausage should not be exposed to too sudden or severe a change in temperature immediately after removing from the smoke house. If it is some distance from the smoke house to the dry room it is advisable to cover the sausage on the trucks with a tarpaulin or cover so that the cold air cannot strike it. It is a good idea not to hang the sausage up on the racks immediately, but to place it on the bottom rack, close together, so that it may cool gradually.

The following are several formulas for the making of cervelat or summer sausage:

FORMULA B.

45 pounds beef chucks,
82 pounds lean pork trimmings
23 pounds shoulder fat,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

FORMULA C.

30 pounds pork cheek meat,
30 pounds beef trimmings,
90 pounds pork trimmings,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

FORMULA D.

40 pounds pork cheek meat,
30 pounds beef trimmings,
50 pounds lean pork trimmings,
20 pounds shoulder fat,
10 pounds pickled pork trimmings,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

Trim beef chucks very lean, entirely free from sinews. Pork trimmings must be lean except in Formula C, where fat pork trimmings are used. White whole pepper is always thrown on the block a few minutes before chopping. Shoulder fat should be handled the same as in Formula A. Pickled pork trimmings are ground through an Enterprise ¼-inch plate. Beef chucks and trimmings are ground through an Enterprise 7/64-inch plate. Pork trimmings and cheeks are chopped on a rocker; otherwise handled same as Formula A.

FORMULA E.

40 pounds shank meat,
30 pounds pork cheek meat,
10 pounds beef cheek meat,
10 pounds pork hearts,
20 pounds pork trimmings,
40 pounds neck fat or fat trimmed from Boston butts,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6½ ounces formula "A" preservative.

If neck fat is used it is cut into small pieces but not shaved. If fat from Boston butts is used it is run through an Enterprise ¼-inch plate. This fat, of course, has more or less lean in it but might be called very fat trimmings. Pork hearts, beef cheek and shank meat are all ground through an Enterprise 7/64-inch plate. Beef and fat are always put on the block with the seasoning first. Pork trimmings and cheeks are added five or ten minutes after rocking; otherwise handled same as Formulas A, B, C and D.

FORMULAS FOR FARMER SAUSAGE.

FORMULA A.

50 pounds shank meat,
10 pounds beef cheek meat,
30 pounds pork trimmings,
30 pounds pork cheek meat,
10 pounds pickled pork trimmings,
20 pounds shoulder fat,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

Shank meat, beef cheek meat and pork cheek meat are ground through an Enterprise ¼-inch plate; shank fat is cut into small pieces but not shaved. Ground material and shank fat should be put on the block first with the seasoning and chopped five or ten minutes, when the pork trimmings are added, the whole being chopped fifteen or twenty minutes. As this meat is very coarse, it should, after being chopped, be mixed in a mixer for three or four minutes and then be thoroughly mixed by hand, after which it is taken to the cooler and handled the same as cervelat. It is then stuffed by hand stuffers in beef middles about 11 inches in length, and is allowed to hang in the dry room, same as cervelat and for about the same length of time, before smoking. The same precautions should be taken with this as with cervelat, relative to slime, etc.

It is smoked from six to eight hours at a temperature of from 65° to 70° F. It must be handled very carefully in smoke as too much heat will wrinkle it. A great deal of farmer sausage is allowed to dry naturally without smoking, especially in the winter months, and where there is plenty of room and a proper place. However, in damp weather and through the summer months it is always advisable to smoke it. This sausage can be made throughout the summer months, provided there are proper dry rooms, which can be regulated and kept moderately cool. Some manufacturers have used dry cooler space in the summer time, which could be kept at a temperature of 46° to 48° F., but the best results are obtained by drying in a room where the sausage can have the benefit of the outside air. This sausage, if handled properly according to the above directions, will be ready for shipment in twenty-five days; it should then be in a medium dry state.

FORMULA B.

80 pounds medium fat pork trimmings,
20 pounds pork cheek meat,
50 pounds beef trimmings or shank meat,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

Beef and pork cheek meat ground through an Enterprise 7/64th-inch plate. Put ground material with seasoning on block first and chop five or ten minutes, then add pork trimmings and chop fifteen or twenty minutes. Stuff and handle same as Formula A.

FORMULA C.

40 pounds beef trimmings or shank meat,
10 pounds pickled beef trimmings,
100 pounds pork trimmings,
5 pounds, 12 ounces salt,
2 ounces whole white pepper,
6 ounces formula "A" preservative.

The beef trimmings or shank meat should be ground through an Enterprise 7/64th-inch plate. Put ground material with seasoning on block first and chop five or ten minutes; then add pork trimmings and chop fifteen or twenty minutes. Stuff in beef middles; otherwise handle same as Formula A.

HOLSTEINER SAUSAGE.

This sausage is identically the same as farmer sausage and is handled the same except that it is stuffed in beef rounds. The same care is necessary as with the farmer from the time it leaves the block until ready for shipment, which should be in about twenty-five days.

SWEDISH MEDWURST OR GOTTBERG SAUSAGE.

FORMULA.

30 pounds pickled beef trimmings,
30 pounds fresh beef trimmings,
90 pounds medium fat pork trimmings,
1 pound rice flour or corn flour,
5½ pounds salt,
2 ounces coriander,
3½ ounces white pepper,
6 ounces formula "A" preservative.

Beef trimmings are ground through an Enterprise 7/64th-inch plate. Ground beef and seasoning are put on block first and chopped five or ten minutes when pork trimmings are added, the whole being chopped twenty to twenty-five minutes. This sausage is stuffed in beef middles 14 inches in length, and handled in other respects same as cervelat in beef middles.

The old fashioned way of handling Swedish medwurst was to pickle the sausage, after it was stuffed, in a vat of 50-degree strength pickle, for ten hours, when it was taken out of the vats, hung up and allowed to dry for twenty-four hours, then smoked the same as cervelat in beef middles. If this process is used, four and one-half pounds of salt to 150 pounds of meat is all that is necessary. However, as good results can be obtained by not pickling the sausage, and it is not generally done by manufacturers of this article.

BRAUNSCHWEIGER SAUSAGE.

FORMULA.

50 pounds selected back fat trimmings,
45 pounds selected ham trimmings,
25 pounds selected shoulder trimmings,
20 pounds beef chucks trimmed extra lean and free from sinews,
10 pounds shoulder fat,
5 pounds salt,
2½ ounces white pepper (ground),
1 ounce whole white pepper,
6 ounces formula "A" preservative.

Beef chucks are ground through a 7/64th-inch plate. Shoulder fat is cut into strips about 2 inches square, and cut into shavings, as fine as it is possible to cut them. Ground beef, shoulder fat and seasoning are put on the block and rocked ten minutes when ham and shoulder trimmings are added, the back fat trimmings being the last to go on the block. The whole is rocked twenty to thirty-five minutes. This is not a fine chopped sausage, however, and is not as coarse as farmer sausage but a great deal coarser than regular cervelat. It should be stuffed into short, lean, thick hog bungs about 14 inches in length, and handled in every respect, from the block to the smoke house, same as cervelat in hog bungs. As this is a very fat sausage greater care needs to be taken in smoking than with any other summer sausage made, and it should be hung near the top of the smoke house as far away from the fire as possible. For this reason it is important that the sausage should be properly dried after stuffing before smoking. Smoke at a temperature as near 65° F. as possible for thirty-six to forty-eight hours.

D'ARLES SAUSAGE.

FORMULA.

30 pounds extra lean beef chucks trimmed absolutely free from sinews,
70 pounds fresh lean especially trimmed pork shoulder trimmings free from sinews,
30 pounds selected back fat pork trimmings,
20 pounds shoulder fat,
5 pounds salt,
2½ ounces white pepper (ground),
1 ounce whole pepper,
1½ ounces saltpetre.
½ ounce powdered borax,
¼ ounce boracic acid.

In order to use the following additional seasoning it is advisable to chop at least six blocks, of 150 pounds each, of this sausage and mix in a large truck for the purpose, as this seasoning has to be added immediately after the meat has been chopped. For six blocks of this sausage, or 900 pounds, use:—

¼-pound package pure white gelatine,
2 quarts strong imported French red wine,
1 whole nutmeg,
1¼ ounces whole cloves,
½ ounce stick cinnamon.

Put the gelatine, nutmeg, cloves and cinnamon in a thin bag and cook with the wine for ten or fifteen minutes, just below boiling point. Strain the wine through a cloth to remove all particles of spice. When moderately cool mix the meat in thoroughly by hand, and at the same time mix in the shoulder fat, which is cut into shape of small dice and chopped on the rocker, and the beef which has been ground through an Enterprise 7/64th-inch plate, after which the mixture is placed on the rocker with the dry seasoning and rocked for seven to ten minutes, when the pork trimmings are added and the whole chopped eighteen to twenty-two minutes, providing the speed of the rocker is from fifty-two to fifty-four strokes per minute.

This is a coarse sausage but not as coarse as farmer. After the beef and pork have been rocked, the wet seasoning and shoulder fat which has been previously cut into the shape of small square dice, is mixed thoroughly by hand, when it is taken to the cooler and allowed to stand from twelve to twenty-four hours. It is then stuffed by hand into No. 1 selected hog bungs entirely free from fat, and hung in a dry room where the temperature is about 50° F., where it is entirely separate from other sausage and where it can get plenty of air but no draft. After it has hung for thirty-six to forty-eight hours, if firm and the casing moderately dry, wrap the casings with No. 4 flax twine commencing at the small end, making a hitch with the twine every 2 inches the whole length of the sausage to the top or the bung end; then hitch back every inch on the off side and back and forth again until two more hitches are made so that the strings will be about ½ inch apart when the last hitch is complete.

Care must be taken to wrap the sausage tightly so that the strings will not fall off in the process of drying.

After the sausage has been wound with string it should be taken to the dry room and dried very slowly without becoming moldy too soon. If hung in a room with other sausage, this article should be hung in between so that it will not get too much air or dry too quickly. It should be moved about very frequently, from the bottom to the top, and from the middle to the front and back of the section. This is one of the most difficult of summer sausages to make and but few manufacturers are successful in making them. Therefore the above instructions should be followed closely to obtain satisfactory results. Do not smoke.

ITALIAN SALAMI SAUSAGE.

Practically the same formula applies to Italian salami sausage as for D'Arles sausage, except that generally not as high grade trimmings, either beef or pork, are used. However, it is advisable for a high grade Italian salami that the same grade of trimmings be used and the same care is taken in preparing them. Identically the same seasoning is used and also the same procedure is followed in every respect in regard to the chopping and handling of the meat. Smaller or less expensive hog bungs are used. They are generally what are known as medium primes and the sausage is usually shorter in length. However, this is a matter of preference as this sausage is made in lengths of from 12 to 22 inches. Handling after stuffing, to the wrapping process, is the same as that for D'Arles sausage. Wrapping, however, is much simpler and usually the same grade of twine is used, but instead of wrapping the twine both ways, it is simply wound around tightly after three or four strings have been run from the top to the bottom of the sausage. This sausage is not smoked and is tied the same as

D'Arles, the same care being taken in every respect as regards temperatures, etc.

MILANESE SALAMI SAUSAGE.

FORMULA.

50 pounds fresh lean specially trimmed pork shoulder, trimming free from sinews,
60 pounds fresh Boston butt trimmings.
20 pounds extra lean beef chucks, trimmed absolutely free from sinews,
20 pounds shoulder fat,
5 pounds salt,
2½ ounces white pepper,
1½ ounces saltpetre,
1 ounce whole pepper.

Chop at least six blocks (900 pounds) of this sausage and mix at one time by hand in a large truck constructed for the purpose, in order to add the following additional seasoning. For the six blocks use:—

3½ quarts strong imported French red wine,
¼-pound package pure white gelatine,
4 nutmegs,
½ ounce whole cloves,
1 ounce stick cinnamon.

Prepare same as similar formula for D'Arles sausage and mix with the meat after it has been rocked by hand thoroughly. The beef is ground through an Enterprise 7/64th-inch plate. Shoulder fat is cut into small thin pieces but not in the shape of dice. Rock the beef and the shoulder fat together with the dry seasoning for seven to ten minutes, then add the pork trimmings, the whole being chopped twenty to twenty-five minutes. This sausage is not as coarse as D'Arles or Italian salami.

After the meat and wet seasoning have been mixed thoroughly put in the cooler to stand twelve to twenty-four hours. Then stuff by hand into hog middles, as large as can be obtained. Prepare at least thirty days before using. Care must be taken in stuffing as they are very tender and break easily. The only way to stuff them successfully is to arrange a board to hold the casings after they are stuffed so that it will be just high enough from the filler to permit the casings to be filled and not handled other than to hold them with sufficient pressure to stuff as tightly as possible without breakage.

If the middles break, which they are bound to do in many cases, patch them with a piece of hog middle when they are being wound with string. They should be lifted with care from the stuffing board, placed upon a truck and wrapped immediately with No. 4 flax twine, the same as D'Arles sausage, the string running equidistant around the sausage from either end and being wound around it so as to form squares.

As the casings are so very tender, it requires great care in wrapping and the sausage is usually not of uniform appearance. Greater care must be used in tying this sausage than D'Arles, salami or any other sausage known. The casings are so thin that the meat will become dry and hard on the outside or near the casings while the inside will remain moist, therefore too much exposure is not desirable. They should be watched closely after stringing, because, not being allowed to dry before they are strung, the handling which they get will naturally make them slime very easily. It takes at least sixty days to dry this sausage properly with best conditions. Not smoked.

GERMAN SALAMI SAUSAGE.

FORMULA.

40 pounds beef chucks or beef shank meat,
110 pounds regular pork trimmings,
5 pounds salt,
5½ ounces white pepper,
1¾ ounces garlic,
6 ounces formula "A" preservative.

Beef is ground through an Enterprise 7/64th-inch plate, rocked with the seasoning five to ten minutes, when the pork trimmings are added and the whole chopped fifteen to twenty minutes. This is a very coarse sausage, about the same as farmer sausage. It is well to mix the meat thoroughly by hand after it has been rocked, or to mix it carefully with a mixer. A " Stallman " mixer is better than a " Zimmerman " for farmer sausage and coarse chopped summer sausage. However, the teeth in a " Zimmerman " mixer can be reversed so that it will not tear the meat, as it otherwise does.

After the meat has been chopped it is removed to a cooler and allowed to stand the same period as farmer sausage before stuffing. It is then stuffed in either beef middles or hog bungs, as the case may be. After stuffing, the sausage is handled the same as Italian salami, except that it is wrapped with hitches same as D'Arles sausage, there being only about one-half the number.

This sausage can be very lightly smoked, but it is preferable to dry it the same as D'Arles and Italian sausage. It is stuffed in beef middles and should be handled the same as farmer except that it is wrapped with string about the same number of hitches as salami in hog bungs. This latter also can be very lightly smoked. The majority of manufacturers always smoke Italian salami in beef casings a very little, usually about twelve hours with as little smoke as possible. This is done to prevent sliming, as it is very hard to air-dry beef-middle sausage without the very best conveniences, or dry rooms where it can be hung apart from other sausage.

HUNGARIAN SALAMI SAUSAGE.

FORMULA.

90 pounds lean pork trimmings,
35 pounds beef chucks trimmed free from sinews,
25 pounds shoulder fat,
5 pounds salt,
1½ ounces white pepper,
1 ounce garlic,
5½ ounces formula "A" preservative.

The beef chucks are ground through an Enterprise 7/64th-inch plate. The shoulder fat is shaved into thin pieces and both the beef and the fat, with the seasoning, are rocked seven to ten minutes, when the pork trimmings are added, and the whole is rocked from eighteen to twenty-two minutes. This is a moderately coarse sausage, about the same as Milanese salami.

After the meat is rocked it is handled in the cooler the same as other summer sausage and stuffed into extra large beef middle ends, which are, when stuffed, 22 to 26 inches long and weigh from twelve to twenty pounds each.

Great care must be taken in stuffing this sausage to stuff it tightly and two or three lengths of string should be run from the large to the small end and vice versa, so as to prevent it from breaking, also to keep it straight, and it should be hung, of course, the small end down.

This sausage is allowed to hang, before being put in the smoke house, three or four days in a dry atmosphere, and then smoked over a cold smoke at a temperature the same as for summer sausage in beef middles, for from fifty-five to sixty hours. Handle after smoking the same as summer sausage in beef casings. It usually takes, under favorable circumstances, sixty to seventy days before the sausage is ready for shipment.

This sausage is used very extensively in Germany and Austria and there is some of it used in Pennsylvania. However, there is not a very general demand for it in the United States.

THURINGER SALAMI SAUSAGE.

FORMULA.

30 pounds extra lean beef chucks, trimmed free from sinews,
90 pounds fresh pork blade or shoulder meat, trimmed free from sinews,
30 pounds shoulder fat,
5 pounds salt,
1 ounce garlic,
3½ ounces white pepper,
6 ounces formula "A" preservative.

Beef is ground through an Enterprise 7/64th-inch plate and rocked with the fat and seasoning, the fat having been cut into small pieces and shaved. Rock from seven to ten minutes, when the pork trimmings are added and the whole is chopped eighteen to twenty-two minutes.

This sausage is rocked about as coarse as Milanese salami. After it is rocked it is handled in the cooler the same as other summer sausage and stuffed in large calf bladders which have been soaked a short time before stuffing so that they will be pliable. Care must be taken in stuffing this sausage to fill the bladders as full as possible. Use a skewer, also a string hanger.

Allow it to hang two or three days before smoking, in a moderately cool temperature (50° to 55° F.), where there is no draft, and smoke over a cold smoke for forty-eight hours, the same as Braunschweiger, and Gothair, the sausage being hung near the top of the smoke house. Do not smoke at the same time with any other sausage.

Unless care is taken in smoking, the bladders will come out wrinkled, which spoils the appearance and consequently the sale of the sausage. Hang in the dry room with beef middle cervelat and handle in every respect the same. This sausage is usually ready for shipment in forty to fifty days.

MORTADELLA SAUSAGE.

FORMULA.

135 pounds absolutely fresh lean trimmings,
15 pounds fresh lean beef chucks,
10 pounds shoulder fat,
5 pounds salt,
1½ ounces saltpetre,
2½ ounces white pepper.

Additional wet seasoning is used for this sausage, therefore it is advisable to chop it six blocks at a time and mix it by hand in a large truck constructed for the purpose, as the seasoning must be added immediately after the meat has been chopped. For six blocks use:—

3½ quarts strong imported French red wine,
¼-pound package pure white gelatine,
8 nutmegs,
1 ounce whole cloves,
3 ounces stick cinnamon,
4½ ounces bay leaves,
2½ ounces split coriander.

Prepare this seasoning same as for D'Arles sausage, then mix the wet seasoning with the meat in a truck. Scatter through it twelve ounces of whole white pepper and two ounces of coriander. The beef is ground through an Enterprise 7/64th-inch plate and chopped on the block with the dry seasoning for seven to ten minutes, when the pork trimmings are added and the whole chopped thirty to thirty-five minutes. This is a very fine sausage. After the meat has been chopped mix the shoulder fat, which is cut into the shape of small dice (same as for D'Arles sausage), with the meat and mix in the wet seasoning at the same time.

Remove to a cooler and allow it to stand from twelve to twenty-four hours, then stuff into medium-sized beef bladders, which must be soaked in lukewarm water a few moments before they are stuffed, in order to make them pliable, and care must be taken to stuff them as tightly as possible. Skewer, as well as tie, them and also wrap immediately with heavy coarse flax twine, making about two wraps the long way of the bladder and one wrap around the center, the twine terminating in a hanger. This sausage must not be hung by the tied end or by the same string that the bladder is tied with, for in such case they will fall in the smoke house, or when drying.

This sausage should be allowed to hang for twelve hours after stuffing in a hot smoke house with more heat than smoke at a temperature of about 90° F.; then cook in clear water for four hours at a temperature of 150° F.; wash off thoroughly with boiling water when taken from the cooking vat and hang them up in a moderately cool place or dry room where the temperature is about 48° to 50° F. They will be ready to ship in four or five days.

This sausage can be smoked sufficiently heavy so that cooking is unnecessary if proper facilities are available in smoke house. The house should be arranged with steam coils so that a temperature as high as 150° F. can be obtained during the process of smoking. This really is the most satisfactory way of handling this sausage.

LYON SAUSAGE.

FORMULA.

120 pounds extra lean selected pork trimmings, pork blade meat being preferred, trimmed free from sinews,
20 pounds extra lean beef chucks, trimmed free from sinews,
10 pounds shoulder fat,
5 pounds salt,
2½ ounces white pepper,
1 ounce whole pepper,
1½ ounces saltpetre.

It is necessary to use an additional wet seasoning for this sausage; at least six blocks should be chopped so as to mix properly and the seasoning must be added immediately after chopping. For six blocks lyon sausage use the same formula for wet seasoning as for Milanese salami, and prepare in the same way. Grind the beef through a 7/64th-inch plate and chop first on the block with the dry seasoning for seven to ten minutes when pork trimmings are added and the whole chopped thirty to thirty-five minutes. This is a very fine chopped sausage. After the beef and pork have been rocked the wet seasoning and shoulder fat, which has been previously cut into the shape of small dice, are mixed with it thoroughly by hand.

The meat is then taken to a cooler and allowed to stand the same period as D'Arles or Milanese salami, when it is stuffed by a hand stuffer into No. 1 hog bungs free from fat, and hung in a dry room where the temperature is about 50° F. and where it can be kept entirely separate from other sausage, with plenty of air and no draft. After it has hung for thirty-six to forty-eight hours and the casings are moderately dry, wrap the sausage with No. 4 flax twine, both lengthwise and around so as to form a mesh about ½ inch square. It is handled the same as D'Arles or Milanese salami.

GOTHAIR SAUSAGE.

FORMULA.

20 pounds extra lean beef chucks free from sinews,
110 pounds extra lean pork trimmings free from sinews,
20 pounds pork shoulder fat,
5 pounds salt,
3½ ounces white pepper,
6 ounces formula "A" preservative.

The beef is ground through an Enterprise 7/64th-inch plate and together with the shoulder fat, which has been shaved as thin as possible and cut into the shape of small dice, is mixed in mixer with the seasoning for from seven to ten minutes, when the pork trimmings are added and the whole chopped for thirty to thirty-five minutes, after which it is taken to a cooler and handled the same as other summer sausage. It is stuffed into short No. 1 lean hog bungs, or bungs that are free from fat. This sausage is handled in every respect the same as cervelat sausage, except smoking. It should be smoked lightly with the same temperatures and same relative position in the smoke house as Braunschweiger sausage, and about the same length of time. It is handled after smoking, in the dry room, same as Braunschweiger.

LEHIGH VALLEY SUMMER SAUSAGE.

This sausage is made from lean bull chucks, the meat being ground through an Enterprise ¼-inch plate, then reground through an Enterprise 7/64th-inch plate and rocked on a rocker for fifteen minutes. The seasoning is mixed on the rocker and is as follows for 100 pounds of meat:—

SEASONING FORMULA.

1/3-pound fine salt,
1½ ounces saltpetre,
4 ounces formula A preservative,
5 ounces mace,
1 ounce ground cloves,
2 ounces allspice,
4 ounces black pepper,
6 ounces coriander,
1 ounce sugar,

After it is chopped it is put into a "Zimmerman" mixer and mixed for about five minutes. It is then taken to a cooler and spread on tables made for the purpose, about 8 or 10 inches thick, and allowed to remain for about three days, when it is stuffed into beef bungs, sack pieces being preferable. After it is allowed to stand in a temperature of 48° F. until the casings become moderately dry, it is hung in a smoke house and smoked for ten days or two weeks, at a temperature of between 50° and 60° F. Great care should be taken in smoking this article, as it requires but a light smoke.

After it is taken from the smoke house, it is hung in a dry room for the purpose, where a temperature of 48° to 50° F. can be maintained, and where the sausage can be kept perfectly dry. This sausage takes from two to three months to dry thoroughly, and sometimes longer.

CHAPTER XIX.

LARD AND GREASE.

LARD REFINING.

As shown by tests given in a previous chapter from 13 to 15 per cent of the live weight of the hog is fresh lard, consequently at points where large numbers of hogs are killed the manufacture of lard is a very important factor in the packing business. The principal grades, as commonly made at large manufacturing points, are known as:—

First, kettle rendered lard,
Second, prime steam lard,
Third, refined lard,
Fourth, compound lard.

Tallow and beef stearine also enter largely into the manufacture of refined as well as compound lards.

The refining of lard in large packing houses dates from a comparatively recent period, and many people will be surprised to know that even the largest packers only added lard refining to their business within the past fifteen or twenty years. Previous to that time lard refineries were operated by firms entirely independent of the packers, who bought their supply of lard in the form of what is known as "prime steam" at the different packing centers, converting it into the different grades in their own establishments. In the natural evolution of the business this branch was taken up by the packers and today forms a very important adjunct to the modern packing business.

Before modern methods were in vogue, lard refining consisted in pressing from the lard about 30 to 40 per cent of lard oil, this being sold for lubricating and lighting purposes, etc., and mixing the remaining stearine with the proper percentage of straight lard, thus making a very high grade of pure lard. At this time the method of bleaching in all lard refineries was accomplished by the use of caustic soda, pearl ash, lime, alum, or other mixtures of more or less value, the principal ingredient, however, always being caustic soda. The underlying principle is that the alkali, used in proper proportion, saponified the acid and sediments in the lard, making it lighter. This process, however, is a thing of the past, very few, if any, of the refiners now use it.

About twenty years ago the method of refining lard with fullers earth was first inaugurated, and for years only imported earth coming from England was thought suitable for this purpose. Within the past five years, however, many deposits of fullers earth, of fair quality, have been discovered in the United States and American fullers earth is today used in quite a number of the lard refineries in at least three of the large packing house centers, and the indications are that with further improvements in mining and methods of grinding, and possibly also in the discovery of better beds or layers of this substance, it is safe to predict that ere long the manufacturers of America will not have to go abroad for any of their supplies of fullers earth.

An explanation of how fullers earth bleaches lard and its kindred fats would be interesting, if anyone knew the exact explanation, but so far there has been no scientific reason given that accounts for this property of this material, therefore no chemical test can be applied to different samples of fullers earth to determine whether they are suitable for refining or not. The only safe test is the practical one of heating a sample together with lard and watching the result of the bleach.

During this period of development in the packing house business the consideration of color was the predominating influence. In improving the color of lard it is invariably done at the expense of the flavor, and a very wholesome and sweet odor, which is natural to the lard, is sacrificed in a greater or lesser degree to the advantage of color. The tendency today is to make lard white, even though it loses in odor and taste. In compounding lard this is always intensified by the general use of tallow. The use of tallow was developed after the refining process by means of fullers earth was established and where tallow is used excessively it gives a strong and more pungent odor to the lard than was found to be the case before this ingredient was used. However, sharp competition has necessitated the use of different ingredients to reduce the cost of the manufactured article. Nearly all samples of pure refined lard contain more or less tallow in their makeup.

Fullers earth is also used for bleaching cotton seed oil and other greases and fats which are necessarily subjected to the bleaching process.

METHOD OF USING FULLERS EARTH.

First see that the lard itself is dry. If the lard has been steamed out of tierces, or if there is any water in it, it must be settled long enough, in order to avoid a cloudy appearance when it begins to cool. The lard to be bleached is first placed in a round iron kettle, jacketed, the most suitable dimensions being about 6 feet in diameter and 4 feet deep, the kettle to be supplied with mechanical agitators. A sectional view of such a kettle is shown in Fig. 141 and a smaller kettle suitable for small houses is illustrated in Fig. 142. It was formerly the practice to use compressed air for agitation in order to thoroughly mix the fullers earth with the lard. This, however, has been discontinued in the

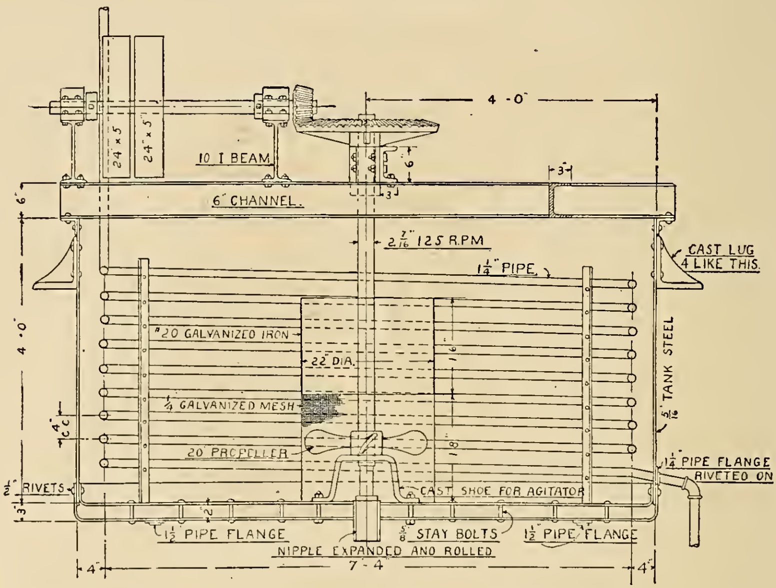


FIG. 141.—SECTION THROUGH TANK FOR MIXING FULLERS EARTH AND LARD.

best refineries, as it was found that agitation with compressed air had a tendency to make the lard turn rancid quicker after exposure to the air than if agitated by mechanical force. The kettle is supplied with a vertical shaft, to the bottom of which is attached a blade shaped like a fan, about 14 inches in diameter. Around this is fitted a wire screen about 30 inches high made out of galvanized wire, 3/16-inch mesh, this screen clearing the blades of the fan about an inch. On top of this screen is fixed an iron pipe approaching to within about 18 inches of the surface of the lard, when the kettle is filled. A kettle of this size will hold about 5,000 pounds of lard for one treatment. The agitating blade should revolve at a speed of from 125 to 175 revolutions per minute. This has the effect of producing a miniature whirlpool in the body of lard to be treated, by driving the lard through the screen against the sides of the kettle, while it rises

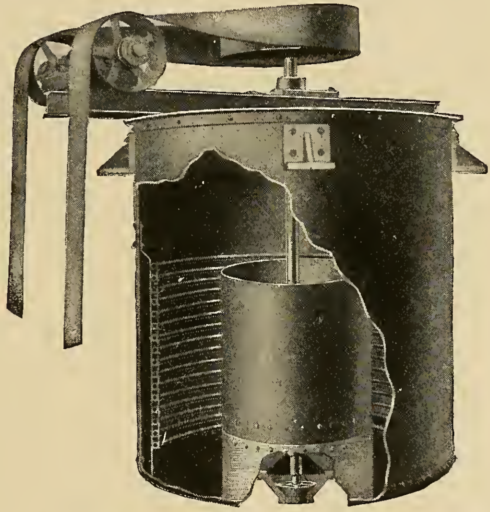


FIG. 142.—FULLERS EARTH KETTLE FOR SMALL HOUSES.

rapidly to the surface and goes down through the funnel-shaped tube to be again driven through the screen.

In this way the fullers earth is thoroughly mixed in and if there is a tendency to "lump" the lumps are readily broken up by impact with the screen. Fullers earth is added to the lard in a proportion to suit the requirements of the particular lot to be treated, it being impossible to make a rule to fit all cases. The best way to determine, where there are large quantities of lard, is to take a small sample and make tests in the laboratory to learn the proper amount of earth to be used in each case. The point to be gained is to get the bleach with as little of the flavor of the earth as possible. Generally speaking, from $\frac{3}{4}$ to $1\frac{1}{2}$ per cent of fullers earth will be required to get the desired result.

The temperature at which lard should be bleached is a very important matter to be determined. The necessary amount of fullers earth required for a particular lot of lard is largely determined by its capacity for absorbing fullers earth flavor. If the lard has been heavily cooked and has a strong steam flavor, a temperature of 180° F. is correct. If the lard has not been well cooked a somewhat lower temperature is necessary. As a rule the lower the temperature at which bleaching is done the more fullers earth is required and consequently the greater objectionable flavor is imparted to the lard. It is apparent, therefore, that to get the proper bleach and at the same time as little earth flavor as possible is a point requiring careful and intelligent consideration in order to obtain the best results.

When the lard is brought to the proper temperature, the proper percentage of fullers earth is thrown into the kettle, when it is agitated and as a general rule should be left in the agitator from eight to twelve minutes, and then pumped through the filter press as rapidly as possible. There are some refiners who prefer to pump the lard and fullers earth immediately through the filter press without giving it any time in the kettle for agitation, but there seems to be no special advantage in this, and the bleach will be uncertain if the fullers earth is not thoroughly mixed before it goes through the filter press. It takes a certain length of time, as proved by experience, for fullers earth to do its work properly and a strong agitation of from eight to twelve minutes appears to be the best method to adopt in order to obtain the full effect of the earth.

After the contents of the kettle have been pumped through the filter air pressure should be turned into the filter press in order to blow out all the lard possible. After this live steam should be turned on, expelling the balance of the lard from the pipe. A large portion of this latter lard, however, is unfit to be used again, as it contains sediment and fullers earth combined, is of a reddish color, has a very rank, strong odor, and can be used only for grease purposes.

Where tallow is used in pure or compound lard, it is always advisable to bleach the tallow separately. This is done in the same manner as described for lard, with the exception that about 3 per cent of fullers earth is used, bringing the tallow to a temperature of 180° F., after which it is pumped through the filter press and into the receiving tanks by itself.

When it is compounded with the lard, the desired amount should be put into the kettle with the lard before it is treated and the two ingredients passed through the filter press together. The same is true of oleo-stearine, except that in the bleaching of this article from ½ to 1½ per cent of fullers earth is sufficient. In using tallow, or stearine, it is done for the purpose of cheapening the product, as well as hardening it, the formula for same being made according to the values and conditions under which the lard is to be sold. For instance lard going south, or into a warm climate, is made much harder than lard for a temperate climate; hence lard formulas, generally speaking, are worthless for general use, the different formulas being made to suit widely different conditions, and their availability also depends to a considerable extent upon the fluctuation of values.

After lard has been put through the filtering press it goes to a receiving tank and is next passed over rollers for chilling (Fig. 143). These consist of cast iron cylinders containing refrigerated brine. These cylinders revolve at from ten to fourteen revolutions per minute, the lard being congealed on the outer surface. Fixed against the side of the cylinder is the sharp edge of a steel knife which scrapes very close to its surface. The lard coming in contact with the cool surface of the cylinders rapidly congeals and as it passes under the knife, it is scraped

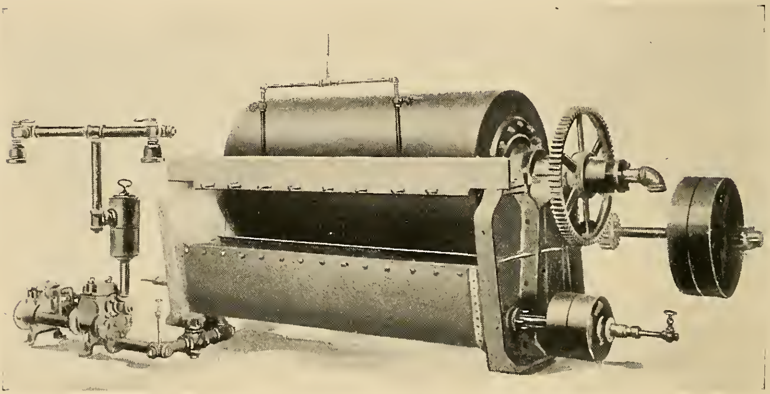


FIG. 143.—LARD COOLING CYLINDER.

off and drops into the pickers, or agitator. Here it is thoroughly beaten by a revolving shaft with pickers on it, so that all lumps are disintegrated and the grain is of a smooth, even consistency. Compound lard is drawn from this point into the different packages. Pure lard goes from there into what is known as a compound agitator, which is a jacketed kettle, where it is given a thorough agitation and drawn off as cool as possible, the object being to have the different ingredients thoroughly mixed at a low temperature, thereby avoiding a separation when exposed to a higher temperature. If they are not thus properly mixed as they cool off, when exposed to a higher temperature the oily substance will immediately separate from the heavier, rising to the top, making it unsalable.

For a receiving tank with a boat bottom for the reception of lard, oleo oils, or any grease which it is detrimental to heat with direct steam, see Fig. 60. The illustration represents a tank 7 x 7 x 12 feet in size, having a capacity of 28,000 pounds. The tank proper is placed inside of a smaller or boat tank, leaving 4 inches of space all around. Into this space is carried a perforated steam pipe and space is filled with water which, by the heat of the steam, holds the contents of the tank at the desired temperature without a scorching or discoloring effect. This tank is particularly adapted for the holding of oleo oils.

COMPOUND LARD.

Compound lard is a substitute for lard and is made of cotton seed oil and oleo stearine, or tallow, or both, as the case may be. The formula on this article varies according to the relative values of the ingredients. The generally accepted formula is 80 per cent cotton seed oil, and 20 per cent oleo stearine.

If the market price of oleo stearine is high, a formula may be substituted as follows: 75 per cent cotton seed oil, 7½ per cent tallow, 17½ per cent oleo stearine. In cold weather even a smaller amount of stearine may be used and a proportionately larger amount of tallow.

Before going into details on the making of compound lard it will be necessary to give a description of the method of handling cotton seed oil.

COTTON SEED OIL.

This is a product from which a large revenue is derived, while only a few years ago it was a bill of expense to the cotton grower. Before the manufacture of cotton seed oil, the cotton seed, after being removed from the cotton, was thrown in large compost heaps and after decomposition, was used sparingly as a fertilizer on the land. An idea of its value today may be gained from the following table.

A bale of cotton weighs about 500 pounds, about one-third of which is seed. From one ton of this seed, on an average, is derived the following:

270 pounds or 36 gallons of oil at 28c per gallon....	$10.08
750 pounds cotton seed meal at 90c per 100 pounds......	6.75
850 pounds hulls at 15c per 100 pounds..............	1.27
30 pounds lint at 3½c.............................	1.05
Total value	$19.15

100 pounds waste and dirt.

The oil when extracted from the seed is termed "crude oil." In refining this oil the loss varies from 7 per cent to 12 per cent, on an average about 9¼ per cent. With crude oil at 28 cents per gallon, figuring on 9¼ per cent loss, refined oil would cost 30¼ cents per gallon. Refiners generally figure on about 2 cents per gallon for refining oil, this covering labor and shrinkage.

The crude oil is often purchased by lard refiners and refined into what is known as "yellow oil." In this process it is put into a large tank (it is generally considered profitable to refine cotton seed oil only in large quantities), this tank being supplied with a revolving agitator, so as to give the contents a thorough mixing. Into the tank is put a solution of 18 to 20 per cent of caustic soda. The quantity and strength of the solution necessary is determined by treating a small sample. To a small sample of oil add the soda, stirring continuously, having the whole solution heated up to a temperature of 160° to 180° F. When sufficient lye has been stirred in, a precipitation will be noticed, carrying with it all the sediment and other impurities. The sediment is known to the trade as "foots."

An excessive amount of lye will saponify its equivalent in good oil, therefore care must be exercised to see that only the proper amount is used. After a thorough agitation to insure the thorough mixing of the caustic soda and the oil has been accomplished, the tank should be allowed to settle, when all the sediment and impurities will go to the bottom of the vat. A few shovelfuls of fullers earth, amounting to less than one-quarter of one per cent is added and the oil is then pumped through a filtering press and is known to the trade as "yellow oil."

The "foots," after the oil has been removed, is drawn off and pumped into soap kettles and treated with an additional amount of lye, boiled two or three hours, settled with fine salt and after washing the ingredients with water, the latter is drawn off at the bottom. This treatment is duplicated as many times as necessary, until the soap stock will separate from impurities. When thoroughly settled draw the soap stock into packages for the soap trade. The finished "foots" contains about 33 to 40 per cent of moisture and a small percentage of lye.

DEODORIZING COTTON SEED OIL.

This is a process of comparatively recent development and consists, first, in placing the oil in a jacketed kettle equipped with a large number of spiral coils. The oil is then subjected to a temperature of from 320° to 360° F. After being held at this temperature for an hour to an hour and a half, it is ready for the washing process. This is done by means of a 2-inch perforated pipe at the top of the kettle, through which is sprinkled cold water on this body of oil. The extreme temperature evaporates the water very rapidly and at the same time causes a precipitation. The water should be allowed to run for five minutes, and then the body of oil should be let stand for from one to two hours. The cone, or bottom of the kettle, will be found to carry much sediment which has been precipitated from the oil by the lowering of the temperature. This "bottom" should be drawn off, and the steam again turned on the coils.

When the oil is brought up to as high a temperature as possible a 2-inch live steam pipe should be opened into the oil, the object being to deodorize the material. The extreme heat of the oil evaporates and throws off this steam very rapidly, the steam carrying with it the cotton seed flavor.

Another method, often used with good results in deodorizing cotton seed oil, is, when the oil has been brought to the maximum temperature, to admit a ¾-inch pipe of cold water at the bottom of the deodorizer, allowing it to run from two to five minutes. The extreme heat of the oil rapidly evaporates the water and the steam thus generated carries off a great deal of the objectionable flavor of the cotton seed oil.

The length of time required for treating the oil depends largely upon its nature, some oils being more neutral and more nearly odorless than others, consequently no exact rule can be laid down that would fit all cases; it must be left to the judgment of the person handling the oil.

It is necessary in order to get the temperature above mentioned to have a boiler in which can be carried at least 135 pounds of steam. Consequently the kettle, coils, etc., should be made extra heavy and strong. The top of the kettle must also be hooded as the oil boils violently

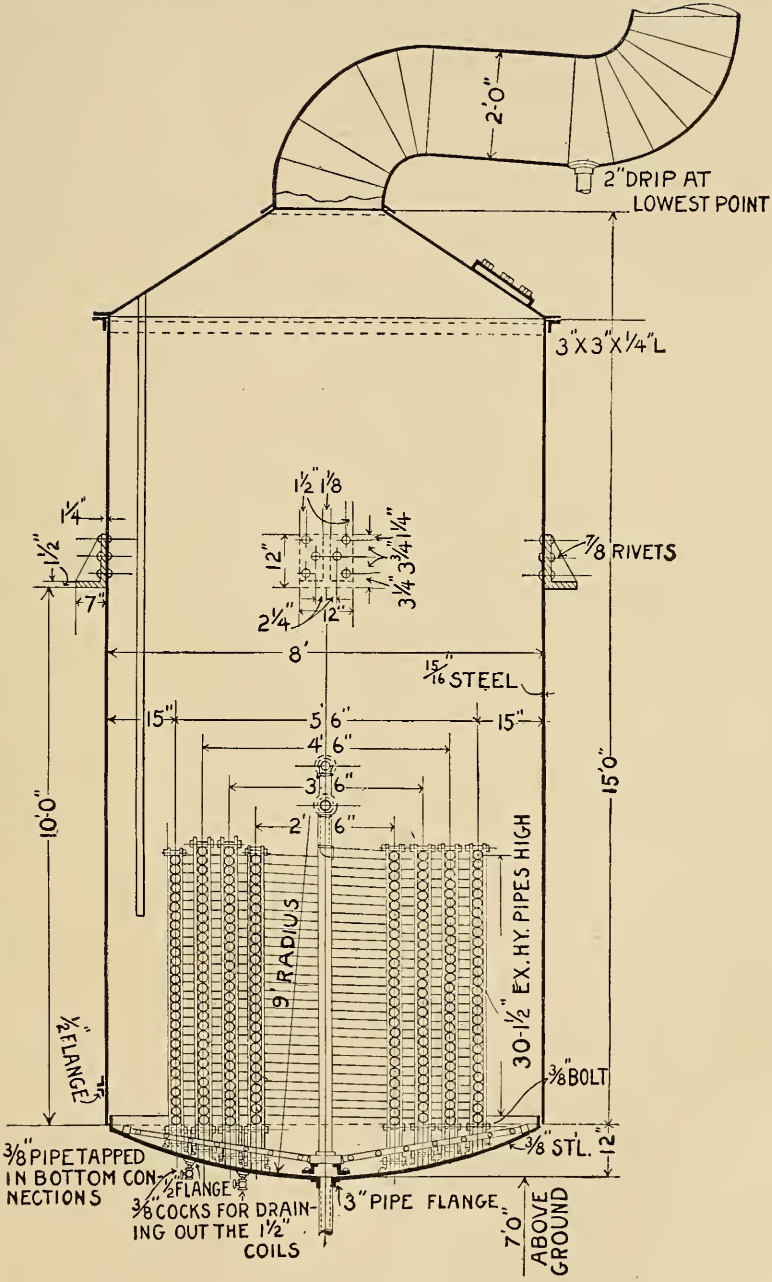


FIG. 144.—DEODORIZING TANK FOR COTTON SEED OILS.

and the steam must be given free opportunity to escape through the escape pipe, which should be at least 16 to 20 inches in diameter in a tank 6 or 7 feet in diameter. The escape pipe should be provided with a goose neck, so that the steam, as it comes from the oil and condenses, does not drip back into the tank, otherwise the process would practically be continuous. Figs. 144, 145 and 146 illustrate such a tank and coils for deodorizing cotton seed

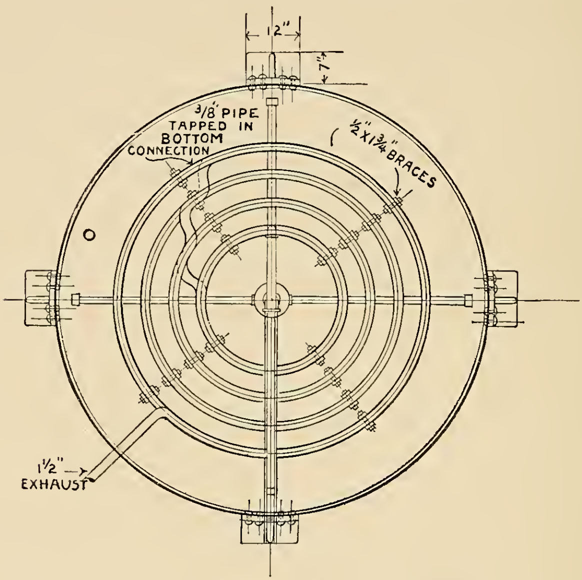


FIG. 145.—SECTION OF BOTTOM OF DEODORIZING TANK.

oil, also show exhaust bonnet, which should be used when the exhaust pipe extends into the atmosphere a short distance above the deodorizing tanks. On account of the extreme agitation caused by the heat, the oil is likely to boil over and waste. Special attention is called to the crook or neck in the exhaust pipe with 2-inch outlet at the lowest point. This is done so that the condensation of the exhaust will not run back into the oil but will be taken out at this point. A small catch basin

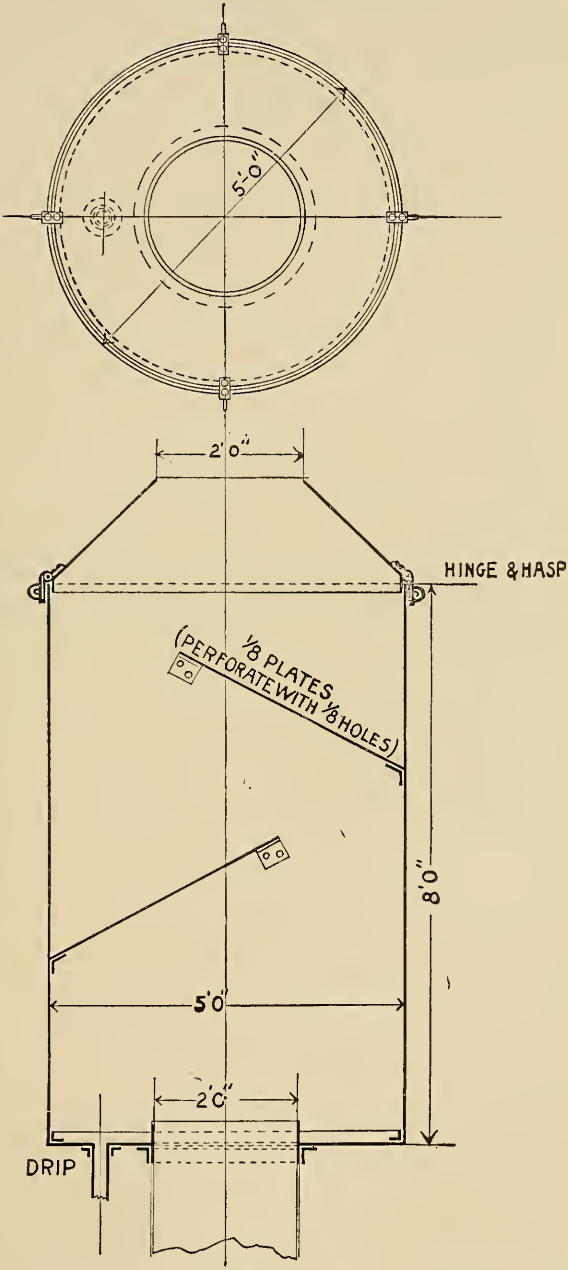


FIG. 146.—SECTION THROUGH EXHAUST HOOD OF DEODORIZING TANK.

or receptacle should be set under this in order to save any oil which may come over into the neck from the condensed steam.

As soon as the oil is deodorized it is drawn off and allowed to cool. It is then ready to be pumped into the treating kettle, or what is known in refineries as the "dirt" kettle. There it is brought up to a temperature of 160° F., when the fullers earth is added, generally using from 1 to 2 per cent of earth with this bleach, following an agitation of about ten minutes. It should then be

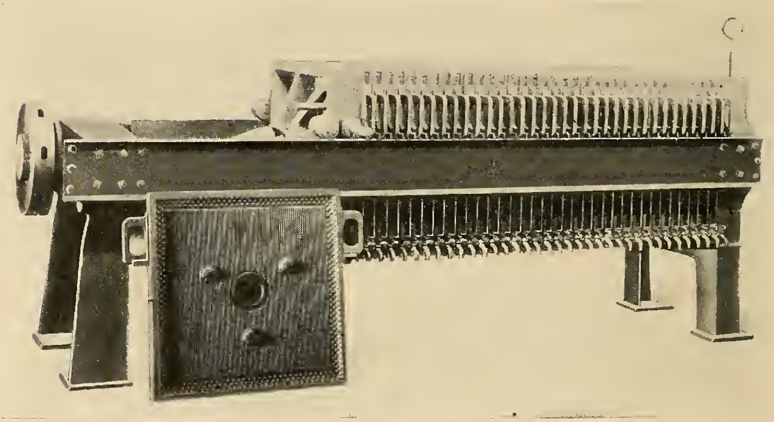


FIG. 147.—FILTER PRESS FOR LARD OR OLEO OIL.

pumped through the filter press into the receiving tank, where it is held until used. After going through this process the oil is known to the trade as "water white."

CARE OF FILTER PRESS.

The filter press (Fig. 147) should not be used more than two or three times until it is taken apart, all the sediment and dirt removed and clean cloths substituted. Continued use of filter cloths, without proper cleaning, has a deteriorating effect upon the material pumped through the presses, and different kinds of products should never be pumped through the same press without cleaning same every time.

KETTLE RENDERED LARD.

In actual practice, probably not to exceed 10 per cent of the lard produced today is kettle rendered, the balance is all sold under the head of "Refined," "Compound," etc. Kettle rendered lard is the purest and best lard that is turned out in packing houses and consists of leaf lard and back fat, the proportions varying according to the value of the raw product, usually on a basis of about 60 per cent back fat and 40 per cent leaf. Lard handled in this manner has a sweet, wholesome odor and flavor, the same as the old-fashioned kettle rendered lard. It would seem as though the drift of the art of lard making has been in the wrong direction when only 10 per cent of the output of the lard produced is of this class, while the balance is of the refined. But the refined lard, while it is equally as wholesome, is sold cheaper to the consumers than is the kettle rendered.

MANUFACTURE OF KETTLE RENDERED LARD.

Kettle rendered lard is handled on much the same lines as oleo fats, it being first put through a hasher which thoroughly mangles and disintegrates all the fat tissues, so that when the heat is applied the oil readily separates. (See Figs. 54, 55 and 56 for kind of hasher and style of kettles.) The kettle generally used for this purpose is about 5 feet in diameter and from 5 to 7 feet deep, made of wrought iron, jacketed for steam, with an agitator to keep the product agitated while cooking.

Upon starting to hash, ten pounds of bicarbonate of soda should be added to a kettle holding 5,000 pounds of material. This is used to cut the slime, blood and gelatine, and also as a bleach. The pressure should be kept on the kettle until through hashing, then increased until the temperature reaches 255° to 260° F., when the pressure should be immediately shut off for one and one-half hours at least—one and one-half hours should be taken to reach this period. If oleo or lard stearine is used it should be added at this time, using about 15 per cent for the summer formula. After this period of shut-off, again turn on the steam, holding at about this temperature, allowing the contents to cook until dry, or until no further steam arises, which will consume probably from thirty to forty-five minutes from the time steam is shut off. Stop agitating and add twenty pounds of salt, let stand to settle one hour, then lower into the kettle below and strain through a cloth sieve, the lard being taken off the scrap at this point with a siphon. The scrap will remain in the bottom of the cooking kettle, for if it is siphoned off carefully, very little will pass through the pipe. The lard, when being drawn into the kettle below, should be passed through one or two thicknesses of cheese cloth in order to catch any small pieces of scrap or tissue which may find their way through.

After the lard is all drawn from the cooking kettle, the scrap should be drawn from the bottom, through a pipe for that purpose, into a receptacle below. This scrap is generally used in the prime steam lard tank. If, however, lard is being rendered where there is no other provision for handling the scrap, it should be put into a hoop press (Fig. 75) and pressure applied, thereby liberating all the oil left in the residue, the scrap then being used as "pressed scrap."

After the lard is lowered into the settling kettle and allowed to stand two to three hours, it should be siphoned off to a third kettle, as considerable scrap will have gone through into the lard from the cooking kettle, and should be strained through a double thickness of cheese cloth, stretched tightly over a frame. After it has been drawn off to the third kettle a scum will arise on it, which should be immediately skimmed off, and about ten pounds of fine salt added to a 5,000-pound batch, to aid in settling. If convenient, it is advisable to allow the lard to settle in this kettle for twelve hours before drawing it off, although this length of time is not necessary, but a perfect settlement of the impurities is necessary to make the best lard. After it is thoroughly settled it should be drawn off into a cooler, ranging from 35° to 40° F.

When drawn into wooden packages, such as ten, twenty or fifty pound pails, lard should be drawn at 150° F. If drawn into tins it should be drawn off at 175° to 180° F.; when drawn into tierces, barrels or half barrels it should be drawn at about 130° F. When drawing lard into wooden packages these should always be silicated the day before, giving them ample time to dry, as this not only prevents the packages from soaking up the lard, but it also prevents excessive shrinkage of the package on account of the heat.

For kettle rendered lard it is very desirable that there should be a light, fluffy top. This is only possible when the lard is drawn hot in a cool room; in chilling the lard so rapidly the heat rising from the body of the lard in the package causes this appearance at the top, which is always looked upon by the trade as a mark of excellence. When the lard is drawn off into small packages they are tiered up, one on top of the other, simply covering the top of the package with paper. The cover should not be put on the lard until it is chilled, for if it is put on while the lard is still hot, the fluffy appearance is entirely lost.

Lard is generally sold in three, five, ten, twenty, forty and fifty-pound tins, the packages being sold gross weight. In wooden packages tare is deducted. The following data will show the actual weight of the different packages which are usually made from an X L grade of tin. Inasmuch as lard sells at more per pound than the tin costs, there is always an endeavor to get the packages as heavy as consistent.

WEIGHT OF LARD PACKAGES.

Weight packages	Weight material	Avg. weight
3-POUND PAILS:		
100 pails..........................	43 lbs., 7 oz.	6.95 oz.
100 bails..........................	5 " 4 "	.84 "
100 covers	9 " 7 "	1.51 "
100 summer covers..................	6 " 3 "	.99 "
Average weight each.............	....	10.29 oz.
5-POUND PAILS:		
100 pails..........................	58 lbs., 12 oz.	9.40 oz.
100 bails..........................	5 " 15 "	.95 "
100 covers	13 "	2.08 "
100 summer covers..................	8 " 10 "	1.38 "
Average weight each.............	....	13.81 oz.
10-POUND PAILS:		
100 pails..........................	92 lbs., 14 oz.	14.86 oz.
100 bails..........................	7 " 12 "	1.24 "
100 covers	19 " 5 "	3 09 "
100 summer covers..................	13 " 10 "	2.18 "
Average weight each.............	....	21.37 oz.
20-POUND PAILS:		
100 pails..........................	144 lbs., 15 oz.	23.19 oz.
100 bails..........................	10 " 9 "	1.69 "
100 covers	34 "	5.44 "
100 summer covers..................	22 " 4 "	3.56 "
Average weight each.............	....	33.88 oz.
40-POUND SQUARE CANS:		
100 cans...........................	268 lbs., 8 oz.	42.96 oz.
100 caps...........................	2 " 8 "	.40 "
Average weight each.............	....	43.36 oz.
50-POUND ROUND CANS:		
100 cans............	270 lbs., 10 oz.	43.30 oz.
100 covers	50 " 2 "	8.02 "
100 summer covers..................	38 " 12 "	6.20 "
Average weight each.............	....	57.52 oz.

DIMENSIONS OF LARD PACKAGES.

3 lb. cans	5 in. high;	top 4⅞ in.	and bottom 4 3/16 in. diam.		
10 " "	8¼ "	" 7⅝ "	" 6⅛ "		
20 " "	9¼ "	" 9¾ "	" 8⅝ "		
50 " "	13 7/16 "	" 12¼ "	" 11⅛ "		
5 " square cans	7⅛ "	by 4⅛ in. square;	2⅜ in. cap hole.		
40 " " "	34⅜ "	" 9⅛ " "	2⅜ " "		

When lard is drawn into wooden packages it is not necessary to put it in as cold a storage as in the case of small tin packages; the body of the lard being larger, the heat contained therein will give the tops a fluffy effect without extreme cold. A temperature of from 40° to 45° F. is ample for kettle rendered lard in wooden packages.

While kettle rendered lard is usually sold under the label of "pure leaf lard," there is little or no actual leaf lard sold, as this particular part of the lard is worth more as a neutral lard than when made into kettle rendered. A very acceptable formula for kettle rendered lard, if handled properly, is as follows:

70 per cent back fat;

15 per cent leaf scraped lard, which is pieces of leaf, scraped out of the hog after the leaf lard has been pulled, and thoroughly chilled.

15 per cent lard stearine. When stearine is not available, 5 to 7 per cent of oleo stearine may be used, with an additional percentage of back fat.

Where neutral lard and kettle rendered lard are made together a very nice flavor may be imparted to the kettle rendered lard by using the bottoms of neutral lard when cooking it, as the scrap from the neutral when brought to the high temperature of kettle rendered lard imparts a rich leaf lard flavor.

NEUTRAL LARD.

When oleomargarine was first manufactured it was always considered necessary to use a percentage of natural butter in order to give it the proper consistency, as the oleo oil was of too grainy and coarse a nature and sufficient natural butter was added to change that condition. But soon after some one conceived the idea of using neutral lard made from leaf lard in place of natural butter in oleomargarine. When this was worked out successfully the term oleomargarine practically disappeared and the term "butterine" was substituted. In most of the butterine made today no natural butter is used, the body of the butterine being neutral lard.

The same process, or conditions, that make oleo oil and tallow also make neutral lard and kettle rendered, namely, the difference in temperature in cooking. When leaf lard is cooked for kettle rendered purposes, if a temperature of from 250° to 260° F. is obtained the tissues of the lard are burned or partially consumed, this heat giving it a flavor which is called "high kettle rendered" flavor. When it is made into neutral this condition is reversed, the lard being melted at a temperature of from 126° to 128° F. At this temperature no burning of tissues is possible, hence the oil extract is neutral in every sense of the word, both in color, flavor and smell. Having developed these three essential points the material readily forms the body for butterine by adding milk or cream and oleo oil and cotton seed oil, as desired.

PROCESS USED IN MAKING NEUTRAL LARD.

The first essential is to have the leaf lard thoroughly chilled, and quickly enough so that no part of it sours. If it is chilled too slowly a strong "hoggy" flavor is developed which it is impossible to eradicate from the fresh product. The leaf lard should be chilled for twenty-four hours in a temperature of 34° to 36° F. before being melted. It is then put through a hasher which thoroughly disintegrates it and from there to the melting kettles, which are made of very thin iron with a jacket. Oftentimes the melting kettle is but a wooden vat with a galvanized iron kettle inside, the space between the wooden vat and the galvanized kettle being filled with water which is heated to the desired temperature for melting the product. It is not practicable to use steam in this case as the heat would be excessive and it would be impossible to control it.

In a kettle holding 4,000 to 5,000 pounds steam should be turned on to the tank before any lard is permitted to go in, the agitator started to revolve slowly, not to exceed six to eight revolutions per minute, and the heat should be regulated so as to have the lard all melted and ready to drop in one and one-half hours from the time of starting to hash. By the time the lard is thoroughly melted the temperature should be 126° to 128° F. As soon as it is melted it should be drawn off with a siphon into receiving kettles, which are also jacketed and held at practically the same temperature. The scrap is then drawn out at the bottom and the kettle is ready to be refilled.

As soon as the lard has dropped into the tank below it should be salted with ½ to 1 per cent of fine salt, letting it stand from fifteen to thirty minutes. Then all the liquid lard should be drawn off with a siphon, running it through a cheese cloth into the receiving tanks, where it should be allowed to settle for at least four hours. It is then drawn off into tierces through a pipe raised far enough from the bottom to leave 1½ to 2 inches of lard in the tank, care being taken that no "bottoms" get into the tierce, as these contain tissues which are, for the most part, undiscernible, and also what moisture may have been left in the lard. If either of these ingredients get into a tierce of neutral the result is that it, being only partially cooked and still more or less of a raw nature, immediately begins to decompose. It is a delicate article to handle and the settling of all impurities is essential.

After the lard is drawn into tierces these should be left in a room, kept at a temperature of about 75° F. for about ten or fifteen hours, and then put into a cooler with a temperature of from 45° to 50° F. The tierces should always be filled from the sides and while the lard is lying in the first mentioned temperature, the bungs should be left out, permitting the heat to escape out of the tierce, carrying with it considerable flavor, and leaving the material more neutral than if bunged up as fast as chilled. The neutral, when drawn into tierces, should be drawn at a temperature of from 115° to 118° F. The following test shows the yield on chilled leaf lard, cooked in rendering tank, making prime steam lard:

TSET ON CHILLED LEAF LARD TO DETERMINE VALUE AND YIELD.

Warm leaf lard to cooler	1,000 lbs.
Chilled leaf lard	986 lbs.
Shrinkage, 1.4 per cent	14 lbs.

Weight to test tank, 986 pounds; value per cwt., $7.556.

Yield prime steam lard	.94.12 per cent;	928 lbs. at	$8.025	per cwt.	$74.47
Yield tankage (pres'd)	.81 per cent;	8 lbs. at	9.89	per ton	.04
Total					$74.51

A second test shows a lot cooked under the same conditions, although the yield varies.

TEST ON WARM LEAF LARD TO DETERMINE VALUE AND YIELD.

Weight to test tank, 1,000 pounds; value per cwt., $6.981.

Yield prime steam lard	..92.40 per cent;	924 lbs. at	$7.55	per cwt.	$69.76
Yield tankage (pressed)	. 1.10 per cent;	11 lbs. at	9.23	per ton	.05
Total					$69.81

In the tables below is given a test on raw leaf lard rendered into neutral, showing yield and percentage of the neutral lard produced, the scrap and bottoms from the kettle being run into kettle rendered lard. Also comparative test of cooking leaf lard under forty pounds pressure for six and one-half hours to determine the production of prime steam lard obtainable, also for comparison with raw leaf lard run as neutral:

TEST ON LEAF LARD RENDERED INTO NEUTRAL.

Raw leaves......8,958	pounds at	$0.08⅛	per pound	=$727.84	
Salt for settling. 35	" "	4.90	" ton	= .09	
					$727.93
Production:					
Neutral lard..... 7,880	pounds at	$0.09125	per pound	=$718.96	
Neutral bottoms. .1,055	"				
(Run under forty pounds pressure two and one-half hours.)					
Prime steam lard. 497	" "	$ 0.082	" "	=$ 40.75	
Tankage......... 56	" "	18.00	" ton	= .45	
					$760.16
Gain on production					$ 32.23

Gain per 100 pounds on raw weight, $0.036.

Percentage Production:

Neutral lard to raw weight	87.97
Neutral bottoms to raw weight	11.78
Prime steam lard to raw weight	5.55
Tankage to raw weight	.63
Prime steam lard to weight of bottoms	47.11
Tankage to weight of bottoms	5.31
Total production of lards	93.52
Total production of raw weights	94.15

Tanking Leaf Lard:

Raw leaves..............1,000	pounds at	$ 0.08125	per pound	=$81.25
Prime steam lard......... 929	" "	0.0825	" "	= 76.18
Tankage.................. 5	" "	18.00	" ton	
Loss on production				$ 5.07
Loss per pound on raw weight				.0051

Prime steam lard to raw weight, per cent, 92.9.

NO. 2 NEUTRAL LARD.

This is a neutral lard made from back fat. At times it is very profitable to make this product into No. 2 neutral instead of into prime steam lard, for when the market for No. 1 neutral is extremely high there is demand for a good No. 2. When making this, the rind should be all skinned off from the back fat, leaving just the clear back fat to be hashed for neutral. If the rinds are put in, it gives the product a "hoggy" flavor, which makes it unsalable as neutral lard. It is hashed and melted practically the same as No. 1 neutral, except as to temperature, the melting point for this being 132° to 134° F., the same method and apparatus as described for the making of No. 1 neutral, being applicable to this.

In making a No. 2 neutral, the bottoms, after the neutral has been drawn off, can be converted into a kettle rendered lard, if there is a demand for this product, and make a very desirable article. The following test on 5,000 pounds of back fat converted into No. 2 neutral and prime steam lard shows accurately the yield of each.

TEST ON 5,000 POUNDS OF BACK FAT CONVERTED TO NO. 2 NEUTRAL KETTLE RENDERED LARD AND PRIME STEAM LARD.

	Net wt. lbs.	Per cent.
Back fat	5,000	
Less skins removed	586	=11.72
Skinned back fat rendered to No. 2 neutral	4,414	
Production No. 2 neutral	1,846	=41.82
Bottoms left in kettle	2,568	
Bottoms from No. 2 neutral rendered to kettle rendered lard	2,568	
Stearine added	270	=10.51
Total	2,838	
Production of kettle rendered lard from above	1,940	=68.36
Bottoms from No. 2 neutrals	898	
Kettle rendered bottoms	673	
Loss on production	225	
Bottoms from kettle rendered to prime steam lard to tank	673	
Production of prime steam lard	307	=45.62
Skins from back fat rendered to prime steam lard	586	
Production of prime steam lard	192	=32.76

RECAPITULATION:

		Net wt. lbs.
Rendering back fat		5,000
Oleo stearine added		270
Total		5,270
Production No. 2 neutral lard	1,846 pounds	
Production kettle rendered lard	1,940 "	
Production prime steam lard	499 "	4,285
Waste		985

GREASE.

In the rendering of lard and tallow there is always a certain amount of grease produced, but the amount should be kept down to a minimum. There are always catch basin skimmings and parts of the rendered fats which have become contaminated, rendering them unfit for edible purposes. These greases are used for pressing purposes where different grades of oil and stearine are made and are also used for the manufacture of soaps. There is at times a very handsome profit in pressing greases and extracting the oil from them, which is used for various purposes. At times there is a good demand for tallow and lard oils, although at best the demand is limited.

The product to be pressed is drawn off into seeding trucks, in a similar manner to oleo oil, and there allowed to stand until partially chilled, when it is put in cloths in the presses and the oil gradually squeezed out, leaving the stearine in the cloth. The demand for this kind of oil has been greatly curtailed in the last few years because of the varieties of oil it has been found possible to make from petroleum. More or less of grease goes into the catch basin, where it becomes contaminated with foreign matter, rendering it in the case of lard, yellow grease, an unedible product, and in the case of tallow, black grease. This kind of product is generally pressed; the oil extracted from yellow grease, or grease made from hog product, is used for lubricating, as well as lighting purposes, there being quite a good demand for same. The oil made from tallow product or black grease is also used for lubricating purposes and enters into the manufacture of many articles not edible. The stearine from these different greases is generally used in the making of soaps or candles, glycerine is extracted therefrom, and various other products. Before the pressing of low grade greases is possible, it is necessary to wash the fats with sulphuric acid to eliminate the impurities, such as water, lime soaps, albuminous matters and ordinary dirt. Shallow wooden vats are ordinarily used for this purpose, the vats being of greater width than depth, as the acid water settles best in a shallow receptacle. Where a comparatively small amount of work is to be done an ordinary wooden vat made out of good sound pine, with 3-inch staves and well bolted together, is all that is necessary, but where the work is continuous these wooden vats should be lined with ten-ounce lead, as the acid very soon destroys the vats.

The method of washing with the sulphuric acid is as follows: Into the wooden or lead-lined vat run clear water to the amount of about 10 to 15 per cent of the weight of the grease to be treated, and when the water is in, add 1 per cent of sulphuric acid to the fat to be washed, the acid to be 66-degree density. It is important that the water be put in first, for if the acid is put into the tank first and the water afterwards run in, an explosion is liable to occur on account of the intense heat generated by the absorption of the water by the acid. In case of an explosion the acid is liable to be thrown on the attendants. After the water and acid has been mixed, add the liquid fat, turn on steam and boil until the fat and acid show clear; at first it will be muddy or cloudy. Usually a boiling of twenty to thirty minutes is sufficient. This work should be done on the top floor of the building, or some place where there is ample room for the escape of the vapor, as the fumes of the acid are very strong and are injurious to the building. After the boiling is finished, allow the tank to settle ten to twelve hours, then draw off the acid water from the bottom, and if the same is clear and clean it shows that the fat had little foreign substance and the solution can be used over again. If it shows a great deal of foreign matter in the solution it should be run away.

All pipes leading from such treating vats should be of lead. It is also necessary that the pipes in the vats be of perforated lead coils, as iron pipes would very soon be destroyed. After the fats have been washed they should be drawn into trucks or tierces and placed in a room where there is good ventilation, and kept there for about two days, giving the acid fumes an opportunity to pass off; the fat will then be found to be lowered to about 80° F., and should then be removed to a room that is refrigerated to the degree required by each special class of product to be pressed. The temperatures necessary for the different greases are as follows:

Tallow	58° to 65° F.
Prime steam lard	48° to 50° F.
Neatsfoot oil	45° to 48° F.

After remaining in these temperatures three or four days the fats will be found to be crystallized, or grained, and of about the temperature of the rooms. It is then ready to go to press. The temperatures of the press rooms should be—

Yellow grease	63° to 65° F.
Prime steam lard	53° to 58° F.
Pure neatsfoot	50° to 53° F.

As a rule it is generally found advisable to have the press room a few degrees warmer than the stock, as it facilitates the draining of the oils from the stearines.

COLD TESTS ON GREASE.

It is not customary to speak of any particular cold test of cotton or grease oils; however, in case of pure lard oil, pressed, as before mentioned, it would have a cold test of about 42° F. Pure neatsfoot would have a cold test of about 45° F. In case colder degree oils are desired, either pure lard or neatsfoot, it would be necessary to make the lard colder than above; as to neatsfoot oil, if it is desired to make a 30° F. test, it would be best to make two pressings. First chill stock to a temperature of 42° F., pressing it in a room at 45° F., and then take the oil that is made in this way, refrigerating it in a room at 32° F. and pressing it at a temperature of 32° F. The same is true of lard oil. If it is desired to make a very low test of lard oil it is necessary to press it twice.

There are several forms of presses made for this work, but the ones generally in use are the lever and weight presses; they are more economical to install and also to operate. Another factor in favor of the lever press is that a much thinner cloth can be used than in a power press, and the amount of oil which is absorbed by press cloths is a large item in the pressing of fats. This is greatly reduced by using a lighter grade of cloth. One of the great advantages to be obtained in washing low grade fats is apparent in the stearine; when the stearine is shaken out from the cloth it is found to be free from impurities, also free from water. These stearines are generally put into melting kettles where they are heated to a liquid form and drawn directly into the packages. The oils from the pressings should be filtered after coming from the presses.

The amount of fullers earth to be used in filtering depends upon the condition of the oil to be filtered. With prime steam lard no fullers earth should be used; it is simply filtered through clean press cloths. In the case of lard oils and tallow oils, the color of the oil desired must also determine the amount of fullers earth to be used, no set rule as to the amount to be used in every case being practicable.

No. 1 lard oil and No. 2 neatsfoot oil are generally made from the same kind of stock, the grading being made according to the color. A lot that is particularly dark would be graded as No. 2 neatsfoot. A No. 2 lard oil would be practically the same stock bleached with 4 to 6 per cent of fullers earth. Every manufacturer of these different grades of oils has his own grades and standards established, to which the lard refiners usually work, and the amount of bleaching, etc., which is necessary for each individual lot should be governed by the knowledge of the operator, rather than by any set rules.

In the pressing of these articles the oils generally run from 40 to 52 per cent of stock, the balance being stearine, the percentage of oil obtained varying according to the temperature at which it is pressed, and according to the relative market prices for oils and stearines.

CHAPTER XX.

BUTTERINE AND PROCESS BUTTER.

MANUFACTURE OF BUTTERINE.

Butterine is a product possessing great value as food and puts within the reach of the masses an article which is wholesome and palatable and at the same time of moderate price. However, national, as well as state, legislation has done a great deal to curtail and cramp its sale, as it was found to be a severe competitor of the dairyman and farmer. The restrictions at present in force are of such a nature as to limit the volume of business done, but as the consumption is increasing in spite of the restrictions, this business will undoubtedly again assume in the near future its former proportions.

Practically all the oleo oil made in this country is shipped to Europe, where it is used in the manufacture of butterine, and there consumed; for with the comparatively dense population of European countries they are unable to supply themselves with pure dairy butter.

While prejudice exists in many places against butterine, it is wholesome in every respect, handled, as it is from necessity, in a most approved and cleanly manner, for if it is not made with absolute cleanliness, and the milk used becomes in the least tainted or impregnated from any cause, the whole mass is injured. This is seemingly true to a greater extent than it is in the manufacture of pure butter, as the different ingredients used in

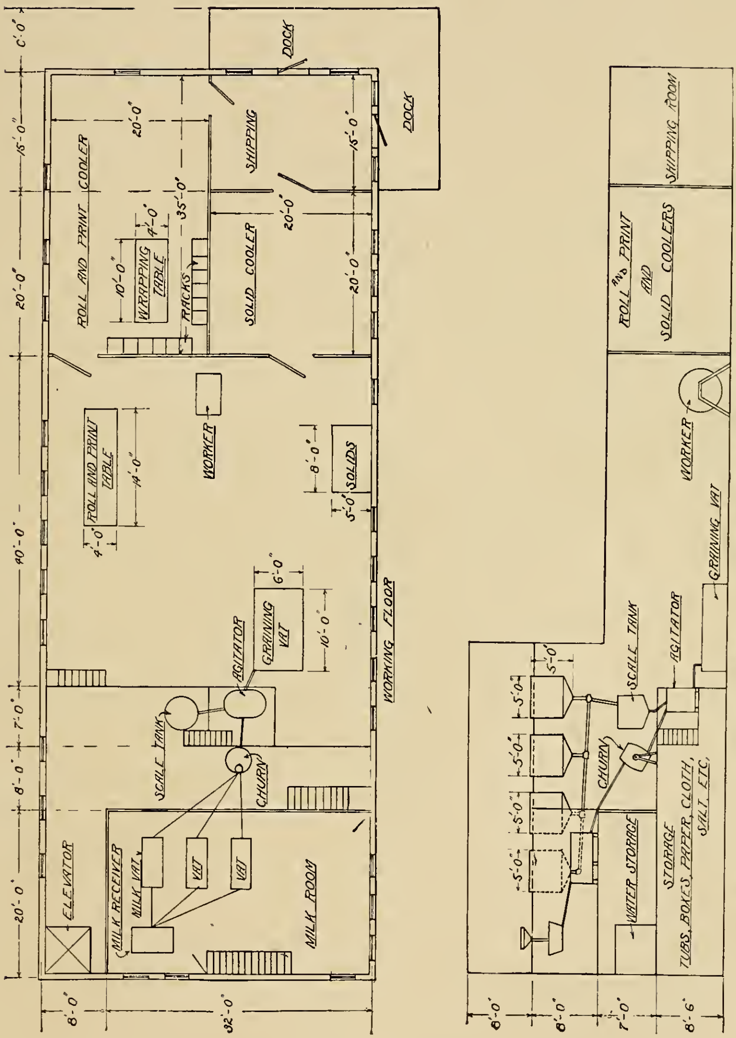


FIG. 148.—OUTLINE PLAN AND SECTION OF MODERN BUTTERINE FACTORY.

butterine, being more or less foreign to each other, propagate germs more readily than any one of the various ingredients would separately.

Very marked advances have been made in the manufacture of this article within the past few years. A much more desirable product has been made since the advent of neutral lard, which is now used instead of natural butter; it is, however, necessary to use milk or cream to give the goods the natural flavor of butter. It is in the han-

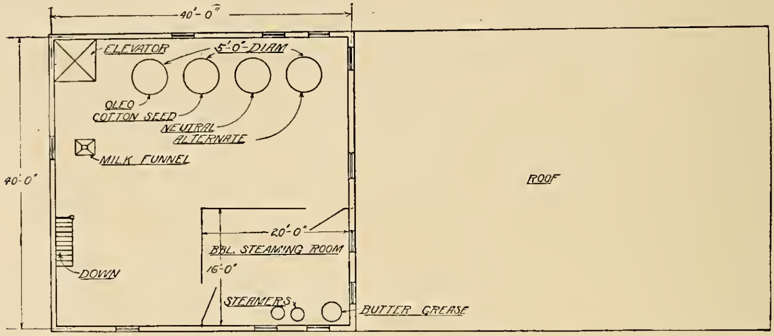


FIG. 149.—SECOND FLOOR PLAN OF MODERN BUTTERINE FACTORY.

dling of these latter ingredients that the difficult part of the manufacture of butterine presents itself.

Fig. 148 shows plan of modern butterine factory, location of vats and machinery, together with ground floor of refrigerator, shipping room, etc. The lower half of the diagram represents a longitudinal section, while Fig. 149 presents a plan of the second floor of the manufacturing department of a modern butterine making plant.

HANDLING OF THE MILK IN MAKING BUTTERINE.

The principal, and by all odds, the most important matter to be considered in the manufacture of butterine, is the quality and proper handling of the milk and cream.

If the milk or the cream is of poor quality, the entire product will be spoiled. Milk was formerly handled by souring before churning. When received it was put in a tin receptacle, which in turn was set in a wooden box which contained warm water, the milk being held at a temperature of 78° F., and the temperature of the room

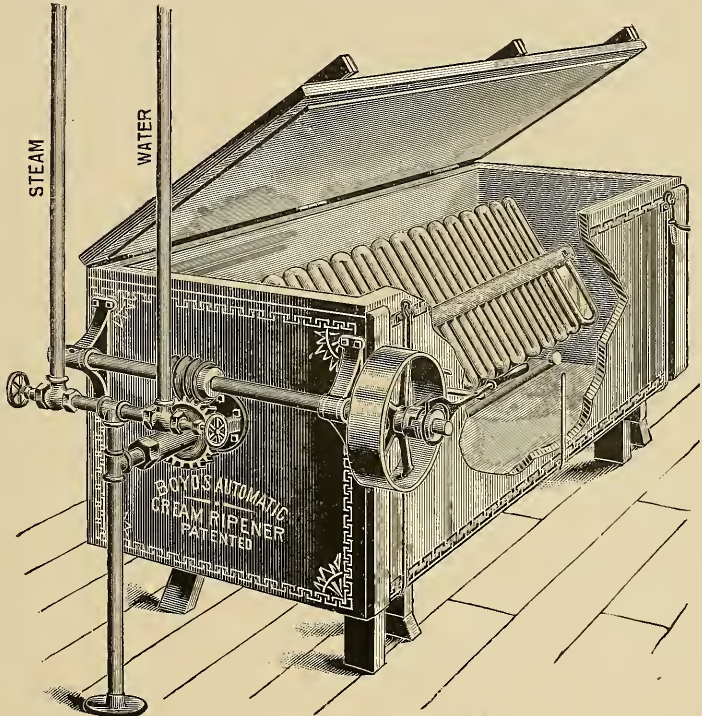


FIG. 150.—BOYD CREAM RIPENER.

from 86° to 90° F. The milk was then allowed to remain in the souring vats about fifteen hours before using. The proper condition for use being reached when there is a strong acid taste to the milk, which is developed when it is sufficiently sour.

Fig. 150 illustrates a cream ripener which is so connected that either water, cold brine or steam can be used through a center agitator, thereby insuring absolute control of the temperature of the cream or milk.

At this point the cream and milk are thoroughly mixed and the mixture is then drained off into a churn. (See Fig. 151.) It is next agitated until the butter is practically all separated from the buttermilk. At this juncture about one-quarter of the required amount of neutral lard is mixed in, still keeping the churn in action. When it is thoroughly mixed it is ready to be put into the mixer with the proper amounts of oleo oil, neutral lard and cotton seed oil in the proportion of each to be used, according to the grade desired.

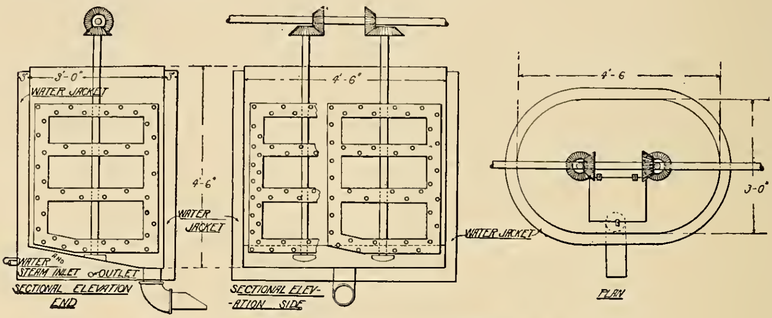


FIG. 151.—CHURN USED IN BUTTERINE FACTORY.

After the different ingredients have been thoroughly agitated in the mixer, the proper or desired coloring matter is added, an article manufactured especially for this purpose. The principal manufacturers are Wells, Richardson & Co., Burlington, Vermont, and Heller, Herz & Co., New York City, the latter of whom manufacture what is known as the "Alderney Butter Color." From four to forty ounces to a batch of 100 pounds, according to the color and shade required, should be used. After the coloring matter is added the mixer should be run about twenty minutes, after which the contents are ready for the graining vats.

In regard to the coloring, the reader will understand that this is the particular point upon which federal restrictions have been placed, and the goods today cannot be colored except upon payment of a prohibitory tax amounting to ten cents per pound. On uncolored goods the tax is one-quarter cent per pound. While the goods are equally as wholesome uncolored as colored, they are not as attractive in appearance and sales are proportionately curtailed.

Butterine is made in two grades, viz., a "high" and a "low" grade. High grade butterine is that which contains no cotton seed oil and in which cream is used in the place of milk. Low grades contain cotton seed oil and milk is used instead of cream. Different qualities and grades are merely subdivisions of these two, obtained by deducting from and adding to the quantities of these various ingredients.

As before stated, cleanliness is the all-important factor, since milk as a food product is most easily contaminated by foreign flavors and germ life. Milk readily absorbs the odors given off by articles placed in the same room. Therefore, only pure and absolutely sweet milk and cream should be used, but as absolutely pure milk, though sweet, is difficult to secure, it becomes necessary to adopt some method whereby the condition of such milk can be righted.

Careless milkers care little whether hair, dirt, dust, etc., drop into the pails while milking, thinking that in straining the milk, all particles and impurities are removed. It does remove all particles, but the filth germs which were clinging to these particles by the million are not strained out. They remain in the milk and under favorable temperatures thrive and multiply unless arrested by some purifying agent. Hence a "pure flavor germ" is cultivated in the form of a commercial "starter."

Before giving the details as to the working of the "starter," let us first consider the methods adopted for receiving the milk, and also making the proper tests in order to determine its value and the amount of fat it contains. This test is made as follows, and it is very essential that this be done carefully and intelligently, as the result of the test determines the value of the product purchased.

The test generally accepted by experts is obtained by using Babcock's "Acme" steam turbine test machine. This machine is made to accommodate twenty-four bottles at one time. Care should be taken to have the machine set up well and secured and balanced exactly each time test is made. This is accomplished by placing bottles exactly opposite each other. For instance should a test be desired on only one sample of milk, fill up another bottle with water and place in machine opposite sample. The machine in motion makes 3,000 revolutions per minute. It will, therefore, be seen at once that a perfect equilibrium is necessary. Test bottles are so arranged that they will contain the amount of milk or cream and acid needed. A 17.6 cc. pipette is used for measuring the milk or cream and a 17.6 cc. graduated tube for the acid. First pour 17.6 cc. milk in bottle, then pour in 17.6 cc. commercial grade sulphuric acid. Do not pour the acid so that it drops on top of the milk, but hold the bottle sidewise so that the acid will slip into the milk at side. Otherwise a burnt taste will result and make it impossible to correctly read the test. Shake the bottle well until milk has entirely disappeared, then place in machine.

After all bottles are filled in this manner and machine is balanced, admit steam, gradually increasing it, until machine is running at full speed. Allow it to run five minutes, then stop and fill each bottle with hot water up to the lowest mark on graduated neck of bottle; start machine again and allow it to run for three minutes, when again it will be necessary to add hot water up to within one-half inch of top of neck of bottle. Then run machine two minutes longer, and read test. Use a pair of compasses in reading the fat in neck of bottle and read it quickly as the fat recedes if left long. This test determines the percentage of fat in sample of milk, consequently its value.

MILK AND CREAM FOR BUTTERINE.

Only sweet milk should be used. Milk that is sour before reaching the factory has invariably soured under conditions which cause trouble impossible to remedy, and no matter how good the " starter " may be that is added to the milk, it has developed germs and bacteria that cannot be destroyed, and as the milk or cream grows older the development of the proper germs or bacteria is over rapid and impossible to control. This is as true after it has been worked into the butterine as before. Hence it will be seen, that a great deal depends upon the milk and cream being absolutely sweet in developing the proper conditions with the " starter."

The exact " sourness " or acidity of the milk can be determined by taste or smell, but not accurately. Hence a test is necessary to determine the exact conditions of the milk when purchased, as well as when treated for the butterine.

Experience has shown that when milk contains six-tenths of one per cent acid, the most desirable point has been reached, as then it imparts the best flavor to the goods. If more than six-tenths of one per cent acid is used the flavor is not as good. This is also the case if a lower percentage of acidity is used. Hence the milk or cream should be brought to this exact degree of sourness before using.

In order to determine this accurately, it is necessary to do it by a test, as milk may be three-tenths of one per cent acid before it is perceptible to the taste or smell. Milk that would pass as sweet by taste or smell will show two-tenths of one per cent acid.

The test to determine this is very simple. Any chemist is able to furnish an alkali solution and the necessary neutralizer of proper strength. The usual way, however, is to use what is known as Farrington's tablets, prepared by Prof. Farrington of the Wisconsin Dairy School. These tablets are dissolved in water, a convenient strength being five tablets to fifty cubic centimeters of water. The solution is mixed with the milk to be tested and shaken; the acid in the milk acting upon the alkali of the solution immediately turns the milk to a pink color and the amount of the solution required to produce the pink color determines the acidity of the milk.

A 20 cc. pipette is used for measuring the milk or cream. Each cubic centimeter of solution is equal to two one-hundredths of one per cent acid, hence if 10 cc. of solution is necessary to turn the milk or cream a pink color, the milk would contain just two-tenths of one per cent acid and would be sweet. Any more than that would show the milk to be too sour for use. In receiving even sweet milk, it must be taken for granted that it is dirty and contains some impure bacteria, which only await the proper temperature to develop and thereby sour the milk and produce bad flavors. This is why the "starter" should be used on all milk and cream that is to be utilized in butterine.

Another great advantage obtained in the use of the "starter" is the fact, that it permits the ripening of milk and cream at a lower temperature. Bacteriologists state, and it is proved by experience, that a temperature of about 65°F. is most favorable to the development of the best fermentation in ripening milk and cream. This is another very valuable point to be considered in the use of "starters." Prior to their discovery it was customary to sour the milk at a much higher temperature, which was correspondingly favorable to all the objectionable bacteria in the milk. Without the use of the "starter" the conditions were practically beyond the control of the operator.

When the milk for use in butterine has been examined and accepted it should be strained through a double thickness of clean cloth into the milk vats for ripening, bringing the temperature on the different vats to the same point, so that as the milk is used it will all be in the same condition. In cold weather the temperature should be held at 70° F., while during the warmer seasons from 60° to 65° F. is desirable. In cloudy, murky summer weather a lower temperature will be required. It is generally known that electrical disturbances have a very marked effect upon milk and very often a thunder storm will cause milk to sour. Under such conditions the temperature should be held at from 55° to 60° F. until the storm is passed, when it should again be held at the normal temperature named.

The "starters" referred to contain nothing more than the healthy bacteria always found in clean, fresh milk cultivated in such vast numbers that when incorporated with milk containing the impure variety, miniature warfare is at once begun. If the "starter" is right, the warfare ends with the pure germs victorious, bringing the milk once more to its proper and original condition.

There are two ferments or " starters " on the market which are commendable on account of their uniformity and purity the year round. They are produced in eastern laboratories in what might be called vitalized air, every care being taken to see that no foreign flavor comes in contact with them. They are Keith's " Butric " and Hansen's " Lactic." The former is produced by Simon Keith, of Boston, Mass. (this culture being in liquid form and coming in four ounce bottles); the latter by Christ Hansen, of Little Falls, New York, which comes in the same size package, but in powder form. These are the leading manufacturers and both articles give highly satisfactory results.

PREPARATORY STARTERS—HOW PREPARED.

Into a bright, tin vessel, put four gallons of sweet, skimmed milk, which tests two-tenths of one per cent acid, no more. Strain through a double thickness of perfectly clean cloth, heat the milk to 180° F., holding at this temperature for one-half hour. This " Pasteurizes " the milk by absolutely killing all life in it. It also destroys all flavor.

The milk should then be cooled quickly to 90° F. As soon as this temperature has been reached pour in a four-ounce bottle of " starter " or ferment, holding the bottle close to the milk so that no flavor or odor may contaminate it. The bottle should not be opened until ready for use. After adding the ferment cool down slowly to 70° F., stirring all the while so as to thoroughly mix it with the milk. The bacteria grow very rapidly at this temperature. In twelve hours, if kept evenly at this temperature in a tightly closed vessel, a sufficient quantity of the proper germs will have been developed to produce an acidity of five-tenths of one per cent. The milk will also have thickened somewhat. If the above conditions are found at the termination of twelve hours, cool the milk quickly to 40° F. and hold at this temperature until ready to make a large or regular "starter."

If by careful test the milk has not grown sufficient germs to produce the above named acidity, that is, five-tenths of one per cent, reheat to 90° F. and hold at this temperature until it does. Do not stir it at this stage, as the "starter" should be kept with as little agitation as possible after the germs have been propagated.

THE REGULAR "STARTER."

When ready to make the large or regular "starter," place twenty gallons of sweet, skimmed milk in a sterilizer, after having cleaned the vessel, and heat as before to 180° F.; hold at this temperature for one-half hour, then chill to 70° F. and add the four gallons of preparatory "starter" already described, stirring well while adding.

Let this stand twelve hours as before in a temperature of 70° F., when it should appear as the preparatory starter did, slightly thickened and showing an acidity of five-tenths of one per cent. When acidity test shows this to have been reached, chill to 40° F. (at this temperature the bacteria are dormant and will not develop), and hold until ready to ripen the day's run of milk and cream for churning.

When the milk has been brought to the proper temperature distribute the larger "starter" evenly through it. Of the second "starter" 3 per cent is sufficient during the summer months, while even as high as 10 per cent is necessary in cold weather. Stir thoroughly and arrange vats so that they can be closed tightly while the milk is ripening, leaving only a small opening in the top for gases to escape as the acid develops.

At the expiration of twelve hours, the milk should be ripened sufficiently for churning and by test it should show, as above stated, six-tenths of one per cent acid. When this acidity has been developed cool to 58° F. and place in churn. At this temperature the butter-fat will form in small, firm globules and separate nicely from the casein. If the temperature is lower than this it takes much longer to separate the fat from the casein and it is impossible to separate all of it, hence some fat is lost. At a higher temperature, the fat, when separated, will be fluffy and soft and will not produce a firm body.

As texture is one of the essential points to be sought after in producing artificial butter, the churning of the milk, in order to produce the proper texture in the butter-fat, is a very important function and one which should be carefully performed. Before putting the milk into the churn it should be stirred thoroughly, as during the twelve hours occupied in ripening, the butter-fat, being the lightest, has come to the top and unless again thoroughly mixed one churn will contain most of the fat and the others will contain comparatively little, and as each churning of milk going into the mixer constitutes a separate run, the quality of the butterine manufactured will be uneven. The churn should turn about fifty revolutions per minute and about twenty minutes churning is necessary to separate all the fat. At the expiration of this time the milk or cream is ready for the mixer.

LOW GRADE BUTTERINE.

This grade is composed of cotton seed oil, No. 2 oleo oil and No. 2 neutral lard. Straight milk is used for flavor. The oils go into agitator at the following temperatures: Cotton seed oil at 75° F.; neutral lard, added next, at 95° F., and oleo oil next at 90° F.

The cotton seed oil should be agitated first for about fifteen to twenty minutes, before the other oils are added, leaving the lid of the agitator open. This has the effect of removing some of the flavor from the oil and while it may be slight, it is certainly an advantage. The neutral

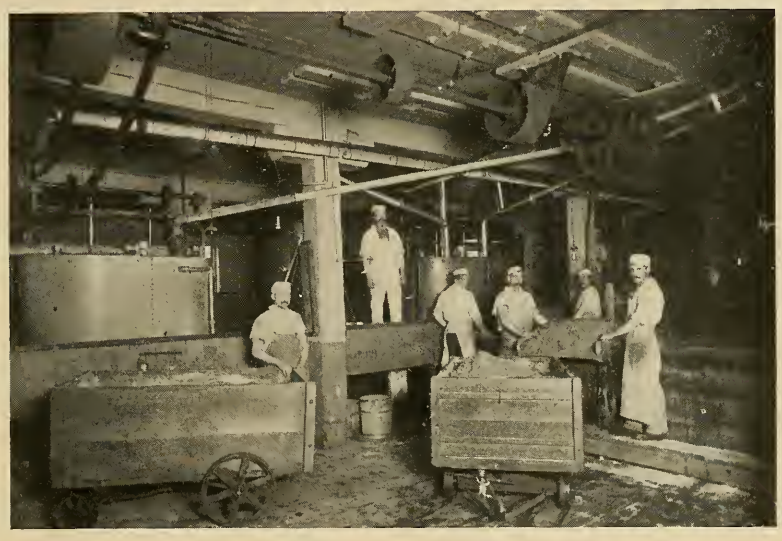


FIG. 152.—CHURN ROOM FOR BUTTERINE.

lard should be added next, care being taken to see that it is free from flakes and sandy texture. In other words, it should be brought to the proper temperature, viz., 95° F. and held there long enough before going to the agitator to be sure that the grain of the lard has entirely disappeared, for if this is allowed to go in it can never be removed in the finished product.

The oleo oil is next added and after these three ingredients have been agitated for twenty minutes and thoroughly mixed, the milk should be added last and the whole mass left in the agitator for five minutes with the lid of the agitator closed tightly.

At this stage the salt and color are added. The amount of salt required should be decided by the necessities of the particular trade to be supplied, but 5 per cent will be found a medium salt. Experience has proved that it is better to add salt at this time because it is more evenly distributed in the emulsion than in the granular butterine.

After the color and salt are thoroughly mixed, let the whole body run into the graining vat filled with water at a temperature of 40° F. This should be drawn through a 5-inch galvanized pipe flattened out at the end to form a spreading exit for the butterine. The butterine passes into the water vat directly behind a paddle wheel arranged so that one-half of it is above water. The wheel revolves rapidly causing the butterine to be quickly submerged, thereby graining it as fast as it hits the cold water. The quicker butterine is grained, the more flavor it retains, as the globules formed incase the flavor. Should the water be too cold, the butterine will be hard and dry, and is likely to crumble and mottle, besides causing a reduction in gain. On the other hand, if the water is too warm the butterine will be soft and mushy and cannot be worked properly, although the gain will be larger. Warm water is used on very cheap grades when butterine is to be packed in solids and a large gain is desired.

Butterine differs from creamery butter, in that the butter-fat and casein are both used in the butterine, whereas in creamery butter the fat alone is utilized. This is done in butterine to gain all the flavor possible by passing the buttermilk through the oils. It is later washed out in the water vats, but in passing through the oils, it imparts some flavor. Butterine also requires much less working, thereby avoiding a "salvey" or pasty condition, also preventing a loss of moisture and increasing the yield of the article. Salt being the primary cause of the "mottle," or discoloration, that danger is also avoided when goods are not over-worked.

Fig. 153 shows a butter-worker and receiving tray for entering worker. By revolving the worker with tray in this position the butterine is placed on the table.

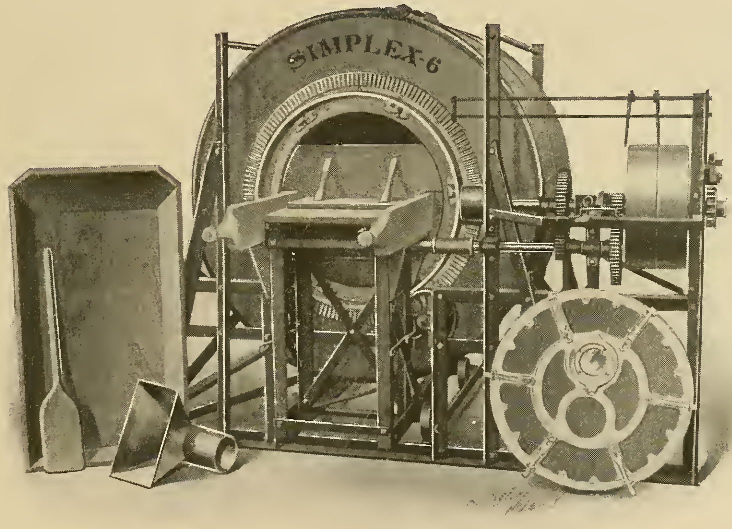


FIG. 153.—SIMPLEX BUTTER WORKER.

In figuring a formula for butterine, the titre must be carefully watched, because hard, crumbly butterine, or the soft, mushy product is often traced to poor figuring in the formula. A simple formula that may be depended upon would be as follows:

350 pounds of oleo oil at 90° F.,
250 pounds of cotton seed oil at 75° F.,
450 pounds of neutral lard at 95° F.,
30 gallons of milk at 60° F.

This, when mixed, will show a temperature of about 90° F. as a whole. If not, heat to that point before drawing into the graining vat. As fast as the butterine to be grained shows on the top of the water, it should be lifted onto a cloth in the hands of two men to a clean box truck.

The butterine should then be covered with a sprinkling of fine salt and the trucks placed in the tempering room, where a temperature of 60° F. should be maintained, to remain twelve hours. In this time, it will develop all the flavor it is possible to obtain and be ready for the workers.

FIG. 154.—MAKING BUTTERINE PRINTS.

The temperature of the tempering room is something that must be watched carefully and should never be allowed to go above 60° F. as the ingredients in this condition contain a large amount of water, and at a warmer temperature action of the water and grease are liable to cause the goods to sour. After remaining in this temperature twelve hours the butterine is taken out to the workers. It should be worked as little as possible to obtain a smooth, compact body, as overworking produces a "salvey" condition. In packing the product is worked up into prints or rolls, or packed solid into tubs, as the case may be, and should be run into a cooler kept at a temperature of from 40° to 45° F., and there held twelve hours, at least, before being shipped. This gives the butterine time to properly set.

FIG. 155.—PRINT COOLER FOR BUTTERINE.

HIGH GRADE BUTTERINE.

The formula for high grade butterine differs from low grade in that it does not contain cotton seed oil and that cream is used instead of straight milk. The oils are also treated in a different manner and at different temperatures. Larger quantities of cream are used to improve the quality and grades. The treatment of the oils is the same in all high grades.

The neutral oil should be placed in the agitator first. Before being put in, however, it should be brought to a temperature of 110° F., or enough to remove the flakes and grain. Then cooled quickly with clear ice, or by means of the refrigeration, to 95° F. and run into the agitator, in motion, with the lids open. Oleo oil should be heated just enough to remove the grain and make it smooth, about 115° F., then chilled quickly to 85°

FIG. 156.—BUTTERINE SOLID PACKING ROOM.

F. and run into the agitator. Let it be agitated five minutes and then add the cream.

The whole body is then agitated enough to insure mixture, ten minutes being sufficient, after which it is dropped into the graining vat, the temperature of the water being 36° F. It should be removed from the water into trucks at once and put into the tempering room at a temperature not over 60° F., tempered twelve hours and worked the same as low grades.

Milk and cream undergo many changes after being incorporated in the finished butterine and the more cream there is in the product the lower the temperature in the tempering room should be. It is not at this stage that flavor is made. Only the flavor the product already contains is developed and many batches of sour or "off" butterine are traced to too warm tempering rooms, whereby the butter fat and oil because of their mixture with water decompose and become rancid.

Cleanliness of all utensils is very important and live steam should be run through all pipes after each time they are used so that there is no possibility of any fats or grease adhering to the inside and becoming rancid, as it is carelessness of this kind that often causes a large amount of trouble in a butterine factory.

FORMULAS FOR MAKING BUTTERINE.

The following formulas show the amount of different ingredients used and cost of finished product at time tests were made. The first is a formula for high grade, then a formula for medium grade and lastly a formula for low grade butterine. The excess of yield over ingredients used shows amount of water absorbed.

FORMULA FOR AND COST OF HIGH GRADE BUTTERINE.

Materials and quantities	Cost per lb.	Total cost
525 pounds No. 1 oleo oil	$0.0875	$45.19
475 " " neutral lard	.08125	38.57
50 gallons 30 per cent. cream	.42	30.24
300 pounds creamery butter	.28	84.00
Labor and package	.01	15.00
Salt and color	.....	1.00
Total	.....	$214.00

This formula will yield 1,500 pounds of butterine, therefore cost per pound is $0.1426.

FORMULA FOR AND COST OF MEDIUM GRADE BUTTERINE.

Materials and quantities	Cost per lb.	Total cost
525 pounds No. 1 oleo oil	$0.0875	$45.19
475 " " neutral lard	.08125	30.57
40 gallons 30 per cent. cream	.42	40.32
Labor and package	.01	12.00
Salt and color	......	1.00
Total	......	$137.08

This formula will yield 1,200 pounds butterine, therefore the cost is $0.1142 per pound.

FORMULA FOR AND COST OF LOW GRADE BUTTERINE.

Materials and quantities	Cost	Total cost
350 pounds No. 2 oleo oil	$0.08 per lb.	$28.00
250 " cotton seed oil	.04 "	10.00
450 " neutral lard	.08125 "	36.54
60 gallons 3½ per cent. milk	.12 per gal.	7.20
Labor and package	......	12.00
Salt and color	......	1 00
Total	......	$94.74

This formula will yield 1,200 pounds butterine, therefore the cost to produce and pack for shipment will be $0.0789 per pound.

SHRINKAGE AND COST OF BUTTERINE.

The following table shows shrinkage and costs of different grades of butterine, these being compiled from actual tests. It shows the different quantities of water absorbed by the butterine at different temperatures and it is readily understood that the amount of water absorbed regulates the yield, although the more water that is absorbed the poorer the texture, so that, generally speaking, high yields are obtained by loss of texture and general character of the product. It will be seen at a glance that the higher the temperature of the water in the graining vat the greater the yield, and the lower the temperature of the water the less yield is obtained, although the texture of the product is improved.

The high grade shrinks considerably less than the low grade. This is explained in two ways. First there is very little loss of cream in the high grade, because one-third of the entire quantity of cream used is butter fat, or solid matter. While in the low grade only one-sixth of the milk used is solid matter, and as the emulsion goes into the graining vat the milk is lost in the water. Furthermore, cotton seed oil being absent from the high grade quality the mass retains more water, as cotton seed oil has little affinity for water at any temperature.

A less amount of salt was used in this particular test on the high grade on account of the presence of salt in creamery butter used in the formula. A careful perusal of the following table will prove interesting:

TEST SHOWING SHRINKAGE AND COST OF BUTTERINE.

Butterine	Temp. water Fahr.	Oleo oil lbs. wt.	Neutral oil lbs. wt.	Cotton seed oil lbs. wt.	Milk lbs. wt.	Cream lbs. wt.	Creamery butter lbs. wt.	Salt lbs. wt.	Color oz. wt.	Total lbs. wt.	Yield lbs. wt.	Shrinkage lbs. wt.	Shrinkage per cent.	Cost per 100 lbs.
Low grade.	38°	350	450	250	450	...	...	60	20	1560	1210	350	.2243	$7.82
Low grade.	45°	350	450	250	450	...	...	60	20	1560	1290	270	.1730	7.36
Medium high grade	40°	525	475	...	...	300	...	60	20	1360	1294	66	.0485	10.59
High grade	40°	525	475	...	...	225	300	50	20	1575	1497	78	.0495	14.29

Note the excessive shrinkage where weight of milk is taken into consideration with other ingredients used, the milk being lost in the chilling water and the flavor being retained. Where natural butter is used the shrinkage is much less.

The following will give an idea of the amount of machinery, also the different makes, necessary for a factory producing from 15,000 to 20,000 pounds of butterine daily and cost of same. To this amount should be added the cost of installation. This only includes actual machinery necessary. The cost of building, necessary coolers, etc., is not included:

COST OF EQUIPMENT FOR BUTTERINE FACTORY.

Four melting tanks, 4 feet diameter, 5 feet deep (galvanized lining, cone and syphon), at $125 each..$	500.00
One oval agitator, 2 x 4 feet (arms galvanized lined).	100.00
One 100-gallon milk vat (Boyd cream ripener)......	75.00
Two 300-gallon milk vats (Boyd cream ripener) at $150 each	300.00
One 100-gallon barrel churn	40.00
Two workers (National) at $75 each................	150.00
One graining vat 4 x 8 feet, 2½ feet deep, with paddle wheel	50.00
One storage water vat 6 x 10 feet, 6 feet deep, with brine connection	50.00
Eighteen graining trucks (box 4 x 5 x 1 foot), white pine, at $8 each................................	144.00
Three tray trucks at $10 each......................	30.00
One scale, tank and scale..........................	75.00
Solid and roll scales	25.00
Milk receiving tank	15.00
Tables, benches, moulds, trays, etc.................	150.00
Total cost	$1,704.00

PROCESS OR RENOVATED BUTTER.

This is a part of the butter business which has developed very rapidly in the past few years and consists in treating butter which was either handled improperly when made or that has been kept until it has become rancid or out of condition. These goods are generally bought up at an inferior price and taken to a factory where they are reworked and sold for a good grade of butter. The method of handling is as follows:

The butter to be treated is put in a tank ordinarily about 48 inches in diameter and 5 feet deep with a cone bottom. The cone should be about 2 feet deep. This tank fits inside of another tank leaving a 3-inch space for a water jacket between.

The stock to be handled is slowly melted at a temperature not exceeding 160° F. Ordinarily it takes about five hours to melt about 1,000 pounds. This degree of heat should not be exceeded, as a higher temperature imparts a bad flavor. When the stock is reduced to the liquid form about 600 of the 1,000 pounds should be syphoned off into a blower tank. This tank should

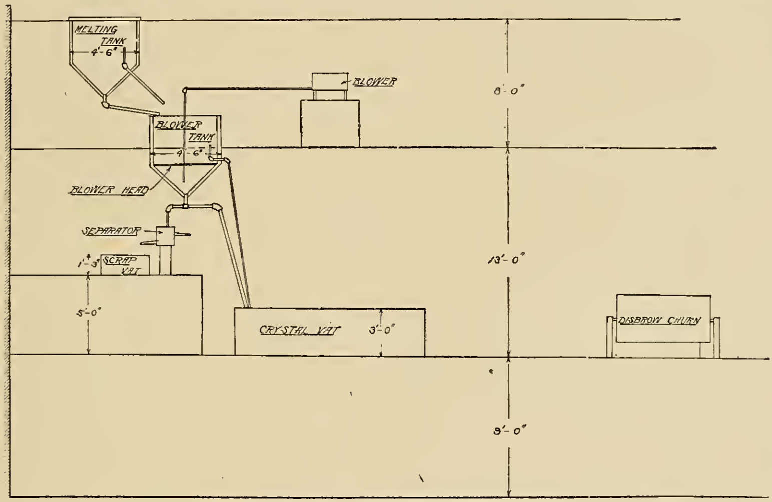


FIG. 157.—DIAGRAM OF BLOWER AND TANKS FOR PROCESS BUTTER FACTORY.

be practically the same size as the melter with a water jacket and cone, but provided at the bottom with a blower head.

The blower head is a block-tin plate having about the same circumference as the tank and fits in at the top of the cone. It is perforated with ⅛-inch holes and a 1½-inch hole in the center to permit a pipe of that size to pass through it from the blower above. Through this pipe air is forced at a pressure of about five pounds, the air being forced upward through the emulsion, thereby removing the odors and bad flavors and thoroughly aerating the product.

This 600 pounds of emulsion should be blown for five or six hours, the length of time depending largely upon the stock used, at a temperature not exceeding 120° or under 100° F. At this time the milk is added and should be about three-quarters of the quantity of the stock used,

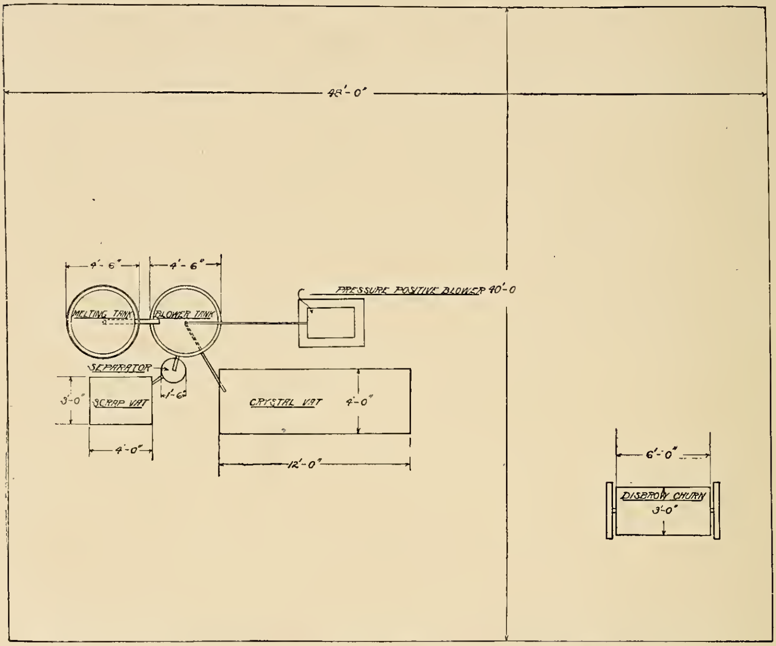


FIG. 158.—PLAN OF TANKS, ETC., FOR PROCESS BUTTER FACTORY.

or in a case of this kind, 450 pounds. The entire mass should be agitated about fifteen minutes at a temperature of about 150° F. after the milk is added. Color and salt are added at this time.

Both the tanks described here should be supplied with syphons; the first tank or melter should have the syphon about 6 inches from the bottom of the cone. The blower tank should have the syphon just above the cone.

Through the syphon in the melting tank the fats are drawn into the blower tank. The curds are allowed to remain in the bottom and are drawn off later by means of a 2-inch pipe. Through the syphon in the blower tank is drawn the finished product into the graining or crystallizing vat, the water being at a temperature of 40° F. The butter should be removed immediately from the crystallizing tank and allowed to stand long enough to thoroughly drain; then worked and packed in the usual manner.

After all the fat in the form of melted oil has been run through the lower tank the bottom valve should be opened and the curd run into a "Danish Weston" separator, which removes all the fat, and the curd is then thrown into a scrap vat, thereby avoiding the loss of any fat.

MILK AND CREAM FOR PROCESS BUTTER.

The milk and cream should be ripened as carefully as in making butterine or creamery butter, a "starter" being used under the same directions as given for butterine. Milk is usually good enough for the ordinary grades. However, when something fancy is desired, or the prices permit, cream may be used to good advantage in producing a superior article. In fact this butter can be made to be indistinguishable from creamery butter.

Process butter should be divided into two grades: No. 1 and No. 2. A careful selection of stock at hand would readily determine which stock is good enough for No. 1 grade and the balance should be used in No. 2. A great deal depends upon the butter maker's judgment of the condition of the goods before blowing and afterward, knowing when flavors are right, etc. The greatest difficulty encountered is in getting the flavor, as all the flavor comes from the milk and cream. The greatest care must be used in their preparation. Temperature in melting is also very important since a few degrees of heat too much will fix permanently any objectionable flavor.

EQUIPMENT FOR MAKING PROCESS BUTTER.

The equipment consists of two tanks, the outside one of heavy galvanized iron; the inside of No. 18 steel plate. The Danish Weston separator is considered adaptable to handling as heavy stock as is required. Wooden scoops or forks are used in lifting the crystals from the crystallizing vat, placing tubs, etc. The "Disbrow" churn is generally used in the working and washing of the product.

The machinery and apparatus necessary for a renovated butter factory of a capacity of 1,000 pounds daily, as well as the cost of same, are outlined in the following table. The cost does not include the installation of these machines:

COST OF EQUIPMENT FOR PROCESS BUTTER FACTORY.

One No. 1 blower	$ 75.00
One melting tank	75.00
One blower	75.00
One blower head	10.00
One settling tank	10.00
One crystallizing vat	25.00
One crystallizing scoop	5.00
Twenty tubs	35.00
One No. 4 Disbrow churn	150.00
One Danish-Weston separator	100.00
Steam and blower pipes	85.00
Total cost machinery for 1,000 lbs. daily capacity	$ 645.00
Cost of machinery for 2,000 pounds daily capacity	$1,500.00
Cost of machinery for 3,000 pounds daily capacity	2,000.00
Cost of machinery for 5,000 pounds daily capacity	2,500.00

CHAPTER XXI.

MINOR PRODUCTS.

BEEF EXTRACT.

Beef extract is a product for which there is a very general demand and large quantities are made in packing centers, especially where canning of meats is done. In the cooking and handling of meats, juices or animal salts are dissolved to a considerable extent in the water in which the meat is placed, and by evaporating this water the beef extract is obtained. It is considered a very nutritious article and recommended by many physicians for convalescing patients.

METHOD OF MAKING BEEF EXTRACT FROM CANNING LIQUORS.

Corn beef liquor should be boiled first with steam in an open vat. In boiling this, the albumen which has been dissolved from the meat and is held in suspension in the liquor is coagulated and rises to the surface. This should not be skimmed off but should be used as the filtrant when the liquor is pumped through to filter press. After this liquor has been boiled for five hours it should be allowed to settle for about half an hour. The albumen which rises to the surface should be stirred through the water and the liquid then pumped to the evaporators and reduced to about 30 degrees Baumé. When in this condition it should be again boiled in an open vat, adding clear water to the amount of about one-quarter of the original quantity of the liquor. The liquid is then again filtered and twelve pounds of sugar per 100 pounds of extract is added. It is again reduced in a vacuum pan and boiled down to a solid in an open kettle. The chloride of sodium or salt is taken out of the corned beef extract during the process of cooking. It drops to the bottom of the evaporator and should be scraped off after the liquor has been taken out.

EXTRACT FROM BEEF HEARTS.

Where a large sausage business is done and a considerable amount of beef hearts is used, it is very profitable to save the beef extract from these hearts, using the meat afterward in sausage. The method is as follows:

The hearts should be first ground through an Enterprise grinder with an 1/8-inch plate. The meat is put into soaking vats and covered with cold water, allowing same to stand from sixteen to twenty-four hours, changing the water three times. All the liquors drawn off the meat are pumped into cooking vats. Cook with open steam until the water comes to a boil; steam from twenty minutes to half an hour. At this time agitate it thoroughly, fully mixing in the coagulated albumen as this serves as the filtrant when being put through the filter press.

Next, run the liquor through the filter press, evaporate in vacuum pans, and draw off and put in the finishing kettles, evaporating the contents to a solid. It should then be put in pails or kegs and allowed to stand for two weeks or more to allow the extract to work or "age." It should then be dissolved in about one-quarter the original amount of water to which is added six ounces of boracic acid, nine pounds of salt and twelve pounds of granulated sugar per 100 pounds of extract. After it is thoroughly mixed, again filter and evaporate to a solid.

It is then ready to be put up in the packages in which it is to be offered for sale.

ROAST BEEF COOK WATER AND ROAST BEEF SOAK WATER.

The water in which the beef has been cooked or soaked is boiled, filtered and handled the same as beef heart liquor. Beef hearts make the best extract, the canning liquors making a less desirable article, but the different grades can be mixed according to the demands of the market and production of material.

FORMULA FOR BEEF FLUID.

Beef fluid is made as follows:

60 pounds No. 1 extract,
40 pounds of water,
6 ounces of boracic acid,
1 pound glycerine.

Beef hearts will yield 2.41 per cent of extract; corn beef water will yield 1.65 per cent extract; roast beef cook water, 1.55 per cent extract; and roast beef soak water, 1.30 per cent extract.

MACHINERY USED IN MAKING BEEF FLUID.

The following list of machinery is used in one of the largest canning plants in the United States where the liquors are all saved for beef extract. Deductions from this can be made for the volume of business desired.

Double effect evaporators for fresh liquor.
Single effect evaporators for corned beef liquor.
One duplex vacuum pump for evaporators.
Two thirty-gallon "Wm. Dopp" extract finishing kettles.
One single vacuum pump for finishing kettles, size 8 x 10 x 12 inches.
One agitator 24 x 36 inches, with three paddles.
Six cooking vats, capacity 800 gallons each.
Two receiving vats, capacity 600 gallons each.
One soaking vat with three partitions, capacity 1,400 gallons, with heavy wire screen 12 inches from bottom.
One rotary pump for use between soaking and cooking vats.
One Enterprise grinder.
One 36-plate filter press.
One duplex pump for filter press.
Ten fifty-gallon galvanized iron seeding tanks.
One capping machine for jars.
One capping machine for bottles.

The room required for installation of above machinery and the proper handling of materials is about as follows:

Cold storage for soaking vats, 25 x 25 feet.
Cooking vats and filter press, about 35 x 20 feet.
Evaporators, finishing kettles and receiving vats, about 50 x 40 feet.
Label, packing and storage room, 30 x 25 feet.

If evaporating room is high enough, cooking vats and filter press might be placed on platform to save room.

PIGS FEET.

Pigs feet are one of the by-products which by proper handling are converted into a very palatable diet. In preparing them, generally speaking, only the forward foot is used, as it is a better shaped foot to prepare than the hind foot and, besides, the hind feet are more or less disfigured and out of condition by having the gam strings opened in order to hang the hog on the gam sticks. So that in general practice only the forward foot is used for edible purposes, the hind foot being used largely for making a low grade of glue. The method of preparing pigs feet is as follows:

The feet are first scalded, after which the hoofs are removed and the feet are shaved and cleaned. After this process they should be put into a plain salt pickle, 90-degree strong by salometer test, and to this pickle should be added six ounces of saltpetre to each 100 pounds of feet. The feet should be left in this curing pickle for from six to eight days, or until they show a bright red appearance when cooked. If this red appearance does not extend clear through the feet after being cooked, it shows that they are not fully cured. They should not be left in the pickle longer than necessary to fully cure them for when they are too heavily salted before cooking it has the effect of making them break up in the cooking water.

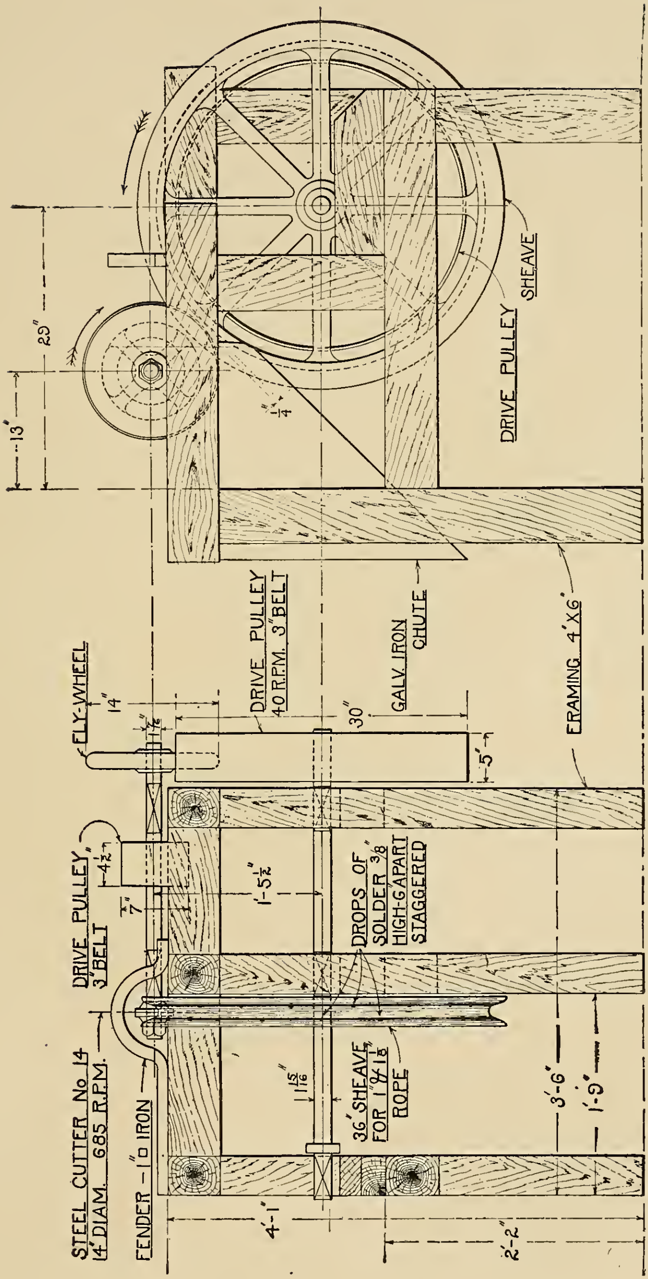


FIG. 159.—DETAILS OF PIGS FEET SPLITTING MACHINE.

After the feet are properly cured in the salt pickle they should be cooked in a wooden vat (an iron vat discoloring them) which is provided with a false bottom about 6 inches above the bottom, so that the direct heat from the steam pipe does not come in contact with the feet. The water should be brought to a temperature of 200° to 206° F. and held at this temperature until the feet are sufficiently cooked. The water should never be brought to the boiling point, as the feet will become badly broken, which greatly injures their appearance. After they are cooked they should be split through the center, a machine for this purpose being illustrated in Fig. 159. It was formerly the practice to split the feet by hand with a knife (Fig. 160). In doing it in this manner, however,

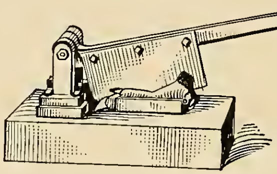


FIG. 160.—HAND PIGS FOOT SPLITTER.

the knee joint was invariably lost as it was impossible to split it. By means of the splitting device shown in Fig. 159 the last knuckle is readily split, and consequently the yield of finished pigs feet is greatly increased.

After the feet are sufficiently cooked and thoroughly chilled in cold water, they should be put into a white wine vinegar pickle 45-degree strong, it being preferable to pack feet which are to be used at once in open vats in a refrigerated room held at a temperature of 38° to 40° F. Where feet are to be held for some months before using it is advisable to put them into barrels or tierces after filling the tierces with vinegar of 45-degree strength. The packages should be stored in a temperature 45° to 50° F.

When held this way it will be found that the feet have absorbed a great deal of the vinegar and a very marked increase in weight is obtained. There should be a gain of from 10 to 15 per cent in weight at the end of three months.

The following tests show costs, in detail, of pigs feet put up in different sized packages, costs being figured at the regular Chicago market prices at the time these tests were made:

TEST ON 483 PIECES OR 500 POUNDS PIGS FORE FEET.

Debit:	
Cost of 500 pounds pigs fore feet at 1⅛c per pound..	$ 5.63
Shaving, hand and machine, 32c per 100 pieces........	1.55
Pulling toes, 5c per 100 pieces........	.24
Counting, pickling and cooking........	.20
Splitting, 2c per 100 pounds........	.10
Miscellaneous labor	.10
Fifty-five pounds salt at ¼c per pound........	.14
Two pounds saltpetre at 5c per pound........	.10
Administrative expense at 47c per 100 pounds on 300 pounds produced	1.41
Total	$ 9.47
Credit:	
Pigs feet oil, 18 pounds at $5.60 per cwt........	$ 1.00
Pigs feet bones, 58 pounds at ¾c per pound........	.43
Pigs feet trimmings, 13 pounds at 1¼c per pound....	.13
Total	$ 1.56
Total net cost of 300 pounds of prepared feet........	$ 7.91

Cost per pound, including administrative expense, $0.026.

Green weight, 500 pounds; cleaned weight, 450 pounds; split weight, 300 pounds.

COST OF FIVE BARRELS PIGS FORE FEET PACKED AT 190 POUNDS NET PER BARREL.

950 pounds pigs feet at 2.6c per pound........	$24.70
Five barrels at 77½c each........	3.88
Packing, one and one-third hours at 17½c per hour.....	.23
Pickle, sixty gallons at 2½c per gallon........	1.50
Coopering, one-half hour at 25c per hour........	.13
Spices, 2c each	.10
Miscellaneous labor	.09
Total	$30.63

Cost of one barrel, $6.13.

COST OF FIVE HALF-BARRELS PIGS FORE FEET PACKED AT SEVENTY-THREE POUNDS NET PER HALF-BARREL.

365 pounds pigs feet at 2.6c per pound	$ 9.49
Five half-barrels at 35c each	1.75
Packing, one-half hour at 17½c per hour	.09
Pickle, twenty-five gallons at 2½c per gallon	.62
Coopering, one-quarter hour at 25c per hour	.06
Spices, 2c each	.10
Miscellaneous labor	.04
Total	$12.15

Cost of one half-barrel, $2.43.

COST OF FIVE QUARTER-BARRELS PIGS FORE FEET PACKED AT THIRTY-SIX POUNDS NET PER QUARTER-BARREL.

180 pounds pigs feet at 2.6c per pound	$ 4.68
Five quarter-barrels at 20c each	1.00
Pickle, ten gallons at 2½c per gallon	.25
Coopering, eight minutes at 25c per hour	.04
Labor, packing	.03
Spices, 2c each	.10
Miscellaneous labor	.04
Total	$ 6.14

Cost of quarter-barrel, $1.23.

COST OF FIVE EIGHTH-BARRELS PIGS FORE FEET PACKED AT EIGHTEEN POUNDS NET PER EIGHTH-BARREL.

90 pounds feet at 2.6c per pound	$ 2.34
Five eighth-barrels at 18c each	.90
Packing, one-sixth hour at 17½c per hour	.03
Pickle, seven and one-half gallons at 2½c per gallon	.19
Spices, 2c each	.10
Coopering, seven minutes at 25c per hour	.03
Miscellaneous labor	.04
Total	$ 3.63

Cost of one eighth-barrel, $0.73.

COST OF FIVE KITS PIGS FORE FEET PACKED AT FOURTEEN POUNDS NET PER KIT.

Seventy pounds pigs feet at 2.6c per pound	$ 1.82
Five kits at 14c each	.70
Packing, one-sixth hour at 17½c per hour	.03
Pickle, five gallons at 2½c per gallon	.13
Spices at 2c each	.10
Coopering, seven minutes at 25c per hour	.03
Miscellaneous labor	.04
Total	$ 2.85

Cost per kit, $0.57.

Prepared pigs feet at certain seasons of the year are a drug on the market and there are times when it is found to pay better to tank them or use them for glue purposes. The following tests on rough uncleaned fore and hind feet will show the yield when tanked. Percentages in tests are correct. The prices are those ruling at the time tests were made:

TEST ON TANKED PIGS FEET.

Total weight of front feet tanked 1,070 pounds cooked in tank five hours at forty pounds pressure:

Sixty pounds hock meat, 5.61 per cent, at 3c per pound...	$ 1.80
Prime steam lard, 138 pounds, 12.90 per cent, at $9.35 per cwt.	12.90
Tankage (dry basis), 125 pounds, 11.68 per cent, at $17.50 per ton	1.09
Total	$15.79

Gross value, $1.47 per cwt.

Weight hind feet to tank, 996 pounds, cooked in test tank five hours, with forty pounds pressure:

Prime steam lard, 163 pounds, 16.37 per cent, at $9.35 per cwt.	$15.24
Tankage (dry basis), 13.76 per cent, at $17.50 per ton....	1.19
Total	$16.43

Gross value, $1.62 per cwt.

PIG TONGUES.

Various uses are made of this piece of meat. They are very extensively used in canning factories where they are put up and known as "lunch tongue"; they are also used in different kinds of sausage, and are put up to quite an extent in vinegar pickle. When handled in the latter manner the following suggestions will be found of practical value.

The tongues after being trimmed should be cured in a 75-degree plain salt pickle using three ounces of saltpetre to 100 pounds of tongue. After the tongues are fully cured, which will require from eight to twelve days, they are scalded, the outer surface of the tongue being scraped off. In some instances the scalding is done before the tongues are put in the pickle. Either way is proper. After being scraped and cleaned they are cooked as desired and afterward pickled in a white wine vinegar pickle of 45-degree strength. The following tests will show the cost of tongues packed in different sized packages, the cost being determined by the cost of meat and supplies at the time tests were made:

TEST ON 1,000 PIECES, OR 910 POUNDS PIG TONGUES.

Debit:	
910 pounds pig tongues at 6¼c per pound	$56.88
Scraping, at 15c per 100 pieces	1.50
Counting, cooking, etc., three hours at 18c per hour	.54
Trimming at 5c per 100 pieces	.50
Miscellaneous labor	.20
Administrative expense, 47c per 100 on 560 pounds produced	2.63
Total	$62.25
Credit:	
Green weight, 910 pounds; cooked weight, 560 pounds; shrinkage, 38 per cent.	
Trimming 112 pounds at 1½c	1.68
Net cost	$60.57

Cost per pound, 10 4/5c; cost handling per cwt., including administrative expense, $0.665 per 100 pounds finished.

COST OF ONE BARREL PIG TONGUES PACKED AT 190 POUNDS NET.

190 pounds pig tongues at 10 4/5c per pound	$20.52
One barrel	.78
Packing, one-half hour at 17½c per hour	.09
Pickle, ten gallons at 2½c per gallon	.25
Coopering, one-sixth hour at 25c per hour	.04
Spices, 2c	.02
Miscellaneous labor	.03
Total cost per barrel	$21.73

COST OF TWO ONE-HALF BARRELS PIG TONGUES PACKED SEVENTY-THREE POUNDS NET PER ONE-HALF BARREL.

146 pounds pig tongues at 10 4/5c per pound	$15.76
Two one-half barrels at 35c each	.70
Packing, twenty-five minutes at 17½c per hour	.08
Ten gallons pickle at 2½c per gallon	.25
Spices, 2c each	.04
Coopering, one-twelfth hour at 25c per hour	.02
Miscellaneous labor	.02
Total	$16.87

Cost per half-barrel, $8.44.

COST OF THREE ONE-FOURTH BARRELS PIG TONGUES PACKED AT THIRTY-SIX POUNDS NET.

108 pounds pig tongues at 10 4/5c per pound	$11.66
Three one-fourth barrels at 20c each	.60
Packing, twenty-two minutes at 17½c per hour	.06
Pickle, seven and one-half gallons at 2½c per gallon	.19
Spices, 2c each	.06
Coopering, one-sixth hour at 25c per hour	.04
Miscellaneous labor	.01
Total	$12.62

Cost per one-fourth barrel, $4.20.

COST OF FIVE ONE-EIGHTH BARRELS PIG TONGUES PACKED EIGHTEEN POUNDS NET.

Ninety pounds pig tongues at 10 4/5c per pound	$ 9.72
Five one-eighth barrels at 18c each	.90
Packing, one-half hour at 17½c per hour	.09
Pickle, seven and one-half gallons at 2½c per gallon	.19
Spices at 2c each	.10
Coopering, one-sixth hour at 25c per hour	.04
Miscellaneous labor	.03
Total	$11.07

Cost of one one-eighth barrel, $2.21.

COST OF FIFTEEN KITS PIG TONGUES PACKED AT FOURTEEN POUNDS NET.

210 pounds pig tongues at 10 4/5c per pound	$22.68
Fifteen kits at 14c each	2.10
Packing, three-fourths hour at 17½c per hour	.13
Pickle, fifteen gallons at 2½c per gallon	.38
Spices at 2c each	.30
Coopering, one-third hour at 25c per hour	.08
Miscellaneous labor	.09
Total	$25.76

Cost of one kit, $1.72.

FORMULA FOR EXPORT PIG TONGUE PICKLE.

There is at times quite a demand for fresh pig tongues in Liverpool and other foreign points, in which case the trade demands that they arrive there without being salt-cured. The following formula will be found very valuable for this purpose and also point out how to carry tongues without salting them, when it is desired to do so: Use 116 pounds of boracic acid, fifty-eight pounds of borax, twenty-nine pounds of fine salt and seven and one-quarter pounds of saltpetre.

The method of mixing is as follows: The boracic acid and borax is put into a vat containing sixty gallons of water. The vat should be connected with steam supply so that it can be brought to the boiling point, cooking same slowly and stirring it well for half an hour. The salt and saltpetre is then added and should be stirred until thoroughly dissolved. After the solution has been allowed to cool, add sufficient cold water to give it a strength of 21 degrees by salometer test. Chill the solution to a temperature of 38° F. The tongues should be trimmed and thoroughly chilled, it being essential that they are in perfect condition. They should then be packed in a tierce, after which the tierce is filled with the preservative. Tongues should be shipped in refrigerator cars where the temperature is not allowed to go above 38° F.

PIG SNOUTS.

These consist of the snout of the hog together with the upper lips and front part of the nose. During preparation they are handled very much in the same manner as pigs feet. They are first shaved and cleaned, afterward scalded, removing the outer skin or membrane of the nose. Then they are cured, using a 90-degree plain salt pickle and adding thereto three ounces of saltpetre to 100 pounds of snouts. After they are fully cured, which will require from five to eight days, they should be cooked in a wooden vat to the desired degree of tenderness, after which they are chilled in cold water and pickled in white wine vinegar of 45-degree strength. The following tests show the cost of preparing pig snouts in different sized packages.

TEST ON 1,060 PIECES, OR 1,000 POUNDS PIG SNOUTS.

Debit:

Cost of 1,000 pounds pig snouts at 2½c per pound	$25.00
Shaving at 40c per 100 pieces	4.24
Labor, trucking, cooking, inspecting, pickling, etc.	1.10
100 pounds salt at ¼c per pound	.25
Two pounds saltpetre at 5c per pound	.10
Administrative expenses, 47c per 100 pounds on 610 pounds production	2.87
Total	$33.56

Credit:

Trimmings, 90 pounds at 2c per pound	1.80
Net cost	$31.76

Cost per pound, 5 1/5c; cost of handling, administrative expense, 85 6/10c per cwt.

Green weight, 1,000 pounds; cleaned weight, 900 pounds; cooked weight, 610 pounds.

COST OF FIVE ONE-HALF BARRELS PIG SNOUTS PACKED AT SEVENTY-THREE POUNDS NET PER ONE-HALF BARREL.

365 pounds pig snouts at 5 1/5c per pound	$18.98
Five half barrels at 35c each	1.75
Packing, one-half hour at 17½c per hour	.09
Pickle, twenty-five gallons at 2½c per gallon	.62
Spices at 2c each	.10
Coopering, one-fourth hour at 25c per hour	.07
Miscellaneous labor	.04
Total	$21.65

Cost per one-half barrel, $4.33.

COST OF TEN ONE-FOURTH BARRELS PIG SNOUTS PACKED AT THIRTY-SIX POUNDS NET PER ONE-FOURTH BARREL.

360 pounds pig snouts at 5 1/5c per pound	$18.72
Ten one-fourth barrels at 20c each	2.00
Packing, one hour at 17½c per hour	.17
Pickle twenty gallons at 2½c per gallon	.50
Spices, 2c each	.20
Coopering, one-third hour at 25c per hour	.08
Miscellaneous labor	.09
Total	$21.76

Cost per one-fourth barrel, $2.18.

COST OF FIVE ONE-EIGHTH BARRELS PIG SNOUTS PACKED AT EIGHTEEN POUNDS NET.

Ninety pounds pig snouts at 5 1/5c per pound	$ 4.68
Five one-eighth barrels at 18c each	.90
Packing, one-third hour at 17½c per hour	.06
Spices, 2c each	.10
Coopering, one-fourth hour at 25c per hour	.06
Miscellaneous labor	.04
Pickle, seven and one-half gallons at 2½c per gallon	.19
Total	$ 6.03

Cost per one-eighth barrel, $1.21.

COST OF FIVE KITS OF PIG SNOUTS PACKED AT FOURTEEN POUNDS NET.

Seventy pounds pig snouts at 5 1/5c per pound	$ 3.64
Five kits at 14c each	.70
Packing, one-fourth hour at 17½c per hour	.04
Pickle, five gallons at 2½c per gallon	.13
Spices, 2c each	.10
Coopering	.03
Miscellaneous labor	.03
Total	$ 4.67

Cost per kit, $0.93.

TEST ON PIG SNOUTS IN TANK.

475 pounds pig snouts, cooked three hours at forty pounds pressure:

Prime steam lard, 120 pounds, or 44 per cent at $0.1065 per pound	$12.89
Tankage, forty-four pounds, or .09 per cent, at $19.00 per ton	.42
Total	$13.31

Value per cwt., green, $2.75.

HOG HAIR AND BRISTLES.

The introduction of the Poland China and Berkshire strains of blood has practically done away with the bristle business in this country, as these breeds of hogs have very few bristles on them and the hair is very much shorter than on the hogs not so finely bred, and in many of the large packing centers the saving of bristles has been abandoned as it was found they could not save them in competition with foreign markets. The Russians and Chinese furnish a large percentage of the markets of the world with bristles and at this time the best bristles are obtained from these two nations. Their hogs seem to be more on the wild boar order and are more heavily covered with hair, which makes very much better bristles than any that are obtained in this country. The bristles are used largely for brush work—all kinds of paint brushes, clothes brushes, etc.

The usual method of fitting hogs hair for the market is either to sun-dry it, curing the hair outdoors, or cooking it in large vats and drying it mechanically. As the hair is scraped from the hog there is a great deal of scurf or outer skin of the hog left on the hair. This must be removed in order to make the hair merchantable. The method usually practiced is to spread the hair out on the ground as produced and when the hot weather approaches, the hair is raked and turned daily. The scurf dries from the heat of the sun and, because of the constant handling, falls off the hair. When the scurf is thus removed the hair is raked up and baled and is then ready for sale to mattress manufacturers, etc. It takes from two to three months for the hair to become cured in the sun-drying process.

A method that is used in some of the larger packing centers is to cook the hair in large vats, when the scurf will fall off from the hair and settle to the bottom of the vat. The hair is then removed from the vats and run through large wringers and dried in dry rooms artificially heated. While this is a very much quicker way of handling than sun-drying in the field it is also more expensive.

CHAPTER XXII.

FERTILIZER AND BLOOD ALBUMEN.

COMPOSITION OF FERTILIZER.

This is a by-product which was entirely lost before the advent of the modern packing house, and it becomes valuable only when handled in large quantities as it is possible to do where there is a concentration of slaughtering. A small packer killing only a few cattle could not afford to save the material required for this product, as in a small way the cost of production would be more than the value of the finished product, but where it is produced on a large scale it forms a department of considerable commercial value. The product from the packing house is only a part of the finished fertilizer. A complete fertilizer consists of food for plant life, and generally speaking there are three primary elements necessary to make a complete fertilizer, as follows:

1. Ammonia or nitrogen.
2. Phosphate of bone, containing about 50 per cent free phosphoric acid.
3. Sulphate or muriate of potash, sulphate being the best.

These ingredients mixed with pure sand and water will stimulate the growth of vegetation and as the sand has not the elements that will sustain plant life the test shows conclusively that the added fertilizer supplies the necessary food. To get the best results it is essential to know the requirements of the land and the crops to be grown. A rich land has all the elements to a greater or lesser degree, while a poor land lacks some or nearly all, and some land will have all the elements but one.

The use of any of the three primary elements on land will enrich it, for water, atmosphere and sunshine assist in supplying the other elements, and for this reason a land continually worked while the crop is growing gives better results. It has been demonstrated that some crops require richer soil than others, for example potatoes, onions and root crops need a richer solution, as they exhaust the strength of the land rapidly, while grain and especially clover do not. Clover and some other plants draw nitrogen from the air in excess of their needs and thus actually fertilize the earth in which they grow. Again some plants require proportionately more of one of the elements; for instance, tobacco and oranges need an excess of potash, while grain needs the phosphates, and cotton the ammonia. One way to determine what a plant requires is to burn it and analyze the ash, which will give the proportion of elements.

While there is no fixed rule to go by in the use of fertilizers, as the many different soils, climates, mixtures of fertilizers, etc., make conditions which must be judged by themselves, yet few soils are so rich but that the addition of a fertilizer proves a benefit, increasing the yield with the same labor.

The principal articles made in a packing house that are afterwards used in producing finished fertilizers are as follows:

First, blood and concentrated tankage, which are used as ammoniates.

Second, ordinary tankage, being the residue from cooking and pressing the finished products.

Third, bone meal or ground steam bone, comprising the bone phosphates.

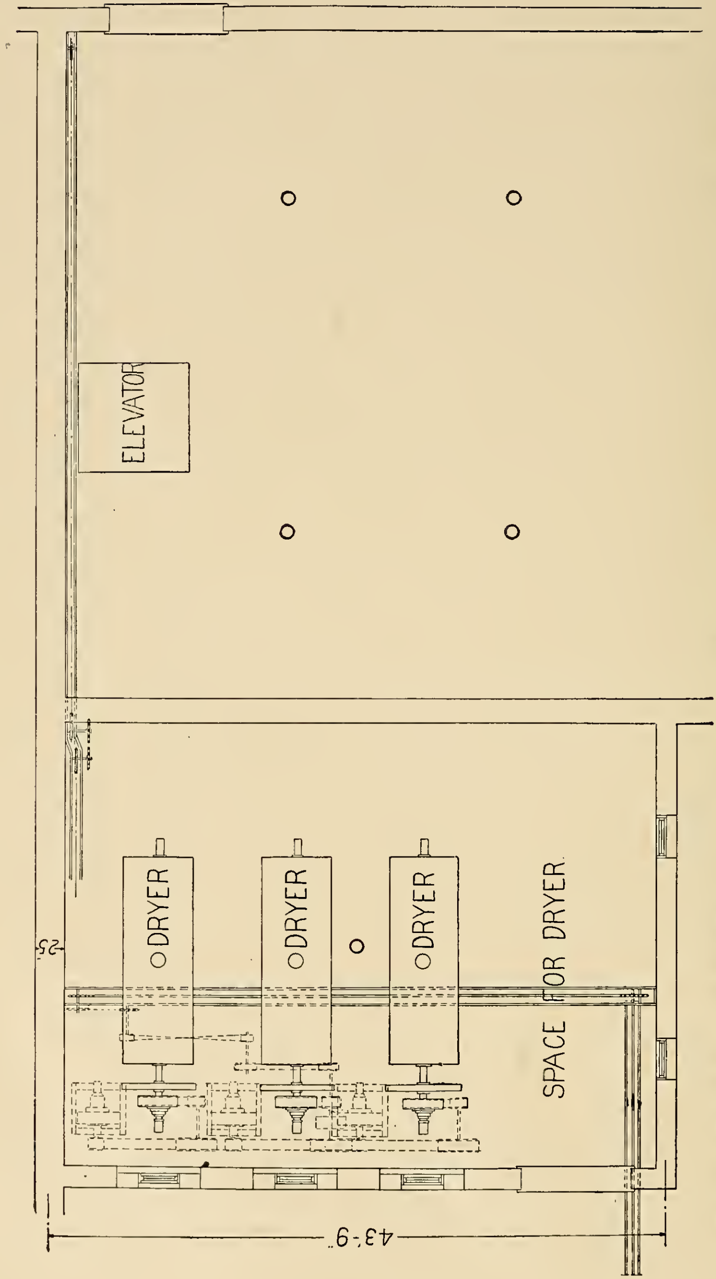


FIG. 161.—FLOOR PLAN OF FERTILIZER ROOM SHOWING LOCATION OF DRIERS AND CONVEYORS FOR HANDLING MATERIAL.

To these are also added muriate or sulphate of potash. The above constitutes the basis of manufactured fertilizers. Guano and fish from canneries are other ammoniate producers. Shells and phosphate rock found in the United States, largely in the southern part, also make phosphates, the latter product being used very extensively in the manufacture of fertilizer. It is only within a comparatively few years that this product was discovered and rock is found in the southern states today which analyzes as high as 64 per cent pure bone phosphate, the phosphate in the condition found being insoluble; it has to be treated with sulphuric acid which makes the bone phosphate in this rock soluble, so that the plant can absorb it. It is generally treated in the proportion of sixty pounds of acid to 100 pounds of rock, the mixture being allowed to stand for five or six months to allow the acid to thoroughly disintegrate it.

While bone meal and steam bone are slowly soluble to the plant without acid, with the use of acid they become quickly soluble, so that the plant would exhaust the strength of the mixture in one season. The ordinary bone meal lasts about three seasons in soil.

The market fertilizers contain, according to requirements for different plants for which they are used, from 2 to 8 per cent of ammonia, from 6 to 10 per cent of bone phosphate and from 4 to 10 per cent potash, the balance being a filler, so that when a market product is mixed, about these percentages of plant food are used, with enough cheap ingredients, such as ashes or dirt, to make the required weight and bulk.

TANKAGE FOR FERTILIZER.

As fast as the tankage comes from the press, the treatment of which was described under the head of "Tank

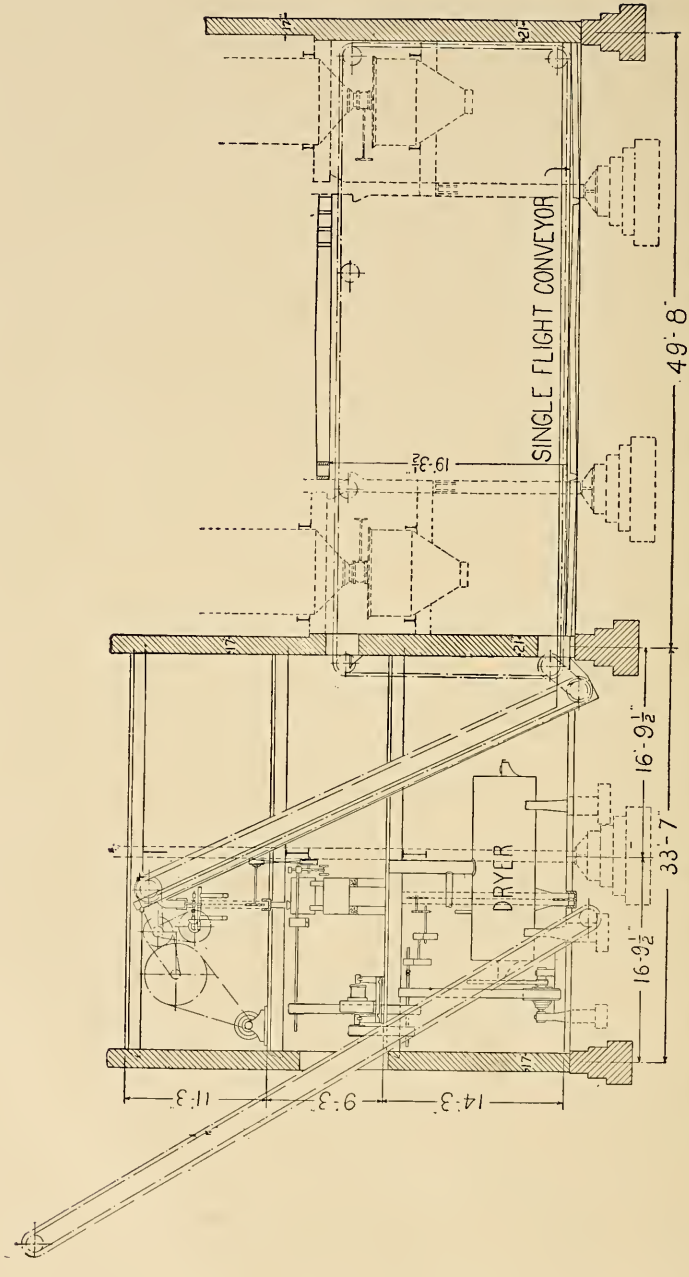


FIG. 162.—LONGITUDINAL SECTION FERTILIZER DRIER, SHOWING CONVENIENT LOCATION OF CONVEYORS.

House," it is ready for the fertilizer department, where it is put into the form of a field fertilizer, which is done by putting it through a dryer and evaporating the moisture. Diagrams of plan of fertilizer room, located convenient to tank house, showing also location of conveyors for handling material to dryers and section of conveying

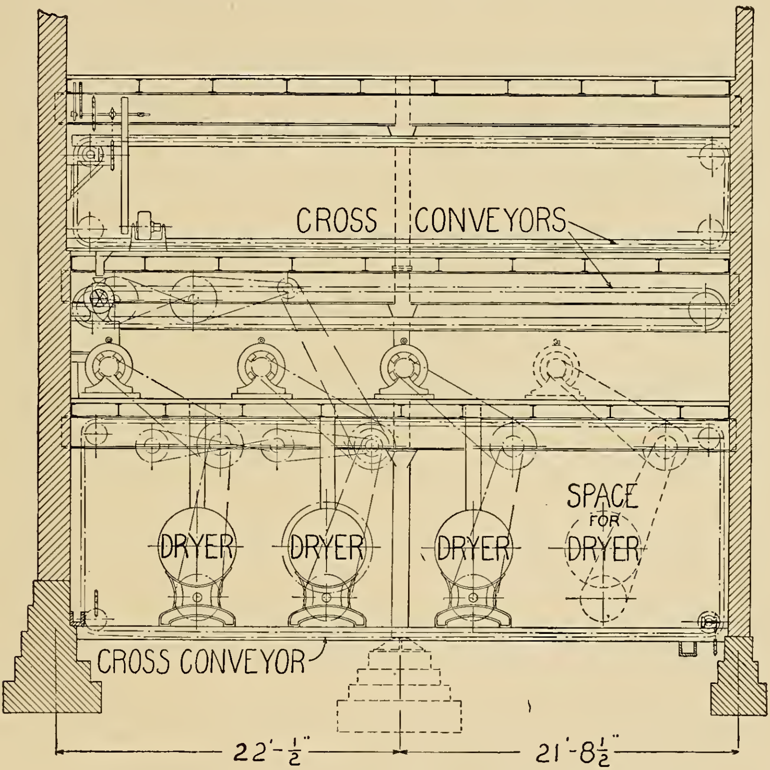


FIG. 163.—CROSS SECTION THROUGH FERTILIZER ROOM.

and drying apparatus are shown in Figs. 161, 162 and 163. Tankage coming from the press is from 50 to 60 per cent moisture. The device for extracting this moisture most commonly used is a steam dryer with an agitator in the bottom. The tankage should first go through a picker, or some device for breaking up the cakes as it comes from the press, after which it is ready for the dryer. After being dried it is ready for the market and is either sold as ground or unground tankage. When ground it is put through a disintegrator with a system of screens, etc., which thoroughly break up all the particles, reducing it to the proper degree of fineness.

The largest proportion of the packing house fertilizer business is with the "mixers," or the people who manufacture the finished fertilizer for the consumer. They buy the raw material and mix it, selling it to the trade direct, although some of the large packing houses today are in the "finished" fertilizer business. Nearly all the fertilizer product produced by packing houses is sold on a basis of so much per unit of ammonia and so much per unit of bone phosphate. The price of a ton of blood for instance that will analyze 17 per cent, if the price per unit was $2.00, would be $2 x 17 or $34.00 per ton. Packing house fertilizer should analyze about as follows:

ANALYSIS OF FERTILIZER.

Blood, 16 per cent to 17 per cent ammonia, 10 per cent moisture.

Concentrated tankage, 15 per cent to 16 per cent ammonia, 2 per cent to 3 per cent moisture.

No. 1 tankage, 9 to 10 per cent ammonia, 10 to 14 per cent bone phosphate, 12 to 15 per cent grease, 10 per cent moisture.

No. 2 tankage, which is made largely from bones, as will be noted by the percentage of bone phosphate, is better kept separate, as it is a disadvantage to have a No. 1 tankage that runs extremely high in bone phosphate. It analyzes as follows: 4 to 8 per cent ammonia, 25 to 40 per cent bone phosphate, 7 to 10 per cent grease, 10 per cent moisture.

Raw bone meal, 3 to 5 per cent ammonia, 55 per cent bone phosphate.

Hoof Meal: It is oftentimes found advantageous to grind cattle hoofs, selling them on their ammonia basis. When they are thus handled they will average from 12 to 13 per cent of ammonia.

Average weight of dry blood per bullock, about eight pounds.

Average weight of dry tankage per bullock, about ten pounds.

METHOD OF TREATING BLOOD FOR FERTILIZER.

In the handling of this product all foreign matter should be kept from it, such as water, manure, refuse, etc. If water is allowed to get into the blood it must be taken out when the blood is cooked, and then it carries away with it a large amount of ammonia, consequently in order to get the best results the blood should be kept free from all foreign substances. As fast as the animals are bled the blood should be run into large vats or receptacles where it can be held until a sufficient amount is obtained for cooking. It should then be pumped or drawn into the cooking tank. Any ordinary tank or vat may be used for this purpose. After the blood is in the receptacle live steam is turned on and the material allowed to cook until it is thoroughly heated. As soon as the steam begins to show through the blood fully it is cooked, the object in cooking being simply to congeal or thoroughly coagulate. Over-cooked blood is very hard to press and dry, causing waste of ammonia.

The blood after being cooked should be drawn into a vat, allowing all the water to drain off. It is then put into a hydraulic press, the cakes being built very thick—from 8 to 10 inches. These are then pressed lightly, thereby extracting all the moisture possible without compressing them too hard. If blood is pressed too hard it is difficult to dry, as it will come through the dryer in small globular balls, which if broken open and examined will be found to contain considerable moisture, but if pressed in large cakes, and lightly, the blood readily granulates. After the blood is dried it is ready for market. It is then known as "unground blood." If purchasers wish it ground it is simply put through the mill and screen and furnished as desired. The following test shows the value and yield of blood from different animals:

VALUE AND YIELD FROM BEEF BLOOD FOR FERTILIZER.

Yield from 100 head cattle ....av. lbs. per head 1,063

Weight raw blood, lbs.........3,250	av. lbs. per head	32.50
Weight cooked pressed blood, 1,718	av. lbs. per head	17.18
Weight dried blood, lbs....... 747	av. lbs. per head	7.47

The value of seven and one-half pounds of blood per head, based on 17 per cent ammonia at $2.00 per unit of ammonia worth $34.00 per ton is as follows:

7½ pounds blood	$0.1275
Less expense for handling	0.0261
Net value per head	$0.1014

VALUE AND YIELD HOG BLOOD FOR FERTILIZER.

6,710 pounds raw blood from 950 hogs; live weight, 211,850; average weight, 223 pounds.

950 hogs yield 6,710 pounds raw blood.

6,710 pounds raw blood yields 1,243 pounds commercial blood, 18.52 per cent.

1,243 pounds commercial blood, 17.47 per cent ammonia, at $2.00 per unit	$21.65
Labor and general expenses	3.34
Net value	$18.31

Basis, ton raw wt.:		Basis, 100 hogs:		Yield lbs. blood to 100 lbs. live wt.:	
Yield	$6.45	Yield, 130.8 lbs. com. blood	$2.279	Green	3.17
Expense	.99	Expenses	.351	Commercial	.59
Net value	$5.46	Net value	$1.928		

VALUE AND YIELD SHEEP BLOOD FOR FERTILIZER.

886 pounds raw blood from 2,150 sheep; live weight, 19,708 pounds; average weight, 92 pounds.

Yield: Commercial blood, 23.41 per cent, 207.5 pounds at $34.24 per ton.... Yield: Ammonia, 17.12 per cent, $2.00 per unit.	$3.552
Labor and general expenses	.558
Total net value	$2.994

Basis, one ton, raw wt.:		Basis, 100 sheep:	
Yield	$8.018	Yield, 96.51 lbs. com. blood	$1.652
Expense	1.259	Expenses	.259
Net value	$6.759	Net value	$1.393

Yield blood, 100 pounds live weight:

Green blood	4.49 pounds
Commercial blood	1.05 pounds

PRODUCTION OF ALBUMEN FROM BEEF BLOOD.

This is a product, which at times is very profitable to produce, while at other times, owing to a cheap article which is imported from Europe, there is little or no profit in it. Albumen is used very extensively in gingham mills for the purpose of setting the colors permanently in the goods. Its manufacture is a very simple process, but as there is only a limited demand for it, it is not very generally manufactured. The process is as follows:

The beef blood is caught from the animal in round pans as soon as the creature is stuck. If the cattle are hung up while being bled, the pan should be held close to the neck of the animal so that the blood will have as little fall or disturbance as possible. The blood from each animal should be collected in a separate pan, it being unwise to put the blood of different cattle in the same pans for settling. The pan of blood should then be carried as carefully as possible so that no agitation takes place, to some out-door point and there allowed to congeal for an hour. At the end of this time it will be found in a clotted or rubbery condition, and should then be cut up into cubes about one inch square, the blood in the pan being at this time about 2 to 3 inches deep. After it is thus cut up it is dropped into a galvanized iron box about 2 feet square with a sieve (½-inch mesh) bottom, so as to hold the clotted blood but allow the serum to drip from it into the pan below.

The first drain of the blood is of a reddish color and is used for a No. 3 or "sugar house" albumen. The last draining is a light colored serum which follows, and this is what constitutes the No. 1 albumen (style of pans and device for draining the serum are shown in Fig. 164). As soon as the lighter colored serum begins to show the pan should be placed in the receiving dish and allowed to drain until the serum ceases to drip from the blood. What is left of the blood is then removed and used for fertilizing purposes.

The serum thus collected is allowed to settle in the pan for a period of from twelve to fourteen hours. By this time it is thoroughly settled and ready to be drained off which is done by means of a glass tube passing through a close fitting cork. By this method the serum can be drained close to the settlings, the serum being on top of the sediment or settlings. The pan should be set on a sloping rack. In its lowest corner there should be an opening with the small neck downward and tightly corked as shown in Fig. 164. Through this cork is run a small glass tube about ¼-inch in diameter and 4 to 5 inches long. The tube when not in use extends upward through the serum; as soon as the serum is fully settled

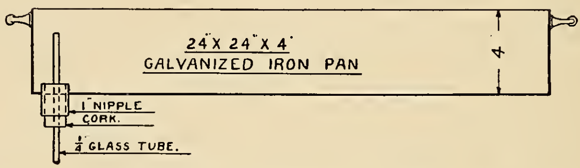


FIG. 164.—SETTLING PAN FOR DRAINING SERUM FROM BLOOD.

this glass tube is pulled carefully down through the cork until its top is submerged, when the serum readily drains off. The pans must be set rigidly on the racks and not agitated in any manner whatever, as the slightest movement of the pans would soon mix the serum and sediments.

The draining of the serum is the most particular part of the work in the production of beef albumen. Care should be taken to see that no settlings are drawn off with the serum. The room where the serum is drained from the blood should be kept at a temperature of 45° to 50° F. When the serum has been thus drained it is ready for drying. This is done by putting it in jelly plates, these being generally made of earthenware, the bottom

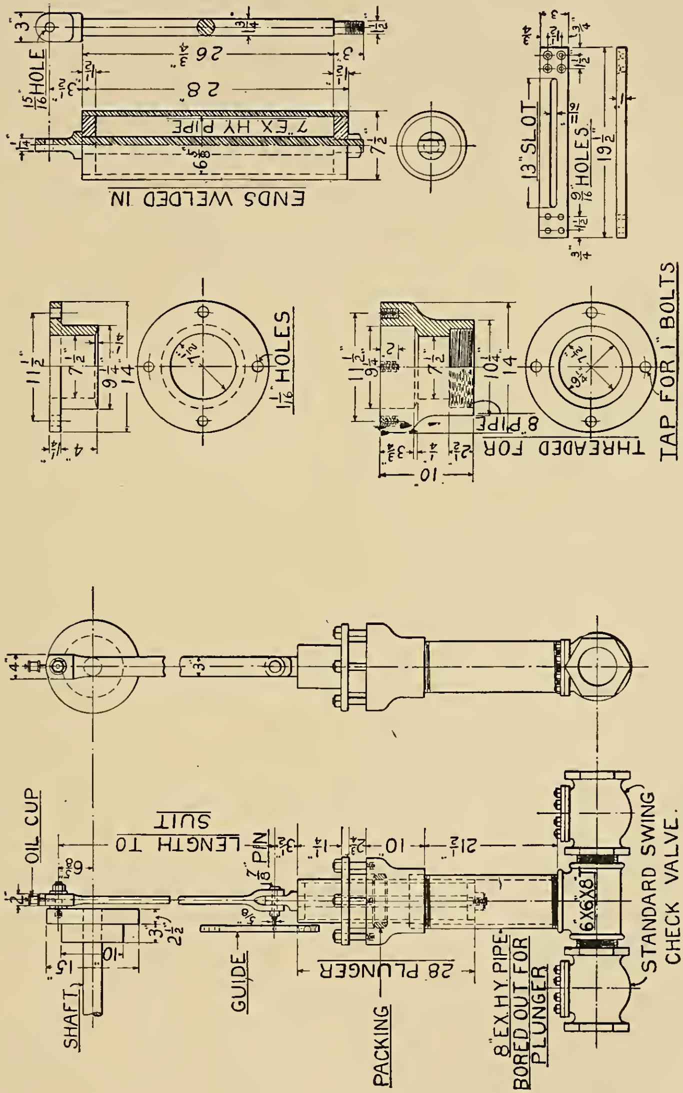


FIG. 165.—SECTIONAL VIEW OF HOME-MADE BLOOD PUMP.

of the plate being thinly covered, not to exceed ⅛-inch. The pan should be in a perfectly level support, so the serum can dry evenly. When dried the product will be in the form of thin flakes of light amber color. The pans should be greased with lard oil before using to prevent the albumen from sticking to them. The plates when filled are put into a dry room where there is an artificial circulation of air with a temperature of from 100° to 120° F. When it is thoroughly dried, the plates are taken out and the albumen is scraped off the bottom with a small hand scraper. It is then in a suitable condition for market.

The first draining or dark albumen of the blood is collected and dried in the same manner as the light albumen above described. The average production of No. 1 albumen, per bullock, is about one-half pound per head, and of the dark or sugar house albumen about one pound per head. Cows and Texas cattle make the best albumen. The cost of producing albumen does not exceed five cents per pound for all expenses. As so little of value is taken from the blood the raw material is not worth figuring.

In Fig. 165 is presented a detail of a home-made blood pump. In ordinary packing house practice much difficulty is encountered trying to pump blood and meat refuse from bone house, etc., where there is a great deal of sediment and coarse stuff liable to get in and do damage to the valves of an ordinary pump. In this illustration is shown a pump consisting of check valves and fittings, with the exception of stuffing box, and plunger on which there is some machine work necessary, details being shown. For anyone in need of a device of this kind it will be found to be very economical as well as effective.

CHAPTER XXIII.

BOXES AND COOPERAGE.

SPECIFICATIONS FOR BOXES.

Of the many supplies needed about a packing house, one of the most important is boxes into which the finished products are packed ready for shipment. Where they are used in such large numbers, it is very essential to have a box suitable for the products which will be packed into it without waste of room, sufficiently strong to withstand handling in transit and at the same time of minimum weight on account of freight charges.

The kind of lumber used for packing boxes varies in different localities. Cotton wood is the best and wherever available, should be used. The packing house industry has created a very important outlet for this otherwise almost worthless wood. It has no natural flavor and is very desirable for lard, butterine boxes, etc. It is used for making the small-sized packages into which lard is drawn direct instead of using pails or tubs. Boxes for these purposes are usually dovetailed and have a sliding cover. Where cotton wood is not available white pine is used, although in this case it is necessary to use thicker lumber, which as a consequence makes the boxes heavier. The following list gives the kind of boxes, inside measurements, thickness of lumber in the sides, top, bottom, ends and cleats, where necessary. The figures are applicable to cotton wood only:

PORK PACKING BOXES.

Contents	Remarks	Inside measurement in inches: Length	Width	Depth	Thickness of lumber in inches: Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
500 lbs. English bellies	Two hardwood hoops	34	$22\frac{1}{2}$	$22\frac{1}{2}$	1	1	1	Outside	1x3	T. & G. Box
500 lbs. " "	" " "	$33\frac{1}{2}$	22	$23\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. " "	" " "	35	$22\frac{1}{2}$	$21\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. hog hams	" " "	28	25	22	1	1	1	"	1x3	" "
500 lbs. New York shoulders .	" " "	30	26	$22\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. dry salt fat backs....	" " "	28	22	$28\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. " " " "	" " "	31	26	24	1	1	1	"	1x3	" "
500 lbs. " " " "	" " "	28	24	27	1	1	1	"	1x3	" "
500 lbs. English bellies	" " "	31	$20\frac{1}{2}$	$25\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. sweet pickle hams ...	" " "	31	22	$24\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. " " " ...	" " "	26	24	$24\frac{1}{2}$	1	1	1	"	1x3	" "
500 lbs. New York shoulders .	" " "	31	24	21	1	1	1	"	1x3	" "
500 lbs. dry salt fat backs ...	" " "	34	24	22	1	1	1	"	1x3	" "
500 lbs. Manchester hams ...	" " "	31	24	23	1	1	1	"	1x3	" "
500 lbs. dry salt and smkd mts	" " "	30	21	20	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	Inside	$\frac{5}{8}$x2	" "
150 lbs. dry salt meats	" " "	24	22	10	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	Box
500 lbs. hog fat backs	" " "	32	22	27	1	1	1	"	1x3	T. & G. Box
100 lbs. short clears	" " "	30	20	8	$\frac{3}{8}$	$\frac{3}{8}$	1	"	$\frac{5}{8}$x2	Box

CANNING DEPARTMENT BOXES.

Contents	Remarks	Length	Width	Depth	Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
24 $2\frac{1}{2}$-lb. cans ox tongues ..	One piece sides	$24\frac{1}{8}$	$12\frac{1}{4}$	$9\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	Box
24 3-lb. cans " " ..	" " "	$24\frac{3}{8}$	$12\frac{1}{4}$	$10\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	"
6 6-lb. cans " " ..	" " "	$18\frac{1}{4}$	$12\frac{1}{4}$	$6\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	"
12 6-lb. cans " " ..	" " "	$18\frac{1}{4}$	$12\frac{1}{4}$	13	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	"

CANNING DEPARTMENT BOXES (CONTINUED)

Contents	Remarks	Inside measurement in inches			Thickness of lumber in inches			Cleats	Width of cleats	Box or crate
		Length	Width	Depth	Sides	Top and bottom	Ends			
24 $\frac{1}{2}$-lb. cans ox tongues	One piece sides	$17\frac{1}{8}$	$8\frac{5}{8}$	$4\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	Box
6 6-lb. cans lunch tongues	" " "	$18\frac{1}{4}$	12	7	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	"
36 2-lb. cans roast beef	" " "	$17\frac{3}{4}$	$12\frac{7}{8}$	$13\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	"
48 1-lb. cans " "	" " "	$17\frac{1}{4}$	$12\frac{7}{8}$	$9\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	"
24 2-lb. cans English brawn	" " "	16	$8\frac{7}{8}$	$9\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
6 5-lb. cans chipped beef	Dove tailed	$10\frac{1}{2}$	7	$3\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 $\frac{1}{2}$-lb. cans Vienna sausage	" "	$11\frac{3}{8}$	$8\frac{3}{4}$	$6\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 1-lb. cans " "	" "	$11\frac{7}{8}$	9	$9\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 $\frac{1}{2}$-lb. cans veal loaf	" "	$16\frac{1}{2}$	9	$3\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 1-lb. cans " "	" "	$14\frac{7}{8}$	$10\frac{3}{16}$	$6\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 1-lb. cans chipped beef	" "	$17\frac{1}{4}$	$12\frac{7}{8}$	$5\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 2-lb. cans roast beef	" "	$16\frac{1}{2}$	11	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	"
24 2-lb. cans chipped beef	Government box, $2\frac{1}{2}$-in. strap	$15\frac{7}{8}$	9	$11\frac{1}{2}$	1	1	1	None	...	"
12 2-lb. cans roast beef	Government box	$16\frac{1}{2}$	11	$5\frac{7}{8}$	1	1	1	"	...	"
6 14-lb. cans chipped beef	One piece sides	$24\frac{1}{2}$	$13\frac{1}{8}$	14	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 2-lb. cans chipped beef	" " "	16	$8\frac{7}{8}$	$9\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
12 2-lb. cans chipped beef	" " "	16	$8\frac{3}{4}$	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
24 1-lb. cans chipped beef	" " "	$13\frac{1}{4}$	$13\frac{1}{2}$	4	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
24 2-lb. cans tall roast beef	" " "	$17\frac{3}{4}$	$12\frac{7}{8}$	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 2-lb. cans flat roast beef	" " "	22	11	$8\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
12 2-lb. cans flat roast beef	" " "	$16\frac{1}{2}$	11	$5\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
48 1-lb. cans lunch tongue	" " "	$17\frac{1}{4}$	13	$9\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
24 1-lb. cans lunch tongue	" " "	$17\frac{1}{4}$	$12\frac{7}{8}$	$4\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
48 $\frac{1}{4}$-lb. cans boneless ham	" " "	$15\frac{3}{8}$	$10\frac{1}{4}$	$3\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
24 $\frac{1}{2}$-lb. cans boneless ham	" " "	$12\frac{1}{4}$	9	$4\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
24 $\frac{1}{4}$-lb. cans boneless ham	" " "	$10\frac{1}{4}$	$7\frac{3}{4}$	$4\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"

CANNING DEPARTMENT BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches			Thickness of lumber in inches			Cleats	Width of cleats	Box or crate
		Length	Width	Depth	Sides	Top and bottom	Ends			
12 $\frac{1}{4}$-lb. cans boneless ham ..	One piece sides	$7\frac{3}{4}$	$5\frac{1}{8}$	$3\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	Box
12 2-lb. cans chipped beef ..	" " "	$15\frac{7}{8}$	9	$5\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
48 1-lb. cans chipped beef ..	" " "	$17\frac{3}{4}$	$10\frac{3}{8}$	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
12 2-lb. cans roast beef	" " "	$17\frac{3}{4}$	$12\frac{7}{8}$	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
24 $1\frac{1}{2}$-lb. cans ox tongues ...	" " "	22	11	$7\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	..	"
24 $1\frac{3}{4}$-lb. cans roast beef	" " "	22	11	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
12 6-lb. cans chipped beef...	" " "	$18\frac{1}{4}$	$12\frac{1}{4}$	$12\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{5}{8}$x2	"

SAUSAGE PACKING BOXES.

Contents	Remarks	Length	Width	Depth	Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
25 lbs. sausage	One $\frac{1}{2}$-in. open space in sides	18	12	6	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Box
30 lbs. sausage	" " " "	18	12	7	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
50 lbs. sausage	" " " "	19	15	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	"
60 lbs. sausage	" " " "	19	15	10	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
75 lbs. sausage	" " " "	23	17	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
4 10-lb. boxes Frankfurts ..	Two 2-in. pcs. sides, 3 2-in. top & btm	$18\frac{1}{2}$	$12\frac{1}{4}$	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Crate
5 lbs. boneless pigs feet ...	Dove tailed....................	$7\frac{5}{8}$	$5\frac{1}{4}$	$3\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	Box
10 lbs. boneless pigs feet ...	" "	13	$5\frac{5}{8}$	4	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
25 lbs. boneless pigs feet ...	" "	26	11	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
15 1-lb. tin meat	Two 2-in. pcs. sds., 3 2-in. top & btm.	13	13	$6\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	Crate
15 2-lb. tin meat	" " " " " " "	26	13	$6\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
25 1-lb. tin meat..........	" " " " " " "	13	13	$9\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
25 2-lb. tin meat	" " " " " " "	26	13	$9\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
100 lbs. summer sausage	....	28	17	10	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Box

SAUSAGE PACKING BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches			Thickness of lumber in inches			Cleats	Width of cleats	Box or crate
		Length	Width	Depth	Sides	Top and bottom	Ends			
100 lbs. summer sausage	....	23	17	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Box
12 1-lb. cans Bologna	Dove tailed	$16\frac{3}{4}$	$10\frac{1}{4}$	$3\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	"
6 1-lb. cans Bologna	" "	$16\frac{3}{4}$	$10\frac{1}{4}$	$1\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
6 10-lb. cans Frankfurts	One 1-in. open space in sides, two 2-in. open spaces in top & bottom	27	$12\frac{1}{2}$	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	Crate
50 lbs. boiled ham	One piece sides	25	18	6	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
30 lbs. sausage	One $\frac{1}{2}$-in. open space in sides	19	15	6	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
25 lbs. Bologna	One $\frac{1}{2}$-in. open space in sides	$15\frac{1}{2}$	$9\frac{1}{2}$	6	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
1 50-lb. can Bologna in oil	....	$12\frac{1}{2}$	$12\frac{1}{2}$	$12\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
2 20-lb. can Bologna in oil	....	20	10	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
1 20-lb. can Bologna in oil	....	10	10	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"

LARD REFINERY BOXES.

Contents	Remarks	Length	Width	Depth	Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
20 3-lb. pails	Three 2-in. strips, side, top & bottom	$25\frac{7}{8}$	$10\frac{5}{8}$	$10\frac{7}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Outside	$\frac{7}{8}$x$1\frac{3}{4}$	Crate
12 5-lb. pails	" " " " " " "	$18\frac{1}{4}$	$12\frac{1}{4}$	13	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x$1\frac{3}{4}$	"
6 10-lb. pails	" " " " " " "	$22\frac{5}{8}$	$15\frac{1}{4}$	$8\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x$1\frac{3}{4}$	"
4 20-lb. pails	" " " " " " "	$19\frac{7}{8}$	$19\frac{7}{8}$	$9\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x$1\frac{3}{4}$	"
1 50-lb. pail	" " " " " " "	$12\frac{1}{2}$	$12\frac{1}{2}$	$13\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x$1\frac{3}{4}$	"
2 50-lb. pails	" " " " " " "	26	$12\frac{1}{2}$	$13\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x$1\frac{3}{4}$	"
28 lbs. net lard	Dove tailed	$13\frac{5}{16}$	$9\frac{1}{8}$	$7\frac{5}{8}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{1}{2}$	None	...	Box
56 lbs. net lard	" "	$18\frac{1}{8}$	$13\frac{7}{16}$	$7\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	"	...	"
6 10-lb. pails	Two $\frac{3}{4}$-in. iron straps	$22\frac{5}{8}$	$15\frac{1}{4}$	$8\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	Inside	Cor'r	"
12 5-lb. pails	" " " "	$18\frac{1}{4}$	$12\frac{1}{4}$	13	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	"	"
20 5-lb. pails	" " " "	30	$12\frac{1}{4}$	13	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	"	"	"

LARD REFINERY BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches: Length	Width	Depth	Thickness of lumber in inches: Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
10 10-lb. pails	Two $\frac{3}{4}$-in. iron straps	38	$15\frac{1}{2}$	$8\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	Inside	Cor'r	Box
20 5-lb. pails (Cuban trade)	" " " "	$31\frac{1}{2}$	13	$12\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	"	"
10 10-lb. pails (Cuban trade)	" " " "	41	$16\frac{1}{2}$	7	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	"	"
4 25-lb. pails	" " " "	$20\frac{1}{4}$	$20\frac{1}{4}$	$11\frac{1}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	"	"
SMOKED MEAT BOXES.										
25 lbs. bacon		22	12	7	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Box
50 lbs. bacon		23	17	7	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
50 lbs. shoulder		18	15	11	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	"
75 lbs. bacon		23	17	11	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
15 lbs. bacon		20	8	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	"
100 lbs. canvased meats	One 1-inch open space in sides, tops and bottoms	23	17	13	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Crate
15 lbs. shoulder and bacon		19	10	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Box
150 lbs. bacon	Two hardwood hoops	24	22	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Inside	$\frac{7}{8}$x2	"
200 lbs. bacon	" " "	30	21	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	"
250 lbs. bacon	" " "	30	21	17	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	"
100 lbs. bacon	" " "	$22\frac{1}{2}$	17	13	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	"
BEEF CUTTING, OFFAL AND FREEZER BOXES.										
Loin butts		28	12	$6\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Box
Loin strips		29	19	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"

BEEF CUTTING, OFFAL AND FREEZER BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches			Thickness of lumber in inches			Cleats	Width of cleats	Box or crate
		Length	Width	Depth	Sides	Top and bottom	Ends			
Beef tenderloins		$29\frac{1}{2}$	13	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	Box
Beef rolls		29	19	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
Beef kidneys		16	9	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
Beef livers and beef knobs		$24\frac{1}{2}$	16	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Inside	$\frac{7}{8}$x2	"
Ox tails		$24\frac{1}{2}$	15	$8\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	"
20 pcs plucks and hog livers		$29\frac{1}{2}$	13	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
Small ox tongues		28	14	8	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
5 lbs. hog brains		$12\frac{3}{4}$	$11\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
15 pieces sheep plucks		24	13	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
10 lbs. beef brains		$12\frac{3}{4}$	$11\frac{1}{2}$	$2\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
5 lbs beef brains		$12\frac{3}{4}$	9	$2\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	...	"
100 pieces lamb tongues		28	12	$3\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
200 lbs. ice case	3-in. ice space on sides and bottom	32	24	16	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Inside	$\frac{7}{8}$x2	T. & G. Box
100 lbs. ice case	" " " " "	28	18	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	" " "
150 lbs. ice case	" " " " "	28	21	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	" " "
12 pieces sheep plucks		22	13	5	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	Box
80 lbs. brains ice case	3-in. ice space on sides and bottom	$25\frac{1}{2}$	$24\frac{1}{2}$	17	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	Inside	$\frac{7}{8}$x2	T. & G. Box
Large ox tongues		28	14	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	None	...	Box
50 pieces lambs tongues		14	12	$3\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"
5 lbs. hog brains iced		19	$11\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	...	"

FRESH PORK PACKING BOXES.

50 lbs. short pork loins	One 1-in. open space in sides, two in top and bottom	26	$12\frac{1}{2}$	$7\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Crate

FRESH PORK PACKING BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches			Thickness of lumber in inches			Cleats	Width of cleats	Box or crate
		Length	Width	Depth	Sides	Top and bottom	Ends			
50 lbs regular pork loins ...	One 1-in. open space in sides, two in top and bottom	29	$12\frac{1}{2}$	$7\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Insid	$\frac{5}{8}$x2	Crate
50 lbs. long cut pork loins .	One 1-in. open space in sides, two in top and bottom	34	$12\frac{1}{2}$	$7\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
100 lbs. pork loins..........	Two 1-in. open spaces in sides, two in top and bottom	29	14	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
50 lbs. export ham butts ..	One 1-in. open space with runner on sides, two same, with runner on btm	29	$12\frac{1}{2}$	$6\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	"
50 lbs. export pork loins ..	One 1-in. open space with runner on sides, two same, with runner on btm	29	$12\frac{1}{2}$	7	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	"	$\frac{7}{8}$x2	"
100 lbs pork shoulder	Three 1-in. open spaces in bottom and top and two 1-in. on sides ...	25	18	11	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
100 lbs. pork loin ice case ..	3-in. space for ice inside bottom of box with rack	29	$12\frac{1}{2}$	$10\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	Box
50 lbs. shoulder ice case ..	3-in. space for ice inside bottom of box with rack	18	15	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{5}{8}$x2	"
100 lbs. shoulder ice case....	3-in. space for ice inside bottom of box with rack	25	18	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{5}{8}$x2	"
100 lbs. pork ice case	3-in. space for ice inside bottom of box with rack	29	14	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	"	$\frac{5}{8}$x2	"
25 lbs. butt ice case........	3-in. space for ice inside bottom of box with rack	22	12	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
25 lbs. pork loins	1-in. open space in sides..........	28	8	6	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	...	Crate
50 lbs. pork loins	....	29	$12\frac{1}{2}$	$7\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Box
100 lbs. pork loins	....	29	14	12	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"
100 lbs. pork shoulder	....	25	18	11	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	"	$\frac{5}{8}$x2	"

FRESH PORK PACKING BOXES (CONTINUED).

Contents	Remarks	Inside measurement in inches: Length	Width	Depth	Thickness of lumber in inches: Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
50 lbs. pork shoulder	Tight	18	15	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	Inside	$\frac{5}{8}$x2	Box
50 lbs. pork shoulder	One 1-in. open space in sides and two 1-in. in top and bottom	18	15	9	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	“	$\frac{5}{8}$x2	“

DRY SALT AND SWEET PICKLE PORK PACKING BOXES.

Contents	Remarks	Length	Width	Depth	Sides	Top and bottom	Ends	Cleats	Width of cleats	Box or crate
500 lbs. export hams	Two hardwood hoops	28	23	24	1	1	1	Outside	1x3	T. & G. Box
500 lbs. export bellies	“ “ “	32	20½	23½	1	1	1	“	1x3	“ “ “
500 lbs. export bellies	“ “ “	33	22½	24	1	1	1	“	1x3	“ “ “
500 lbs. dry salt fat backs . . .	“ “ “	31	27	23	1	1	1	“	1x3	“ “ “
500 lbs. dry salt fat backs . . .	“ “ “	34	24	24	1	1	1	“	1x3	“ “ “
500 lbs. export Cumberlands .	“ “ “	32	21	28	1	1	1	“	1x3	“ “ “
500 lbs. export Cumberlands .	“ “ “	30	18	34	1	1	1	“	1x3	“ “ “
500 lbs. export Cumberlands .	“ “ “	28	18	37	1	1	1	“	1x3	“ “ “
500 lbs. export Cumberlands .	“ “ “	26	18	39	1	1	1	“	1x3	“ “ “
250 lbs. fat backs	“ “ “	32	21	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	“	$\frac{5}{8}$x2	“ “ “
200 lbs. fat backs	“ “ “	27	24	12	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	“	$\frac{7}{8}$x2	“ “ “
100 lbs. fat backs	“ “ “	26	14	14	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	“	$\frac{5}{8}$x2	“ “ “
50 lbs. fat backs	“ “ “	26	14	7	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	None	. . .	“ “ “
500 lbs. Cumberlands	“ “ “	34	17	41	1	1	1	Outside	1x3	“ “ “
500 lbs. long ribs	“ “ “	26	25	23½	1	1	1	“	1x3	“ “ “
500 lbs. English bellies	“ “ “	34	20	22	1	1	1	“	1x3	“ “ “
500 lbs. English bellies	“ “ “	33	22½	23	1	1	1	“	1x3	“ “ “
500 lbs. fat backs	“ “ “	28	26	23	1	1	1	“	1x3	“ “ “
500 lbs fat backs	“ “ “	35	22½	20	1	1	1	“	1x3	“ “ “
500 lbs. English bellics	“ “ “	32½	22	24½	1	1	1	“	1x3	“ “ “

COOPERAGE SPECIFICATIONS.

The following specifications will serve for all kinds of cooperage used throughout a packing house and makes a very satisfactory package for the different requirements:

SIX-HOOP NO. 1 TIERCES.

Staves....................................33¾ inches long
Heads....................................20¼ inches wide
Bilge............................79½ inches circumference
Chime ....⅞ inch

Six iron hoops.

Head hoops......................1¾ inches wide, No. 18 iron
Quarter hoops..................1½ inches wide, No. 19 iron
Bilge hoops......................1¾ inches wide, No. 18 iron
Heads ....⅞ inch thick
Staves ....¾ inch thick

WOOD-BOUND BEEF TIERCES.

Staves....................................33¾ inches long
Heads....................................20¼ inches wide
Bilge............................79½ inches circumference
Chime..1⅛ inches

Hoops: First wooden hoop on bilge; then one iron hoop; then five wooden hoops; then one iron hoop; then one chime hoop on each end.

Staves ....¾ inch
Heads ....⅞ inch

LARD TIERCES.

Staves....................................33½ inches long
Heads ....20¼ inches wide
Bilge............................79½ inches circumference
Chime ....1⅛ inches

Two-thirds of the tierce to be covered with wooden hoops for prime steam lard.

Staves ....¾ inch
Heads ....⅞ inch

EIGHT-HOOP TIERCES.

Same specifications as six-hoop tierces, with two more hoops on, that is, one additional hoop on each end, 1½ inches wide. No. 19 iron used for prime steam and export refined lard, two weights for latter; on tierce weighing seventy-seven pounds, figure 17 per cent tare; on tierce weighing seventy-two pounds, figure 16 per cent tare.

IRON-BOUND OAK PORK BARRELS.

Staves.........................30 inches long by ⅝ inch thick
Head.....................17½ inches wide by ⅞ inch thick
Bilge...................................69 inches circumference
Chime ....1 inch

Six iron hoops.

Head hoop ....1½ inches
Quarter hoops ....1¼ inches
Bilge hoops ....1½ inches

No. 18 iron.

WOOD-BOUND OAK PORK BARRELS.

Just the same as iron-hoop pork barrels, but covered with wooden hoops—no iron hoops—in two and four series.

ASH PORK BARRELS.

Same specifications as iron-bound pork barrels put up bound with both wood and iron, wood being most expensive.

BASSWOOD LARD EXPORT HALF BARRELS.

Staves................................22 inches by 7/16 inch
Head.....................14¾ inches wide by ½ inch thick
Bilge..............................56 inches circumference

Three wooden hoops on bilge, then one-quarter hoop, then one iron collar hoop (No. 20 iron, 1 inch wide), then one wood chime hoop at each end.

WOOD-BOUND BASSWOOD TIERCES FOR EXPORT CASINGS.

Staves......................36 inches long by ¾ inches thick
Head.....................22¼ inches wide by ⅞ inch thick
Bilge...........................86 inches in circumference
Chime..1⅛ inches

One head; one bilge hoop of No. 18 iron, 1¾ inches wide; one quarter hoop, 1½ inches wide, of No. 18 iron, at each end; one chime hoop 1¾ inches wide No. 18 iron; balance, wooden hoops.

NO. 19 SLACK BARRELS.

Staves...30 inches long
Head...18 inches wide
Bilge...................................75 inches in diameter

Three patent wooden hoops on each end.

SLACK TIERCES FOR STEARINE.

Staves...35 inches
Heads.................................23¾ inches wide
Bilge...89½ inches
Chime ....¾ inch

Two patent wood hoops on each end, and two on each bilge.

WOOD-BOUND HOG BUNG TIERCES.

Staves..............................31 inches by ¾ inch
Heads..........................20¼ inches by ⅞ inch
Bilge.........................79½ inches in circumference
Chime...1¼ inches

Two iron collar hoops (No. 18 iron, 1½ inches wide); twelve wooden chime hoops.

EIGHTY-POUND PIGS FEET PACKAGE MADE OF WHITE PINE AND BIRCH.

Staves ....19¾ inches long
Heads ....11¼ inches wide
Bilge...49 inches
Chime ....¾ inch

Three wooden hoops on each bilge and three on each head.

FORTY-POUND QUARTER BARREL PACKAGE MADE OF WHITE PINE OR BIRCH, FOR PIGS FEET, TRIPE AND OTHER OFFAL.

Staves	17 inches long
Heads	10⅝ inches wide
Bilge	38½ inches
Chime	⅞ inch

Two head hoops and two bilge hoops of wood each end.

GOVERNMENT SPECIFICATIONS FOR PACKAGES.

The following are the government specifications for packages containing pork or beef.

The packages must be made of entirely new and of the best seasoned heart-of-white-oak staves and headings: The staves shall not be less than ⅝-inches thick and the headings not less than ¾-inches thick. They shall be three-quarter hooped over, including galvanized iron hoops with the best hickory hoops, and each one-half barrel shall have on it four galvanized iron hoops; one of 1¼-inches in width to each bilge and one of 1⅛-inches in width on each chime, and each shall be 1/16-inch thick.

Each half barrel shall have a capacity of sixteen gallons and must be branded, if it contains beef, by burning on its head "Navy Beef," name of the contractor, name of packer's brand, and on the bung stave, the letter "P."

REFRIGERATOR BOXES.

In the shipping of fresh meats which are to be sent by express, or where small quantities are sent in insufficient amounts to warrant the use of a car, thousands of refrigerator boxes are used. In such cases a good refrigerator box is made necessary in the handling of the product to the trade—a box that will stand the abuse, wear and tear in shipping and at the same time one that is not excessively heavy, adding unnecessarily to the express charges. The dimensions given below are for wooden boxes which are generally made of 1-inch clear pine lumber, the corners being securely fastened with angle iron, or with heavy galvanized iron, and the covers put on with specially strong hinges as the boxes meet with a great deal of hard usage and when filled must necessarily be strong in order to withstand the jar and strain.

A galvanized iron box containing the meat is placed inside of the wooden box, leaving about 2 inches of space around it and 4 inches of space on top. The meat to be shipped is packed tightly into the galvanized iron box, which is then placed in the wooden box and the space around the sides and top filled with crushed ice. In this condition meat will keep fresh in hot weather for from thirty-six to forty-eight hours under ordinary conditions.

The following dimensions are those generally in use for the different sized wooden boxes enumerated:

Capacity.	Inside measure, inches.
50 pounds	26 x 16½ x 9
100 pounds	24 x 18 x 14
100 pounds	26 x 18 x 13
200 pounds	34 x 18 x 18½
200 pounds	34 x 20 x 16
300 pounds	38 x 24 x 19
500 pounds	42 x 28 x 18½

CHAPTER XXIV.

MISCELLANEOUS INFORMATION.

CONVENIENT DEVICES.

In this chapter descriptions are given of a number of apparatuses that will be found very convenient in the packing house, as proved by experience. It also includes a number of miscellaneous items in modern slaughter-house practice not directly connected with any of the departments treated in the foregoing chapters. These are necessarily treated very briefly partly because of lack of space and partly because they really belong to subjects indirectly connected with the packing house industry, or only in connection with the largest central houses, and yet are subjects on which there may be more or less inquiry.

CALKING DEVICE.

Fig. 166 shows detail of a calking machine. This is a very useful device where there is a large amount of calked floor space. Calking floors is very expensive where it is done by hand work but with a machine of this kind it is done very economically. Spun oakum should be used and simply laid on top of the crevices in the floor to be filled. The calking feature of the machine consists of a 10 or 12-inch circular saw, the teeth being ground off, and the machine being run over the crevice forces in the oakum or cotton, as the case may be, very compactly, making a much tighter job than can possibly be done by hand work.

ELEVATOR HOIST.

A very essential part of the equipment of a packing house is good elevators. The machine shown in Fig. 167 makes a very useful and economical elevator, which can either be driven from shaft direct or belted from motor. It will be noticed that the drum is grooved for the reception of the rope, which prevents it from wearing. The

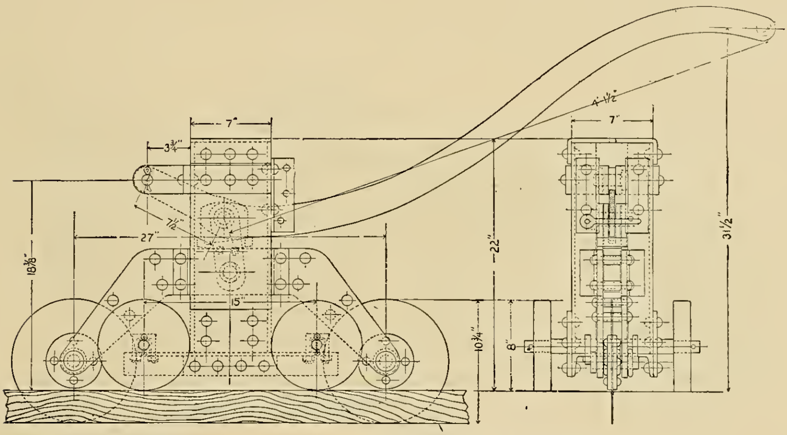


FIG. 166.—DETAIL OF CALKING MACHINE.

drum is also long enough so that it is unnecessary to have the rope wrap or rise upon itself in order to bring the elevator to the top of the shaft, thereby saving it from a great deal of wear and tear. It is also supplied with a balance wheel to aid in starting the hoist. The pulleys are 36 inches in diameter by 8-inch face. The speed on belt pulley is 240 revolutions per minute, on drum shaft sixty revolutions per minute, of elevator 150 feet per minute. The horse power required to operate this elevator is about twenty-five, while the capacity of hoist is 5,000 pounds. It requires a floor space of about 9 feet long by 6½ feet wide and 4½ feet high. The machine weighs 5,375 pounds.

BARREL TRUCK.

A barrel truck that will be found exceedingly convenient about a packing house and one that is easily built or prepared is shown in outline in Fig. 168.

HOG TRAVELER.

A very efficient hog traveler is illustrated in the accompanying diagram, Fig. 169. It will be noticed that the

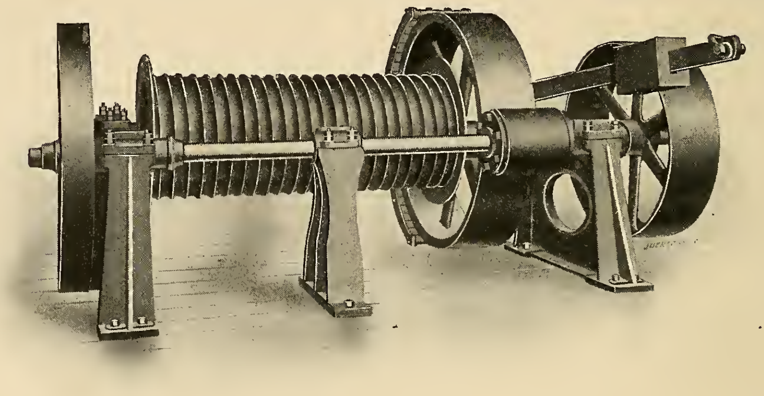


FIG. 167.—ELEVATOR HOIST.

flanges on the wheel which runs on the trolley are beveled, which causes the traveler to make turns on the overhead rail without friction and without danger of leaving the rail. The bevel prevents the wheel from catching against any slightly projecting edge of a joint in the rail and entirely obviates the trouble that is so often experienced during rush periods of having the carcasses stick on some curve.

HANDY CART.

A very useful cart for packing house purposes is illustrated in Fig. 170. Having large wheels it runs easily.

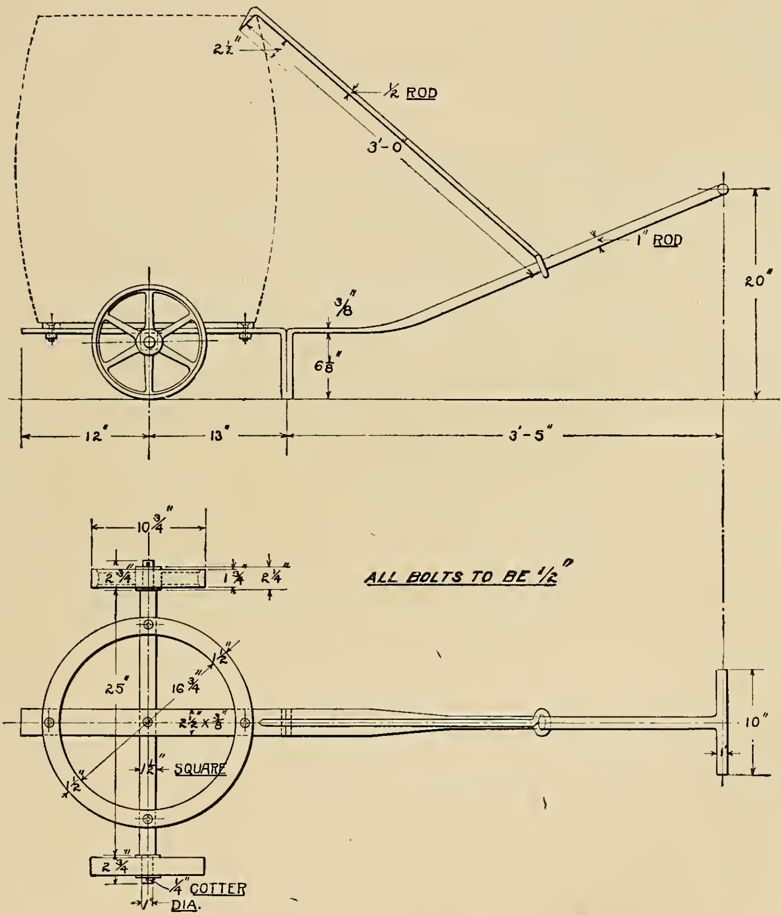


FIG. 168.—DIAGRAM OF CONVENIENT BARREL TRUCK.

In purchasing trucks of any kind the purchaser should insist that there be at least a ⅜-inch crown on the rim of all wheels, as this obviates the trouble from sharp edges coming in contact with the floor and the floor will last much longer where trucks are thus looked after. The size of the platform of the truck is 34 x 54 inches.

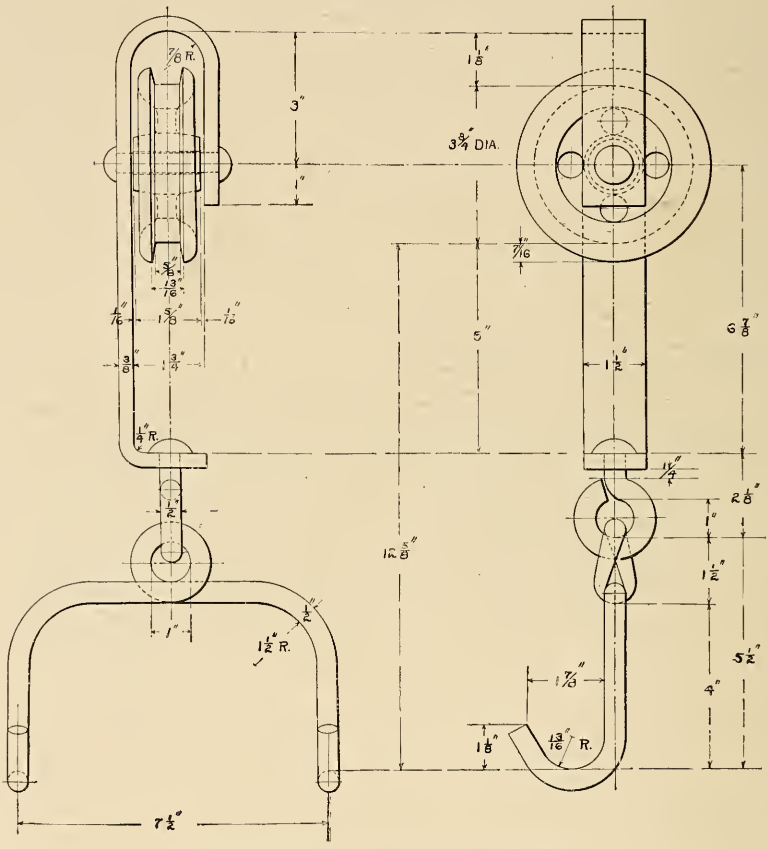


FIG. 169.—DETAIL OF HOG TRAVELLER.

TINNING HOOKS.

About a packing house there are always a number of hooks required on which to hang meat both on the trucks and on the stationary racks; also in the cars, all of which have to be tinned in order to keep them bright and clean, and to prevent the otherwise resulting rust, etc., from discoloring the meats.

If any considerable quantity of hooks is to be tinned, it is very much cheaper to fit up an apparatus and do the tinning than to have it done outside, as the charges for this kind of work are generally exorbitant. The process recommended is as follows:

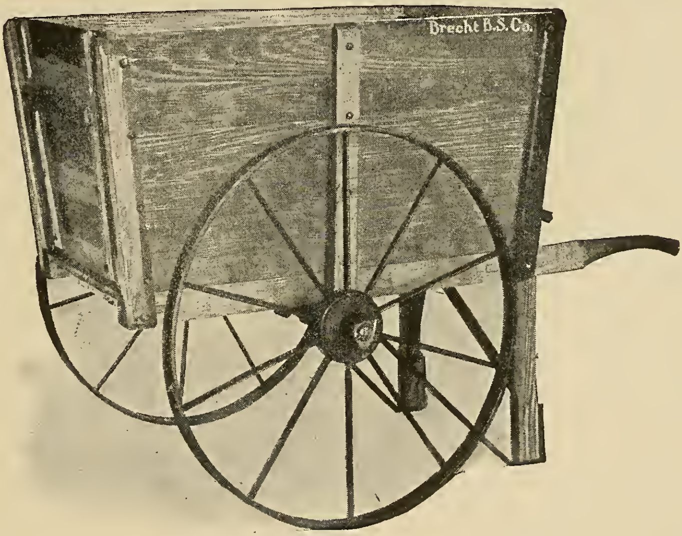


FIG. 170.—FAT CART OR TRUCK FOR GENERAL PURPOSES.

First submerge the hooks in muriatic acid, using a wooden vat for same, as the acid would soon eat out an iron one. Allow the hooks to remain in the acid until the rust is all eaten off, which may take from ten to forty minutes, according to the amount of rust which has accumulated on them. They are taken from this bath and submerged in "reduced" acid, which is muriatic acid reduced by putting in block zinc; keep adding zinc to the acid until it stops boiling. When the zinc is first put in it boils very rapidly, and when the boiling ceases it is "reduced" acid.

The hooks are taken from this mixture and hung up, and allowed to hang from twenty minutes to half an hour to be sure that the acid has all evaporated and the hooks are dry. After they have become thoroughly dried they are again immersed, this time in a bath of pure block tin melted in an iron vat set over a fire.

The top of the vat should be skimmed every few minutes before taking out the hooks, as quite an accumulation of discolored matter will arise on the top of the vat, and if the hooks are pulled up through it, it leaves a scum on them.

Care should be taken that the tin is not too hot, for if it is the hooks will come out a yellow instead of a bright tin color. As soon as the tin is thoroughly melted, the fire should be covered with ashes, or banked in some way so as to keep the tin at about the same temperature. As many hooks may be put into the vat at one time as it will hold.

When the hooks are taken out, care should be taken to keep them as nearly level as possible, for when the hooks are taken out, the tin is in a liquid form, and if allowed to tip either way, a "drop" or rough place on the hook is developed. To avoid this use two pairs of tongs.

As soon as the hooks are taken from the tinning kettle they are put into a cold solution consisting of about one gill of muriatic acid to half a barrel of water. When the hooks are cold they are hung up. For tinning use a kettle about 3 feet long, 12 inches deep and 14 inches wide, with a flange to rest on the sides of the brick wall, fire being built under it of wood or coal, but little heat is needed.

It is advisable to tin all of the hooks of the beef trucks in the same manner as above, the shanks of the beef being kept clean more easily.

THERMOMETERS.

In packing house practice, as well as in many other industries, one oftentimes requires a knowledge of the three different thermometer scales used today, viz: Centigrade, which is used almost altogether in laboratory work, Reaumur and Fahrenheit. It is always, to say the least, troublesome, unless the information is at hand, to convert one to the other. Much annoyance has been caused by the existence of these three different scales, especially on export business. In America and in the British Empire the Fahrenheit scale is used almost exclusively. The Reaumur scale prevails in Germany. The Centigrade (or Celsius) scale is used almost exclusively in France and generally wherever the metric system of weights and measures is followed, and in all except English-speaking countries it is used to some extent in making scientific calculations.

The Centigrade scale includes between its 0 degree (freezing point of water) and 100 degrees (boiling point of water) all the temperatures generally met with in industrial activities.

The Fahrenheit scale is convenient on account of its short degrees, there being 180 between the freezing point of water (32 degrees) and its boiling point (212 degrees), thus allowing more minute calculations without the use of fractions. Its low zero point makes it possible in temperate climates to dispense largely with the minus sign.

The Reaumur scale divides the space between the freezing and boiling points of water into 80 instead of 100 degrees, as in the Centigrade system.

COMPARISONS OF THERMOMETER SCALES.

The following table shows the relative indications of the Celsius or Centigrade, Fahrenheit and Reaumur thermometer scales. In the United States and England the Fahrenheit scale is generally used; in France and in all scientific investigations and treatises, the Celsius scale is uniformly used; and in Germany the Reaumur scale is the one generally adopted.

C.	F.	R.	C.	F.	R.	C.	F.	R.
+100°	+212.0°	+80.0°	+53°	+127.4°	+42.4°	+ 6°	+42.8°	+ 4.8°
99	210.2	79.2	52	125.6	41.6	5	41.0	4.0
98	208.4	78.4	51	123.8	40.8	4	39.2	3.2
97	206.6	77.6	50	122.0	40.0	3	37.4	2.4
96	204.8	76.8	49	120.2	39.2	2	35.6	1.6
95	203.0	76.0	48	118.4	38.4	1	33.8	0.8
94	201.2	75.2	47	116.6	37.6	Zero	32.0	Zero
93	199.4	74.4	46	114.8	36.8	— 1	30.2	— 0.8
92	197.6	73.6	45	113.0	36.0	2	28.4	1.6
91	195.8	72.8	44	111.2	35.2	3	26.6	2.4
90	194.0	72.0	43	109.4	34.4	4	24.8	3.2
89	192.2	71.2	42	107.6	33.6	5	23.0	4.0
88	190.4	70.4	41	105.8	32.8	6	21.2	4.8
87	188.6	69.6	40	104.0	32.0	7	19.4	5.6
86	186.8	68.8	39	102.2	31.2	8	17.6	6.4
85	185.0	68.0	38	100.4	30.4	9	15.8	7.2
84	183.2	67.2	37	98.6	29.6	10	14.0	8.0
83	181.4	66.4	36	96.8	28.8	11	12.2	8.8
82	179.6	65.6	35	95.0	28.0	12	10.4	9.6
81	177.8	64.8	34	93.2	27.2	13	8.6	10.4
80	176.0	64.0	33	91.4	26.4	14	6.8	11.2
79	174.2	63.2	32	89.6	25.6	15	5.0	12.0
78	172.4	62.4	31	87.8	24.8	16	3.2	12.8
77	170.6	61.6	30	86.0	24.0	17	1.4	13.6
76	168.8	60.8	29	84.2	23.2	18	— 0.4	14.4
75	167.0	60.0	28	82.4	22.4	19	2.2	15.2
74	165.2	59.2	27	80.6	21.6	20	4.0	16.0
73	163.4	58.4	26	78.8	20.8	21	5.8	16.8
72	161.6	57.6	25	77.0	20.0	22	7.6	17.6
71	159.8	56.8	24	75.2	19.2	23	9.4	18.4
70	158.0	56.0	23	73.4	18.4	24	11.2	19.2
69	156.2	55.2	22	71.6	17.6	25	13.0	20.0
68	154.4	54.4	21	69.8	16.8	26	14.8	20.8
67	152.6	53.6	20	68.0	16.0	27	16.6	21.6
66	150.8	52.8	19	66.2	15.2	28	18.4	22.4
65	149.0	52.0	18	64.4	14.4	29	20.2	23.2
64	147.2	51.2	17	62.6	13.6	30	22.0	24.0
63	145.4	50.4	16	60.8	12.8	31	23.8	24.8
62	143.6	49.6	15	59.0	12.0	32	25.6	25.6
61	141.8	48.8	14	57.2	11.2	33	27.4	26.4
60	140.0	48.0	13	55.4	10.4	34	29.2	27.2
59	138.2	47.2	12	53.6	9.6	35	31.0	28.0
58	136.4	46.4	11	51.8	8.8	36	32.8	28.8
57	134.3	45.6	10	50.0	8.0	37	34.6	29.6
56	132.8	44.8	9	48.2	7.2	38	36.4	30.4
55	131.0	44.0	8	46.4	6.4	39	38.2	31.2
54	129.2	43.2	7	44.6	5.8	40	40.0	32.0

CONVERSION OF THERMOMETER DEGREES.

°C to °R, multiply by 4 and divide by 5.
°C to °F, multiply by 9, divide by 5, then add 32.
°R to °C, multiply by 5 and divide by 4.
°R to °F, multiply by 9, divide by 4, then add 32.
°F to °R, first subtract 32, then multiply by 4 and divide by 9.
°F to °C, first subtract 32, then multiply by 5 and divide by 9.

WIRE OR BRINE PIPE COVERING.

A formula for a compound such as is used by electricians for covering wire work, as well as galvanized iron brine pipe connections where rubber hose is used, and also for various other purposes, is made as follows:

Stockholm tar	5 lbs.
Rosin	6 lbs.
Gutta percha chips	9 lbs.

The above is put over a fire and melted. After it is fully melted and mixed together and sufficiently cooled to handle, it is taken in small handfulls and put into water to chill. It is then rolled into sticks and used in this form for the above mentioned work. While a like material can be purchased, it is very much more expensive and does not do the work any better than the above preparation.

DISPOSITION OF PAUNCH MANURE.

It is a trade rule that all live stock must be fed and watered before being offered for sale, consequently when cattle are killed the day they are bought the stomach is comparatively full and in many localities it is a serious problem to know what to do with the paunch contents. It is valueless as a fertilizer, simply being masticated hay and water. Where packing houses are located on rivers, it is easily disposed of by letting it flush through the sewers. Where this can not be done the disposition of it is a serious problem. The most approved method, up to date, is to press it and burn it. A machine known as the "extractor" is manufactured by V. D. Anderson & Co., of Cleveland, Ohio, which is the only device made, outside of a hydraulic press, which works satisfactorily, and as pressing it by a hydraulic press is very expensive the "extractor" is generally used. This manure being properly pressed and mixed with screenings or very fine coal has a heat unit value. A careful perusal of the following test will show the comparative results of mixing manure with coal and burning the coal separately. This is not submitted with a view to recommending the purchase of this kind of material as fuel, but instead, to show that a refuse which is extremely hard to dispose of in some cases can be disposed of in this manner and a small revenue from same may thereby be obtained; whereas, if it is necessary to load it into cars and switch it to some vegetable district it would be extremely expensive, and besides, the product has no value as a fertilizer.

TESTS TO DETERMINE VALUE OF PAUNCH MANURE AS FUEL.

Same kind of coal (screenings) used in both tests. Furnace, 7 x 12 feet:

BOILER TEST NO. 1.

Diameter of boiler shell, inches	66
Length of shell, feet	18
Number of tubes	187
Diameter of tubes, inches	4
Heating surface, square feet	4,000
Grate surface, square feet	84
Ratio heating to grate surface, per cent	4.76
Duration of test, hours	8
Average steam pressure, pounds	144.7
Average temperature of feed, in degrees Fahrenheit	196
Pounds of coal burned	22,800
Per cent of moisture	9
Pounds of refuse	2,938
Pounds of combustible	17,810
Per cent of ashes	12.8
Coal burned per square foot grate per hour	34
Total water evaporated, pounds	149,850
Water evaporated per hour, pounds	18,731
Water evaporated per square foot heating surface per hour, pounds	4.68
Water evaporated per pound coal, actual conditions, pounds	6.57
Water evaporated per pound coal from and at 212° F. pounds	7.01
Water evaporated per pound combustible, actual conditions, pounds	8.35
Water evaporated per pound combustible, from and at 212°, pounds	8.90
Rated horsepower	400
Horsepower from 196 feed and 144.7 pounds pressure	579
Per cent above rated capacity	44.7
Temperature flue gases, in degrees Fahrenheit	548
Force of draft in inches of water	.8
Cost per thousand pounds of water	.0837
Cost per horsepower per hour	.0029

BOILER TEST NO. 2.

Furnace of same dimensions, heating surface, grate surface, etc., as in test No. 1. Same kind of screenings used with paunch manure.

Duration of test, hours	8
Average steam pressure, pounds	140
Average temperature of feed, in degrees Fahrenheit.	199
Pounds of coal burned	17,700
Pounds of paunch manure burned	5,538
Per cent of moisture	9
Pounds of refuse	3,224
Per cent of ashes	13.8
Coal burned per square foot grate per hour	26.3
Manure burned per square foot grate per hour	8.2
Total water evaporated, pounds	136,500
Water evaporated per hour, pounds	17,062
Water evaporated per square foot heating surface per hour, pounds	4.28
Water evaporated per pound manure, actual conditions, pounds	3.6
Water evaporated per pound manure from and at 212° F., pounds	3.8
Rated horsepower	400
Horsepower from 199 feed and 140 pounds pressure.	524
Per cent above rated capacity	31
Temperature flue gases, in degrees Fahrenheit	540
Force of draft, in inches of water	.8

Cost per horsepower per hour, taken as $0.0837. Paunch manure is worth $0.60 per ton.

FATTENING CHICKENS.

Killing and handling of poultry has become a very large factor in the packing business at all points where meat packing is done on an extensive scale. It has always been a business that commanded a great deal of attention and it has been done quite generally, although it is only within recent years that it has been developed to large proportions.

It is not intended to go into details of the poultry business as this is a subject so many-sided that it would be impossible to do it justice within the limits of this volume. The feeding of chickens has become a modern industry and is certainly an interesting subject.

Anybody in the poultry business soon discovers, after buying live chickens promiscuously, that they have a

" tail end " which is very undesirable on account of being light weight and poor. In buying poultry in large quantities a great many of these birds are brought together and they can, if handled properly, be fattened rapidly as follows:

The chickens are put into coops 24 inches square and 11 inches deep, six birds to the coop. These coops have galvanized iron bottoms, which can be slipped out and washed in order to keep them clean, and are provided with a drinking cup. The coops are stacked up, one upon another, in a shed consisting, for summer use, of merely a roof to keep off the rain, and which is open on four sides, the coops being piled up to the outer sides of the sheds.

The shed is furnished with heavy canvas curtains on rolls painted black. When the chickens are to be fed, the curtains are rolled up, giving them daylight. They are given about one-half hour in which to eat, when the curtains are again dropped, leaving them in darkness. They should be fed about nine in the morning and again about five in the afternoon.

The feed consists of seven parts of oatmeal, one part of raw tallow cut very fine and thoroughly mixed with the oatmeal, the whole mixture made into the consistency of dough with either skimmed or buttermilk. Chickens gain very rapidly on this food for twelve days, and at the expiration of this time, they must be taken out and killed, for if fed longer, they will begin to fall away and finally die. The chickens get no gravel, shells, etc., so necessary for the digestion of their ordinary food, and after a few days' feeding of this material their anatomy changes, the gizzard practically becoming useless. If the chickens were turned loose where they could get their customary food, they would soon die.

This is very much like the German method of stuffing geese, it having much the same effect upon them. The meat of chickens fed in this manner will be found to be more tender and more desirable than that of chickens fed under ordinary conditions. The following shows the result of feeding 11,674 spring chickens for eleven days:

Purchased	11,674 springs, 28,185 pounds
Fed weight	11,674 springs, 34,022 pounds
Gain	5,837 pounds
Cost of food	$273.50
Cost of labor	182.50
Total	$456.00

Cost per pound of gain, $0.078.

PAINT.

The formula given below for making fire proof, rust proof and water proof paints in paste form to be sprayed on surfaces will be found both useful and economical. About packing houses and markets a great deal of paint is necessary in order to keep the place clean and tidy in appearance, and also to preserve the wood and iron. When it is necessary to go to the trade to purchase this article it is often expensive, and matters of this kind that should be attended to are often deferred on account of the excessive expense. A very cheap paint can be made from the following:

CHEAP PAINT FORMULA.

1 barrel lime	$0.45
10 pounds bolted whiting	.10
25 pounds fine salt	.10
10 pounds plaster paris	.10
10 pounds glue	.70
3 pounds Altamann blue	.30
25 pounds crude paraffine	1.00
Cost of material	$2.75
Labor	2.00
Total	$4.75

The foregoing formula will make from 500 to 600 pounds of paste color, or one barrel, and if thinned for spray will make about three barrels at a cost of less than one cent per pound.

The color of this paint would necessarily be white. Any color can be produced that is desired by simply adding the coloring matter. This paint when mixed can be put on with a pump or brush, as desired, and makes a very satisfactory and inexpensive article.

HEKTOGRAPH FILLER.

In the office of any well regulated packing house much use is made of the hektograph for copying reports, orders and other miscellaneous work. The following formula for a hektograph filler is a very cheap one and gives very satisfactory results; the only expense being the pans, which cost but little and can be used for a long period:

Good transparent glue	5 lbs.
Water	6 lbs.
Glycerine	12 lbs.

This should be put into a tin pail and then set in another receptacle filled with hot water, holding it there until the glue is thoroughly dissolved. Pour this mixture into the hektograph pans, while hot, and allow it to cool. The hektograph is then ready for use.

REFRIGERATOR CARS.

No attempt will here be made to go into detail as to the various methods of building, equipping, insulating, etc., of refrigerator cars, as information of this kind can better be obtained from car builders, but the general care of the car for the handling of the fresh product is an item which is entitled to consideration.

As fast as the cars are returned to the company, whenever possible, the doors should be opened and they should be thoroughly aired, as the car, especially in warm weather, is close and damp. Both doors should be opened so that a full circulation of air may result. After this the car should be thoroughly washed with hot water and soap and rinsed with cold water to keep it sweet and clean. It is then ready to be iced.

ICING REFRIGERATOR CARS.

In icing the car it is customary to use from 7 to 15 per cent of salt; in extreme hot weather the latter amount is often used. The ice is put through a crusher, and this machine should be kept in perfect condition so that the ice may be thoroughly broken up. After the tank is about one-half full of ice the salt should be worked in. In filling the balance of the tank at least 50 per cent of the total amount of salt should be left on top, for when the salt has worked its way to the bottom of the tank it is of no further use as an aid to refrigeration. When the tanks are filled, if the main quantity of salt is in the middle, or bottom, of the tank, comparatively small results are obtained from it. The salt must be near the top of the tank, so that as the ice is melted by the action of the salt and a brine is formed which seeps down through the balance of the ice, it will have a chance to melt all the ice possible before it gets to the bottom of the tank. In using this amount of salt, as the reader will understand, it is only done to hasten the melting of the ice, and thus produce a lower temperature within the car.

In hot weather the car should be iced the day before it is to be loaded. The next morning the tank should be opened and after being thoroughly tamped, more ice should be put in, with about 7 per cent of salt. After the car is loaded, the tanks should again be filled to their maximum capacity before the car leaves the place. In all re-icings in hot weather use 7 per cent of salt. In cold weather when there is little or no heat around the car, and on the contrary the insulation of the car serves to keep the contents from freezing, rather than in protecting them from the heat, as in summer, the tanks will require very little ice and salt; but in icing even under these conditions, 4 or 5 per cent of salt should be used at all times, as it will aid in keeping the material in the tanks from being frozen too solidly. The icing of cars in the winter time is of comparatively little importance.

CANNING OF MEATS.

Meat canning is a subject which need not here be treated in detail, as with very few exceptions the canning business is considered an independent one from that of the packing house proper, and is carried on profitably only on a very large scale, in this country especially. In South America and Australia where cattle and labor are cheaper, it has been carried on to a much larger extent.

The practice consists of partially curing the meats in salt pickle, after which they are cooked and put into various sized cans. The cans are then subjected to excessive heat in retorts, after which the vents are soldered or are put through a vacuum process where the air is expelled from the cans and the vents then closed, in each process, leaving the meat in a vacuum. As long as this vacuum is maintained there is no chance for decomposition of the contents of the cans.

The canning of meats makes it possible to dispose of a good many of the cheaper cuts of meat which if not handled in this way would necessarily be of small value, although equally as nourishing and healthful as better grades of meat. In the cooking of the meats a great deal of the animal salts and juices is taken up by the cooking water and this water is afterward evaporated and used for beef extract.

GLUE.

Glue is an article made from many of the by-products from slaughtered animals, but has comparatively little to do with the packing business proper. For this reason little more need be said in this connection than to point out the different products from the packing house from which glue can be made.

In the cooking of the heads and feet a great deal of glutinous matter is left in the water, which when evaporated produces a low grade of glue. The longer the bones are cooked the greater the yield of glue and the proportionately greater damage is done to the bones and, consequently, the manufacture of a strictly commercial hard bone and, at the same time, a large percentage of glue is an impossibility. There is, however, a happy medium at which heads and feet can be cooked and bones turned out in a satisfactory condition, at the same time producing a good yield of glue.

There is, generally speaking, in the cooking of the heads and feet, from 5 to 8 cents worth of glue obtainable per head, cattle count, from the cooking water. The best glue water is obtained from the cooking of the feet, they being of a more gelatinous nature. The sinews which are removed from the feet of the cattle before the bones are cooked make a very high grade of glue, practically equal to hide glues. This material after being taken off the legs should be spread out and dry-salted as described heretofore, and when cured is sold under the head of sinew glue stock. A low grade of glue that is used for paper sizing, paper box finishing, etc., is made from pigs feet, but generally speaking the hind feet are not saved for pickled pigs feet, but instead are used, mostly, in the manufacture of glue.

HIDE GLUE STOCK.

In some instances hides are sold with the pates and the leggings cut off. This, however, is not a common practice. Wherever it is done the pate and leggings are known as hide glue stock, which is considered the best part of all the products from the animal carcass for the purpose of glue manufacture. Suggestions in regard to the handling of glue stock are given under the head of " Bone Department " in Chapter VIII.

CHEMICAL DEPARTMENT.

This is a department which in all of the large well regulated packing houses is considered very essential and the information obtained therefrom, in the saving and the turning into commercial value of the by-products, as well as in determining the value of the products already produced, is turned to good account. Laboratories in the larger plants are fitted up for making exhaustive tests as to the values of the products as well as for ascertaining the most practical methods for manufacturing, and many of the departments of the modern packing house had their origin in the chemical laboratory.

It is also essential that the different products turned out from a packing house be analyzed weekly to determine the results; for instance, the analyzing of blood and tankage. If there should be found to be a lack of the proper percentage of ammonia the matter should be looked up at once and corrected, and if caught in time would mean the saving of a great deal of money. Lard should be analyzed to determine the amount of free acid, hardness, etc. Tallow and grease should be analyzed for the same purpose as well as for showing the amount of impurities. The value of tallow and grease is based upon the hardness and free acid tests, as a tallow or grease which runs low in hardness or titre test and high in free fatty acids is necessarily of a lower value than if it ran high in titre tests and low in free fatty acid, the titre test determining the solidifying point of the greases and the free acid denoting the state of decomposition.

Many useful tests are also made on food mixtures, such as soups, concentrated foods, etc., which are afterward developed in their respective departments into materials of commercial value.

Small packing houses which from the restricted volume of business done would not warrant the outlay necessary for maintaining a chemical department will certainly find it to their advantage to consult chemists who are versed in this particular industry and a great deal of valuable information will thereby be obtained. There are many reputable chemists who make a specialty of looking after packing house work from a chemical standpoint.

KOSHER KILLING.

This term designates the method of killing animals for the Jewish trade. The orthodox Jew of today abides by the same rules that were laid down in the old Mosaic laws for his ancestors. In many of the large cities this trade amounts to considerable, thousands of cattle being killed weekly in this particular way. The killer is known as the " shekter " and is appointed by the rabbi of the congregation. The duty of the " shekter " is to kill the animals by cutting their throats with a knife that is especially designed for this purpose and which is kept extremely sharp with a hone water-stone.

The method of killing cattle is to put a sling or chain around one hind leg, lifting them off the floor with hand or power machinery until the animal falls on one side. The head is next turned over, stretching the neck very tightly, then the " shekter," or killer, with his knife cuts the throat, severing all the veins and arteries. The animal is then allowed to bleed to death. During the course of dressing a careful inspection is made of the lungs by the same man and if they are found to be in a healthy condition, the animal is considered fit for food. If there is any adhesion to the ribs, or the lungs show any signs of discoloration, or disease, the meat is condemned and is known as " trafer." According to the Mosaic law no meat can be eaten where the veins have not been removed, consequently only the fore quarter of the beef is consumed according to the orthodox belief, this consisting of five ribs of the fore quarter and the neck, which is known to the trade as Kosher chucks. The Kosher meat business is a trade that is little known of in America outside of the larger cities.

INSPECTION BY THE UNITED STATES GOVERNMENT.

In nearly all packing house plants throughout the country where business is done on a fairly large scale, government inspectors are maintained by the Federal government, their duties being to make a post mortem examination of all animals slaughtered. An ante-mortem examination is carried on at all of the large live stock centers. The animals after being inspected are tagged or stamped with a government stamp, showing that the animal was in a healthy condition when killed and is fit for human food. Carcasses which are found to be affected or unfit for food are condemned and put into the rendering tanks and disposed of for fertilizer, the grease from such condemned animals being considered unfit for foods of any kind. This inspection by the government is not compulsory and at any time that parties having the inspection do not live up to its rules the inspection is simply refused them, but it is absolutely necessary that each house have the inspection, for without the stamp the meat is not as salable; furtherfore, it has been found that it is absolutely necessary that this inspection be maintained in order to meet competition. It is a great safeguard to the public health, and while it represents hundreds of thousands of dollars a year loss for animals which are condemned, none of the large packers would feel that they could do without this government supervision of their products.

BRANCH HOUSES.

The advent of the centralized killing houses and the refrigerator car for transportation brought into existence the branch house. In all large cities of the United States may be seen branch houses of the large packing firms, these houses being fitted up in various degrees of elegance, and in all cases in a compact and practical manner for the handling of the business at point of location. The fresh meats when received are immediately run into coolers which are cooled either by artificial refrigeration or by ice and they are there offered for sale to the dealers who come to look for their supplies. The managers know the qualities of meats demanded by their different customers and aim to have a variety of meats at all times for sale. One of the secrets of success of the concentration of the packing business, as seen today, is the fact that a careful study is continually being made of the quality and grades of meat which are in demand at different points. For instance, heavy beef

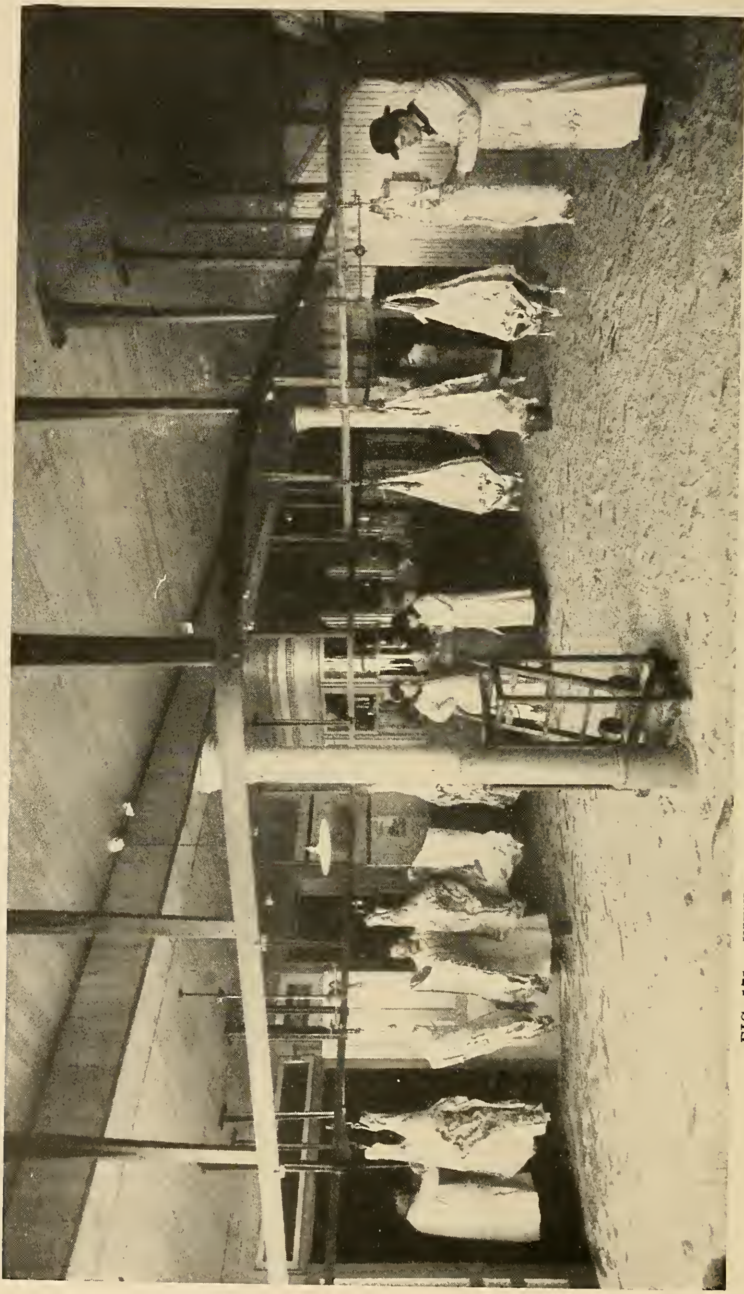


FIG. 171.—VIEW IN BRANCH OFFICE SHOWING SALES ROOM AND COLD STORAGE.

which would be salable in some places might be a drug on the market at other points and sell at an absolute loss, whereas a lighter grade of beef may be in demand at one point and practically unsalable at others. Hence a careful watch of the requirements of each locality is necessary in order to see that the grades and qualities demanded at particular points are obtainable.

CHAPTER XXV.

DEPARTMENTAL ACCOUNTING.

DIVISION OF LABOR.

The large packing house plants are invariably operated on a departmental basis, so that at the end of the month, or year (generally figuring on thirteen periods to the year), a balance can be drawn off showing the profit and loss of each department. There is a great advantage in handling a large business in this manner, for it is probable that while in the aggregate the house is making money, there might be departments that are losing money continuously without being detected unless each one is put on an individual basis. The raw material used is all transferred from one department to another and an account turned into the office on the regular transfer slips. At the end of each period, the office manager, or those in charge, put a price on all the different products transferred from one department to another, generally using the market price which could be obtained if sold to outsiders. This forms a basis of the charge for the raw material in different departments and is credited to the department from which it is received.

The next important feature is the division of labor, so that each department may know just where expense starts and stops and any work that is done by one department for another is credited or debited by labor transfer slips which are turned into the timekeeper's office weekly, thereby keeping track of the proper charges for the labor in each department. A regular charge is also made for a proportionate part, in each department, of the power, steam, electric lights, etc., the same being based on the actual consumption; also proportionate part of the administrative costs, which include supervision, interest, taxes, insurance and general miscellaneous expense.

Against these various debits of the department are credited the products from same, and at the end of every period, the actual results are evident as the raw product was charged to the department at the actual cost. If the department has lost money it is time for change of management or discontinuance of that particular branch, selling the raw material on the market.

This is very valuable information and no well managed packing house is without it. The following pages give details of the general labor distribution, this being the principal expense in the department and also the one which is found to be the hardest to keep straight. If one or more plants are operated on a competitive basis it is essential that the labor distribution be exactly the same in order that an intelligent comparison may be made.

DRIVING AND YARDING CATTLE.

This account includes a portion of the drivers employed in driving cattle and carts—all the labor relative to the driving of cattle from the time purchased until same are delivered in the catch pen on the killing bed. The yard men at the plant are carried on the beef-beds pay roll and 90 per cent of the men's time, weighing, tending and yarding, is charged against cattle drivers, also half of the men's time driving up to the catch pen;

the balance of their time being pro-rated as noted further on under head of "Sheep and Hog Drivers."

CATTLE SLAUGHTERING.

This department takes the cattle as delivered by the yard men into the catch pen, the charges including half of one of the yard men's time, and from this point doing all necessary work until cattle are set on the rail in the cooler.

This department also trucks caul fat and delivers to the chute leading to the tallow floor, the tails to the coolers and truck refuse to tank. The last item will be charged by labor transfers from the tallow trimming department. In figuring the daily killing expense, the actual killing cost starts from the catch pen and ends with the men pushing over, after the cattle are hung off.

The washing gang starts from this point and includes the labor until cattle reach the scale with the exception of a charge of one-half the man's time doing the scribing, which half is charged to the "hot line." The "hot line" then takes the cattle from the scale with the above exception and places them in the cooler, pulling the rags from the necks, wiping and setting them for chilling. "Hot line" includes cost of scaler and boy stamping tags.

TALLOW TRIMMING.

This department takes plucks, paunches, pecks, reeds, livers and all miscellaneous fats as delivered to them through the chutes from the killing beds, trims same and delivers the products either to the tank house or oleo chill vats. As the livers are not sent down to the tallow floor, the tallow trimming department's labor on these includes the trucking and trimming of same upon the killing floor till livers are hung in the cooler.

HEAD BONING.

This department takes the heads as delivered in the vat from the killing floor, tongueing, cheeking and trimming same, delivering the tongues to the tongue cooler and spreading on racks; cheeks to the beef curing, brains to the offal department and bones to the bone house. When cleaning calves heads and feet the labor on same is charged to the offal department. This department is charged its proportion of time from the tallow trimming department for scaler, also its proportion of time from casings department for foreman's time. The lips after being trimmed off are delivered to the man scalding and scraping same.

BEEF CASINGS.

This department takes the sets as delivered by the killing floor doing all necessary fatting and cleaning on same. This account also includes the stripping and blowing of the weasands, trimming and blowing of the bladders and hanging them in the dry room. After the bladders and weasands are dry, taking them from the drying room, trimming and packing them is charged to "casing, packing and loading account." The salting, packing and loading of casings are carried separately on expense sheet. All fats in this department are trucked away and delivered to the fat vats by the tallow trimming department.

COOLER AND LOADING.

This department takes the carcasses, tagging, weighing and loading same for shipment. It also loads the mutton, veal and part of the heavier cutting room products. Their pay roll is sub-divided on the percentage of weights handled for each of the above departments, mutton being increased threefold to place it on the same basis as beef.

This department also includes the pulling of skewers, trimming off necks, skirts and drops after cattle are chilled, and delivering these products to the trimming room. They also do all necessary sacking of cattle. All deliveries of cattle to be made to the wholesale market are made by this department. The foreman furnishes a weekly report to the timekeeper's office showing the weights of cutting room products loaded, also the number of cattle sacked and the total cost of same.

HIDE CELLAR.

This department is sub-divided into "green hides," "cured hides," and "hide loading." The labor on green hides starts with the inspection on the killing beds (but does not include the labor of trucking and spreading them). It includes all labor after the hides are delivered to the cellar until salted and placed in packs. Any unloading of salt for this department is charged to green hide account. Cured hides includes the labor of taking up the hides and placing them in bundles on the floor, ready for the loading gang. Loading of hides from this point and placing them in car does not include cost of weighing for shipment. The cost of inspecting and handling of pelts, which is done by this department, is charged to "sheep pelt putting down account," any unloading of sheep pelts being charged to "sheep pelt loading account." Where salt is unloaded for use in salting pelts, the labor on same will be charged to "sheep pelt putting down account." This department salts sinews and charges the labor on same against the bone house, also all labor of loading same is charged against "bone house loading account." A weekly report is furnished by this department to the timekeeper's office showing the number of hides and pelts loaded.

TANK HOUSE.

This department is sub-divided into four accounts, viz.: "Tank house cooking and pressing," "tank house loading," "catch basin" and "prime steam lard."

All other labor, such as loading tank cars, tiercing and pumping lard, is charged to prime steam lard account, on the actual cost of same.

A weekly transfer is made against "catch basin," for the men employed in this class of work. Any department, however, that received credits for the products skimmed from the catch basin must stand the labor. All loading of tallow is charged to tank house loading account. All loading of prime steam lard in tierces or tanks is charged to prime steam lard account. The labor of cooking and pressing of blood is transferred weekly against fertilizer account. All washing of tank cars is transferred weekly against car cleaning account. After the above charges have been credited to tank house pay-roll the residue is the tank house cooking and preserving account which includes all labor, from the time products going into the fat tanks or hog grease tank are delivered to the tank house floor, until tallows and grease are run off and tierced and tankage is pressed and delivered to fertilizer. The prime steam lard account ends with the running-off and tiercing or pumping to the refinery of the prime steam lard and does not include any labor on the tankage from these products. A weekly report is sent to the timekeeper's office of the production of prime steam lard up to 5:30 p. m. each Saturday.

BONE HOUSE.

To this department is charged a sub-division from the tank house pay roll for the foreman's time. It handles all bone products from time delivered to it by the killing floor until same are placed in the bins for storage, all loading being charged to "bone house loading account." As stated under hide cellar account the bone house is charged with the labor of salting and loading of sinews.

This department manufactures all oils and tallows produced from the bones, and any scraps which are found are delivered to the tank house.

FERTILIZER.

This account is sub-divided to "fertilizer cooking, pressing and drying," "fertilizer grinding and sacking," and "fertilizer loading." A charge made from the tank house for their portion of the foreman's time, also for the cooking and pressing of blood, is carried in the fertilizer cooking, pressing and drying account. To this account is charged the cost of taking the blood from the vats on the killing floor, cooking, pressing, drying and delivering same to the storage; also of the tankage from the tank house, drying and storing same.

To grinding and sacking account is charged all cost of taking the blood and tankage from the storage room and of grinding and sacking same for shipment. All labor for loading these products is charged to fertilizer loading account.

The foreman of this department furnishes a weekly report to the timekeeper's office, showing the tons of tankage and blood cooked, pressed and dried, up to 5:30 p. m. each Saturday, also at the same time the tons of tankage and blood ground and sacked.

OLEO MELTING.

The labor of this department starts when the fats are delivered into the chilling vats and includes the chilling of same and all labor from there until the oleo stock is set on the seeding floor. This department includes the pressing of scrap and the manufacture of laundry stock.

OLEO PRESSES.

The men in this department take the stock from the seeding floor, pressing and tiercing the oil and stearine, and place same in storage. The clerk's time carried in this account is charged in full to oleo presses, but three-quarters of the foreman's time is charged against oleo melters. This department turns in to the time keeper's office, a weekly report showing the number of tierces of oil and stearine packed from the amount pressed, up to 5:30 p. m. each Saturday. There is a transfer made for tiercing the oleo stock against oleo melters.

OIL HOUSE LOADING.

This includes the charges for labor in loading of oil house products, or delivery of oil or stearine to the lard refinery.

TONGUES.

This department includes all labor on trimming, packing, curing and loading of beef, and calf tongues. The labor of trimming sheep tongues and pig tongues, which is also done by this department, is charged respectively to " sheep offal " and " hog heads " departments. The trimming of tongue trimmings and delivery of the meats to the cellar and fats to the oil house and tank house are made by the tongue department.

BEEF TRIMMING.

This department takes the necks, drops and skirts as delivered by the cooler and loading department and delivers the products either for shipment or to the next department handling same. It does not include the trimming of cutting room products.

BEEF TRIMMING LOADING.

Includes the labor of loading beef drops or the trimming from the necks, and is a pro-rated charge from the trimming loading account.

CLEANING CARS.

This work being done by the labor gang, the labor is charged by direct transfer for the actual cost of cleaning cars and their equipments. This department reports to the time keeper's office each week the number of cars cleaned.

ICING CARS.

This department includes all labor of icing cars and hooking up same for beef loading. The cleaning of refrigerator boxes being done by this department, a transfer is made against the departments using same on the basis obtained from the relative number of boxes used in each department.

The repairing and cleaning of liver racks are charged weekly against the "miscellaneous mechanical account." This department furnishes a report to the time keeper's office each week of the number of cars iced.

CALF KILLING.

A direct transfer is made from the sheep killing department against "calf killing" for the actual labor of killing and skinning calves. The foreman of this department reports weekly to the time keeper's office the number of calves killed and skinned.

CALF CHEEKING.

Calf cheeking includes the labor of saving tongues, calf cheeks and brains, and of delivering same to the offal cooler, tongue cooler or beef curing department.

CALF COOLER AND LOADING.

This charge is made, as previously stated, in the beef cooler loading account on a percentage division of the pounds of veal loaded pro rata to the pounds of beef loaded.

SHEEP DRIVING AND YARDING.

This department takes the sheep after buying and delivers them to the chute leading up to the killing floors. Account is kept by a direct transfer covering the actual number of men employed in driving sheep from the stock yards. There is also a charge against the account of 4 per cent of the men's time, due to weighing and yarding; charge being made by transfer from the beef beds.

SHEEP KILLING.

The labor in this department starts when the sheep are placed in the chutes and includes the dressing, weighing and setting of same on the rails in the cooler for chilling. When not saving sheep casings, this account also includes the labor of stripping the fats from the casings and the delivery of all fats to the oleo chill vats.

SHEEP OFFAL.

This includes the trimming of plucks and the delivery of same hung up in the offal cooler; also the saving of brains and delivery of same to the offal cooler. When not saving sheep plucks, this account will cover the trimming of the plucks and delivery of the products from there to the next department using same. Also the saving of tongues and delivery to tongue cooler.

SHEEP PELTS.

This charge is made by labor transfer from the "hide cellar" as previously stated.

SHEEP PELT LOADING.

Includes all labor of loading of sheep pelts; also the bundling of them if same are to be shipped in bundles.

SHEEP TONGUES.

This account is covered by direct transfer from the beef curing department for the curing and packing of sheep tongues.

SHEEP CASINGS.

When the set of casings is delivered to this department the labor charge starts from there and includes pulling and stripping of the casings and turning and sliming of the bungs; also, when casings are cleaned and packed, all cleaning and packing of same. When not saving sheep casings all labor of stripping out the fats, and tanking of them, is charged to "sheep killing."

OLEO MELTERS—SHEEP.

This charge is covered by direct transfer made from the "oleo melters beef account" on the ratio of the pounds of sheep fats sent to the oil house.

OLEO PRESSES—SHEEP.

This account is covered by direct transfer from "oleo presses, beef account" on the percentage established by the proportion of sheep fats going to the oil house.

COOLER AND LOADING MUTTON.

As previously stated in "cooler and loading," mutton is a sub-division made on the basis of pounds of mutton loaded, figuring this weight threefold in order to place it on the same basis as loading of cattle.

HOG DRIVING AND YARDING.

This department, which takes the hogs after purchase, is charged, by transfer, with the actual labor of men employed in driving from stock yards to the plant, also 6 per cent of the scale and yard master's time at the plant, which transfers are made from the killing beds; also a transfer from the stable for man driving crip cart. Delivery is made by this department into the catch pen at the killing floor. A transfer is also made from the hog killing department for the cost of yarding and driving onto the killing floor.

KILLING PACKER HOGS.

The labor in this department starts at the time hogs are driven into the catch pen and includes all labor from there on until hogs are delivered and set on rails in the cooler; leaf lard is delivered to leaf cooler and hung up; plucks, kidneys and chitterlings are delivered to offal cooler and hung up or spread; heads are delivered in chute leading to hog head gang; casings are delivered into conveyor and hog hair is delivered into chute. The man attending to hog scraper is not included in this pay roll.

KILLING SHIPPER HOGS.

The rule that applies to killing packers will also apply to this account. Transfer is made against " shipper account " from " packer account " for the cost of killing and dressing same.

HOG CUTTING.

The labor in this department starts with taking the chilled hogs from the cooler, cutting them and delivering the cut meats to the loin cooler cellars, and all fats and trimmings to the pork trimming department.

FRESH PORK PACKING.

This department takes the cuts as delivered to them by hog cutting department, weighing, packing, marking and checking same for shipment. All loading done by this gang is charged to the " fresh pork trimming loading account." The foreman reports to the timekeeper's office the number of pounds packed each week.

TRIMMING LOADING PORK.

This account is either a direct transfer for the "loading fresh pork products" or else a sub-division of the regular "trimming loading account," on the ratio of pounds of fresh pork loaded.

PORK TRIMMING ROOM.

This department takes the fats as delivered to them by the hog cutting gang, attends to the trimming and assorting of same, delivering the lean trimmings to the sausage or curing departments, and the bones or fat to the prime steam lard tanks. The foreman of this department furnishes a weekly report to the timekeeper's office of the number of pounds of pork trimmed.

DRY SALT PORK CURING.

All meats handled by this department are delivered on its floor by the hog cutting gang, from which point the labor starts and includes all curing, packing and loading of dry salt meats. To cover this labor there is a direct transfer from the sweet pickled pork curing department. The foreman of this department reports the number of pounds of meat received from the cutting floor and from outside parties; also all shipments and deliveries to smoke house or other departments, thus showing the total pounds handled. This report is to be turned into the timekeeper's office weekly, to include up to 5:30 p. m. Saturday.

SWEET PICKLED PORK CURING.

Labor in this department starts after a delivery of the products by the cutting room and includes the packing, curing, shipping or delivery to the smoke house or department using such products. The foreman and stock clerk's salary is charged one-third to "dry salt pork curing accounts." A transfer is also made from this department against "barrel pork account" to cover all labor of packing, curing and loading of barrel pork products. A transfer is made against "pigs feet account" for the curing and handling of pigs feet. The foreman of this department reports weekly, to the timekeeper's office, the number of pounds of meat received from the cutting floor or from outside parties; also the amount of shipment or deliveries to smoke house and other departments of loose sweet pickled productions, thus showing the total weight handled by the sweet pickled pork curing department. He also reports actual weight of the barrel pork packed.

PRIME STEAM LARD.

This account was explained under head of "Tank House."

PIGS FEET.

Labor in pigs feet department starts with the receipt of the rough feet from the cutting floor, scalding, toeing and shaving same, also curing, packing and loading. The cost of scalding, shaving and packing is covered by the regular "pigs feet pay roll." The cost of curing, by transfer from "sweet pickled pork curing" department and the cost of loading by transfer from "trimming loading" department. The foreman of this department reports weekly, the number of pigs feet saved.

PIGS TONGUES.

This account covers only the curing, packing and loading of tongues and is covered by transfer from the beef curing department.

HOG HEADS.

Labor in this department starts when the heads are delivered by the killing department and includes the tongueing, trimming, cheeking, saving of brains, delivery of fats and bone to the tanks, and delivery of all other products to the next department handling same. When heads are saved for shipment and cleaned, both the product and the labor are charged to offal account.

HOG CASING.

This department starts with the delivery from the killing floor of a set of casings and includes pulling the small casing and cleaning same; salting and packing being a separate account. Pulling, salting, trimming and packing of the bungs is also a separate account. Loading is charged to each account respectively. Unloading of salt is charged to "hog casing, packing and loading account."

HOG HAIR.

This department takes the hair as delivered at the bottom of the chute, spreading same on the hair field, and sacking and loading same for shipment.

SMOKE HOUSE.

All departments make their deliveries to the smoke house by dumping their products into the soaking vats. The labor therefore starts from this point and includes all smoking, inspecting, packing and loading. There is, however, a sub-division termed "smoke house canvasing and whitewashing account," which covers the labor on the burlapping, or canvasing, or whitewashing products. In making dummy hams or bacon this labor is charged to advertising account. The foreman of this department turns in weekly a report showing the total shipments, up to 5:30 p. m. each Saturday.

SMOKE HOUSE CANVASING AND WHITEWASHING.

This department takes the meats after being smoked and inspected, canvases or burlaps them and delivers them on racks to the drying room. From this point labor again reverts to the general smoke house account. The foreman of this department turns in a weekly report to the timekeeper's office, showing the number of pieces canvased or whitewashed.

LARD REFINERY.

This is sub-divided to manufacturing or loading accounts. Manufacturing covers all labor pertaining to the manufacture of lards other than prime steam. They must go to the leaf cooler for their leaf lard and to the cutting floor for back fat or cutting fat. All other products are delivered to their departments. Labor in this department ends after the lards have been packed and placed in storage. From this point it is considered the "lard refinery loading account." All labor of loading and storing in cars is charged to that account. All unloading of packages or materials to the lard refinery are charged to "lard refinery manufacturing account." Lard refinery will unload cotton seed oil or any other products received from outside parties. The foreman of this department turns in a weekly report to the timekeeper's office at 5:30 p. m. each Saturday showing the amount of lard the refinery has produced.

SAUSAGE ROOM MANUFACTURE.

This department receives all products after their manufacture from other departments, with the exception of blood, jowl fat and hog stomachs. It is understood that they are to call and get any jowls, catch any blood they may need, bring the hog stomachs from the killing floor and sliming them for their own use. This department ends with the delivery of the manufactured sausage to the packing room. Any unnecessary trimming due to the fact of the pork trimmings not coming in the proper manner are charged to the pork trimming account. Same also applies to beef products which are charged to beef trimming or beef cutting accounts, respectively.

This department chops out the knuckles and packs them and transfers to the hog cutting department for chopping out the knuckles, and to the fresh pork packing account for the packing of same. The foreman of this department turns in a weekly report showing pounds produced.

Labor of curing beef cheeks, sheep cheeks, weasand meat and beef head meat when cured in sausage room is charged to "beef curing." Labor on sheep hearts and pig hearts is charged to offal department when cured in sausage room and products transferred at the cured price. Labor of curing pork cheeks and hog head meats is charged to sweet pickle pork curing.

BOILED HAM ACCOUNT.

The labor in this department starts after the hams have been delivered and includes boning, trimming, tying and cooking same and delivery to the packing room. The foreman of this department turns in to the timekeeper's office a weekly report showing pounds of boiled hams produced. As this account is a sub-division of the sausage room it is handled by a labor transfer from that department.

SAUSAGE PACKING AND LOADING ACCOUNT.

This department being a sub-division of the sausage room, the labor on same is charged by a labor transfer from the sausage room. The labor includes the cost of packing and loading of sausage and boiled ham products. The foreman of this department turns in a weekly report showing the total weight of his shipments.

CUTTING ROOM.

This department takes the carcasses where set on the rail in the cooler, cuts up same, trims all fats and meat from them, and packs for shipment or delivery to freezer (boxed or loose). All other meats are delivered to the curing department; fats and bones to the respective departments receiving same. All unloading done for this department is charged to "cutting room loading account."

FREEZER.

This department takes all products, with the exception of poultry, as delivered to them; stores, freezes and ships out as ordered. They report, weekly, to the timekeeper's office, weight of products received and shipped. On poultry products all labor of handling in and out is charged by labor transfer against the poultry department.

BEEF CURING.

This department takes products as delivered to it, curing and loading same or delivering to next department. The cleaning of ox lips is charged to this department and transfer is made against the "offal department" for any offal cured. Also against "beef tongue department" for curing, packing and loading beef tongues; also against "pig tongue department" for curing, packing and loading pig tongues; also against "sheep tongue department" for curing, packing and loading sheep tongues. Calf tongues are considered the same as beef tongues.

All curing of pork products is transferred against the "sweet pickled pork curing department." On this transfer it will be necessary to show the pounds of pork products handled. The foreman furnishes the timekeeper's office with a weekly report showing the receipts, also all shipments and deliveries to other departments, thus showing the total number of pounds handled.

OFFAL.

After all products are delivered, hung up, when necessary, or spread on racks, the handling, packing or loading of same comprises the labor of this department. The cleaning of hog stomachs for canning room is charged against the offal department, also the cleaning of calves heads and feet. The trimming of sheep tongues and pig tongues, when done in this department, is charged respectively to "sheep offal" and "hog head" accounts.

TRIPE.

This department is sub-divided into the "tripe cleaning" and "tripe packing and loading" accounts. The tripe cleaning account covers all labor from the time the tripe is delivered by the tallow trimming account until same have been cleaned and delivered or spread on racks in the offal cooler. From this point the account is "tripe packing and loading" until shipped.

This department makes all deliveries of their fats and scrap to the tank house. The foreman furnishes a weekly report showing the weight of tripe cleaned, being the net drained weight.

MANUFACTURED ICE.

This account starts with the filling of ice cans and includes all labor until ice is placed in the storage room. The foreman of this department furnishes a weekly report to the timekeeper's office showing the tons of ice pulled.

ICE LOADING ACCOUNT.

This department takes the ice from the storage room and loads cars or wagons, as the case may be. All ice for use around the plant is to be called for by the parties requiring same.

STABLE.

This account includes all miscellaneous drivers and cart men. The time of the cart men being charged out by labor transfers, to the department benefited or to "Yard Cleaning."

YARD CLEANING.

Yard cleaning is charged by weekly transfer from the stable account for all miscellaneous work on the carts and for hauling refuse about the plant.

BOILER ROOM.

This department includes the unloading of coal, cleaning of boilers, attending to the fires in same, and delivering the ashes to the cars or carts, all done by the firemen.

ENGINE ROOM.

There are two brine tenders carried on this pay roll whose time is charged direct to refrigeration account. Three men attend motors and switch board, transferred 10 per cent to "electric light" and the balance to "power" account. The residue of the engine room pay roll is transferred on the regular percentage basis, 69 per cent to refrigeration, 21 per cent to power, and 10 per cent to electric light accounts.

COOPERAGE.

This department attends to the receiving and coopering of all new and second hand packages, also the washing of all second hand packages. No deliveries are made to the departments, but when men of this department are employed in outside work, for other departments, such as heading up tierces, etc., a direct transfer is made for this labor. All second hand packages returned from customers are turned over to this department, re-coopered, washed and issued to departments using same. The foreman turns in to the timekeeper's office, weekly, an itemized report showing the packages which have been issued from the department, his expenses being figured on this report.

MISCELLANEOUS ACCOUNT.

This account is sub-divided by labor transfer at the end of each week to the following accounts:

Watchmen.	Shipping office.
Fire marshals.	Scalers.
Superintendent's office.	Storeroom.
Time keepers.	Railroad yard master.

Each of the above accounts is charged with the actual number of men employed in that special line of duty.

PACKING HOUSE MACHINERY AND SUPPLIES.

The following is a list of the leading houses in America manufacturing and dealing in machinery and supplies for packing houses and butchers:

Allbright-Nell Co....................4019 Wentworth av., Chicago, Ill.
Bechstein & Co.........................100 Michigan st., Chicago, Ill.
Brecht Butchers Supply Co.............................St. Louis, Mo.
Cincinnati Butchers Supply Co......................Cincinnati, Ohio.
Illinois Casing Co......................131 Michigan st., Chicago, Ill.
Berthold Levi & Co..................232 Washington st., Chicago, Ill.
Mechanical Mfg. Co..................Union Stock Yards, Chicago, Ill.
S. Oppenheimer & Co....................440 Wabash av., Chicago, Ill.
Wm. R. Perrin & Co...............Loomis and 46th sts., Chicago, Ill.
M. Waixel & Co..........................Fulton Market, Chicago, Ill.
Weir & Craig Mfg. Co.................2421 Wallace st., Chicago, Ill.
Wolf, Sayer & Heller.............Fulton and Peoria sts., Chicago, Ill.

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