and preparation of the meat, either by refrigeration or curing, in such a way that it will stand a journey to any part of the world and reach the retail dealer in a perfectly clean, wholesome, and palatable condition.

Broadly speaking, there are three methods of preservation, namely, refrigeration, curing, and canning. The present article will deal with the methods of refrigeration and curing as carried on at the establishment of Swift & Co., through whose courtesy we obtained ample opportunities to examine every detail of their plant during a recent visit to the stock yards. The art of meat preservation may be described as a process for the arresting of that law of nature by which all animal tissue, as soon as life is extinct, tends to become resolved by a process of deterioration into its chemical constituents. This can be done either by lowering the temperature of the meat to a point below that at which the bacteria are active, or by treating it with certain salts and substances which secure the same effect. It will be evident at once that the very first requisite in work of this character is that the animals must be absolutely healthy and in first-class condition.

One of the strongest impressions produced upon a visitor to the packing houses is that every possible precaution is being taken to insure the entrance only of healthy animals into the dressing room, and provide for the detection and removal of any that excite the slightest suspicion. This part of the work is in the hands of the United States government, and is under the immediate supervision of the United States Department of Agriculture. The inspection is divided into two kinds—the *ante mortem*, which takes place when the cattle are unloaded into the stock pens, where any animal which by its appearance or actions indicates that it is not in perfect condition is rejected or held for further examination; and the *post mortem*, which takes place after the killing, and consists in a careful examination of the various organs. The *post mortem* examination is made at various points during the process of cutting up, and is continued on the dressed and cured meats up to the very hour of shipment. The personnel of the inspection corps is made up of men who must have successfully completed a three years' course in veterinary medicine at a reputable veterinary college. The Civil Service Commission examines these graduates and about 50 per cent of those examined make the desired grade of 70. The salaries are generous and the promotion of men to higher positions is dependent upon ability. The force is divided into the head inspectors; the laboratory inspectors, who have to pass a civil service examination in bacteriology and chemistry; the inspector's assistants, who examine live stock, stamp the meat, seal the cars, and superintend the removal of condemned meat; and the meat inspectors, who are experts in pickling, salting, smoking, and otherwise curing the meat. We made it a point to converse with several of these men and found them to be intelligent and zealously interested in their work. They stated that the packing-house management was disposed to give hearty co-operation, realizing that the more satisfied the public was of the thoroughness and unbiased character of the work, the better it would be for the houses concerned.

The cattle, after inspection and purchase in the pens, are driven along runways to the dressing floor. The animal is stunned by a blow with a large hammer and hoisted by means of a shackle attached to the hind legs onto the rail of an overhead tramway. While in an insensible condition it is dispatched by severing the principal arteries in the neck. It is then carried forward on the rail; and the operations of dressing follow in quick succession. First the lower joints of the legs are removed, and then the "sider" skins the animal as far down as he can without exposing the parts to contact with the floor. The animal is next opened and the viscera are removed. By means of saw and cleaver the beef is then split entirely in two through the vertebræ. The rough pieces of meat, the spinal cord and other portions are then removed by the trimmers. Next the separated parts are moved down the rail in front of long benches, where other workmen give them a thorough washing with hot water, using a stiff brush from the center of which a hose throws a stream of water against the meat, which is subsequently wiped thoroughly dry with clean cloths. By this time the beef is ready to be passed on to the chill room.

During these various processes the meat has been subjected to careful scrutiny on the part of a United States inspector. When the head is severed an inspector examines the glands which are the common seat of tubercular trouble. At the removal of the viscera another inspector is on the lookout for any indication of abnormality. If there is any evidence of disease, the inspector attaches to the animal a tag on which are the words "U. S. Retained." This tag is numbered to correspond with the number on the stub, which latter he forwards to the office of the inspector with his report. The suspected animal, with any parts which may have been already separated from it, is placed in an iron truck, wheeled away under the eye of the inspector, and locked up in what is known as the "retaining room," the keys of which never pass out of the hands of the government officials. In this room the animal undergoes a final and more

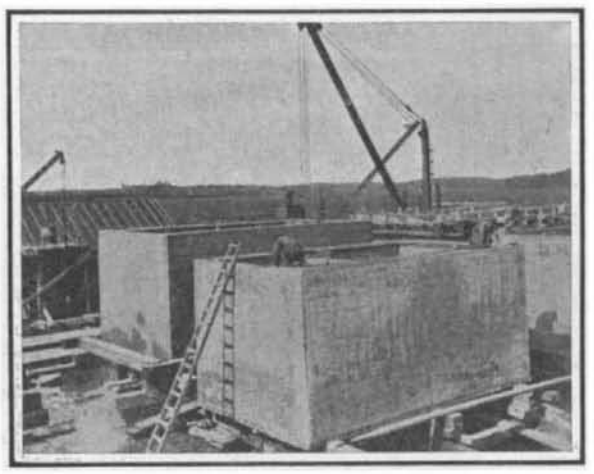

Fig. 1.—Building the caisson.

thorough inspection, and upon condemnation it is removed and completely destroyed.

Returning now to the sides of beef which have been dressed, washed, and wiped, and have passed the inspection above referred to, the government inspector marks each with a metal or rubber stamp which reads "U. S. Inspected and Passed," and the sides are then

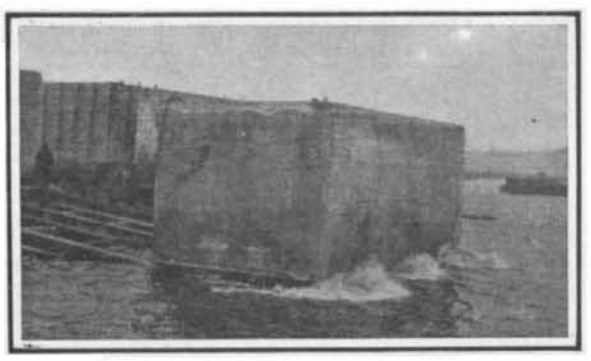

Fig. 2.—Launching the caisson.

wheeled along the overhead rail into a vast apartment known as the chill room, where they are held at a temperature of about 36 deg. F. for forty-eight hours. In the chill room, at the time of our visit, some three thousand sides of beef were hanging. Here, during the time the beef is maintained at the temperature stated, it is subjected to a continual circulation of cold air

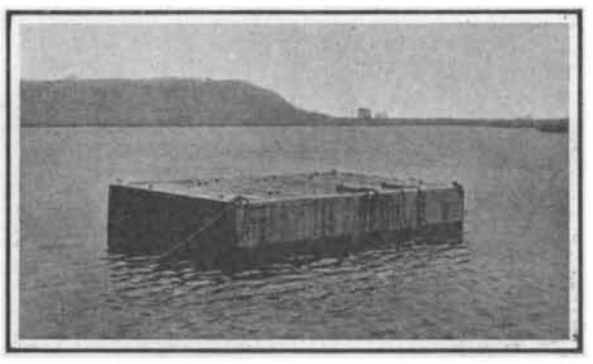

Fig. 3.--Ready to be towed into position.

by a process known as the moist refrigeration method, which is designed not only to reduce the temperature of the air, but also to rid it of bacteria, dust, and other impurities. The cooling and cleansing of the air is done in a large chamber immediately above the refrigerating room. Here are suspended, in long rows extending entirely across the chamber, thousands of

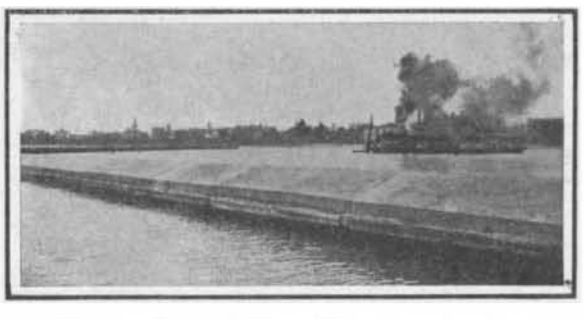

Fig. 4.—Section of completed breakwater.

CONCRETE STEEL CAISSONS.

large sheets of burlap, over each of which trickles continuously a stream of cold brine. The air, drawn in from the outside, is caused to pass between the burlap, where any dust and bacteria which may be in the outer atmosphere are deposited, and the temperature is lowered to the desired point. After passing the burlap, the pure air falls by its own gravity through openings in the floor, arranged directly above the sides of beef in the room below. From the refrigerating room the beef that is to be shipped is wheeled out on overhead rails into the refrigerator cars, where it is hung in symmetrical rows on hooks suspended from the ceiling. At each end of the car is a narrow compartment walled off by boarding which extends from floor to ceiling, but is provided with openings at top and bottom for the circulation of the air; and in these compartments are placed tanks loaded with ice and salt. The air passes in through the vents at the top; is cooled; and falls by gravity to the bottom, whence it issues into the body of the car, a constant circulation of cold air being thus secured.

There are in various parts of the country over three hundred local Swift & Co. distributing houses, where on the arrival of cars the meat is wheeled out on over-head rails into refrigerator rooms, from which it is purchased by the various retail dealers.

CONCRETE STEEL CAISSONS.

A new type of breakwater is being built at Algoma, Wis., of reinforced concrete caissons. These caissons are huge hollow blocks of reinforced concrete, each weighing 120 tons in air. They are 24 feet in length, 15 feet in width, and 12 feet 4 inches in height. They are built over launching ways and are launched like a vessel. After launching they are towed a distance of twelve miles to the harbor, where they are used in the construction of a breakwater.

In the breakwater they rest on a foundation of piles which are cut off 11 feet 4 inches under water. When the foundation has been prepared, the caissons are brought into the proper position and sunk by the admission of water into the hollow compartments. After the caissons have come to a firm bearing, the water is displaced by riprap stone, and this is sealed over with four feet of solid concrete. A superstructure with its crown three feet above the caissons completes the breakwater, which is protected on both sides hy riprap.

Fig. 1 shows several caissons on the stocks; Fig. 2 shows one of these large blocks being launched. One of the caissons is shown afloat in Fig. 3, and Fig. 4 shows the finished breakwater.

These caissons were invented by Major W. V. Judson, who holds a patent covering the invention, and under whose supervision the above breakwater was designed and built.

Disposal of the Heany Patent Fraud Case.

The Heany patent fraud case, which involved a Patent Office examiner, N. W. Barton; a patent attorney, Henry E. Everding; and the inventor, John Allen Heany, himself, has been decided at Washington. Barton withdrew his plea of not guilty, and pleaded guilty. Everding practically admitted guilt to some of the charges, but denied guilt of any wrongful act in connection with one of the applications. Heany offered no evidence whatever. A verdict of guilty was brought in against Barton and Everding. Heany, the inventor, was acquitted.

The case in question involves the tungsten lamp patents, and the ultimate outcome will be watched with much interest.

Official Meteorological Summary, New York, N. Y., December, 1908.

Atmospheric pressure: Highest, 30.53; lowest, 29.38; mean, 30.06. Temperature: Highest, 64; date, 12th; lowest, 20; date, 10th; mean of warmest day, 52; date, 1st; coolest day, 26; date, 10th; mean of maximum for the month, 40.9; mean of minimum, 29.5; absolute mean, 35.2; normal, 34.1; excess compared with mean of 38 years, 1.1. Warmest mean temperature of December, 42, in 1891. Coldest mean, 25, in 1876. Absolute maximum and minimum for this month for 38 years, 68 and —6. Precipitation: 3.21; greatest in 24 hours, 1.91; date, 6th and 7th; average of this month for 38 years, 3.38. Deficiency, 0.17. Greatest December precipitation, 6.66, in 1884; least, 0.95, in 1877. Wind: Prevailing direction, west; total movement, 10,712 miles; average hourly velocity, 14.4 miles; maximum velocity, 50 miles per hour. Weather: Clear days, 7; partly cloudy, 9; cloudy, 15; on which 0.01 inch or more of precipitation occurred, 10. Snowfall, 5.1; sleet, 4th; fog (dense), 12th, 18th, 31st.

A new system of road-making, which, it is claimed, will stand the wear and tear of heavy traffic, such as motor wagons, and be virtually dustless, is to be tried on a more extended scale by the Lancashire County Council. It has already been tested on short lengths of road, and after four years' hard use the road shows no sign of wear. It is made with small granite sets 3½ inches to 3¾ inches, laid in intersecting circles. This method of paving is said to be much more economical than paving with ordinary granite. At the instance of the County Council the system is to be tried on a length of main road between Accrington and Haslingden.