DEPARTMENT OF COMMERCE
U.S. BUREAU OF FISHERIES

Economic Circular No. 27, Second Revision : : : : : Issued October 25, 1917

A PRACTICAL SMALL SMOKEHOUSE FOR FISH:

How to Construct and Operate It.[a]

INTRODUCTION.

In nearly every locality there are fishes of good food quality that seem to find no place in the ordinary domestic economy merely because they have not the most approved flavor or texture when prepared in the usual manner or because the bones are found troublesome. Among these are the bowfins, mooneyes, buffalofishes, carps, and sturgeons. Yet these fishes, when cured by the simple process of smoking, are of excellent flavor and may be kept several weeks if protected from mold. As a result of smoking, the flesh acquires a firm texture that makes the removal of bones much easier than in the case of fried, baked, or boiled fish.

Many fishermen find it difficult to dispose of their catch of the larger or "coarser" fish except at the very lowest prices, but if the fish are properly smoked, which requires very little labor or expense, a much higher price may be commanded. It is an additional advantage that the cured fish do not have to be dumped upon the market immediately, but the sales can be distributed over a period of several days, if necessary. Furthermore, the customer who would buy only 2 or 3 pounds of fresh fish for the day's use can properly purchase a supply of smoked fish to last one or two weeks. The smokehouse also solves a problem for the owner of a fish pond or lake who wishes to capture from time to time quantities of the "waste" fish, as he may deem them, that seem to crowd the game fish from his pond.

A small and easily operated smokehouse for fish is, therefore, a convenient apparatus and a profitable investment for the fisherman and for the pond owner. It will also serve a useful purpose to others. The cheaper fish are often sold at the river for nominal prices, from 1 to 3 cents a pound, while meats of equal food value cost several times as much. The householder would then be wise to purchase a quantity of the fish, smoke them in his own back yard, and stock the pantry with nutritious and palatable food, while effecting a real measure of economy. Here is evidently a good opportunity for cooperation between neighbors.

Most persons like smoked fish. Others find it an easy taste to acquire. A word of caution should be offered. Do not judge smoked fish by the hastily, carelessly prepared product that some fishermen are willing to sell. A couple of hours' hard smoking under improper conditions may make a "smoked fish" in appearance but not in fact. Again, fish are sometimes smoked with excessive and long-continued heat until the product is dry and unattractive, and edible only when cooked. The smoking operation is simple, but thought, care, and

[a] Based on experiments by J. B. Southall, United States Fisheries Biological Station, Fairport, Iowa, and by others.

observation are required to get the most desirable results. Try smoking your own fish if the opportunity occurs; it is an interesting experience.

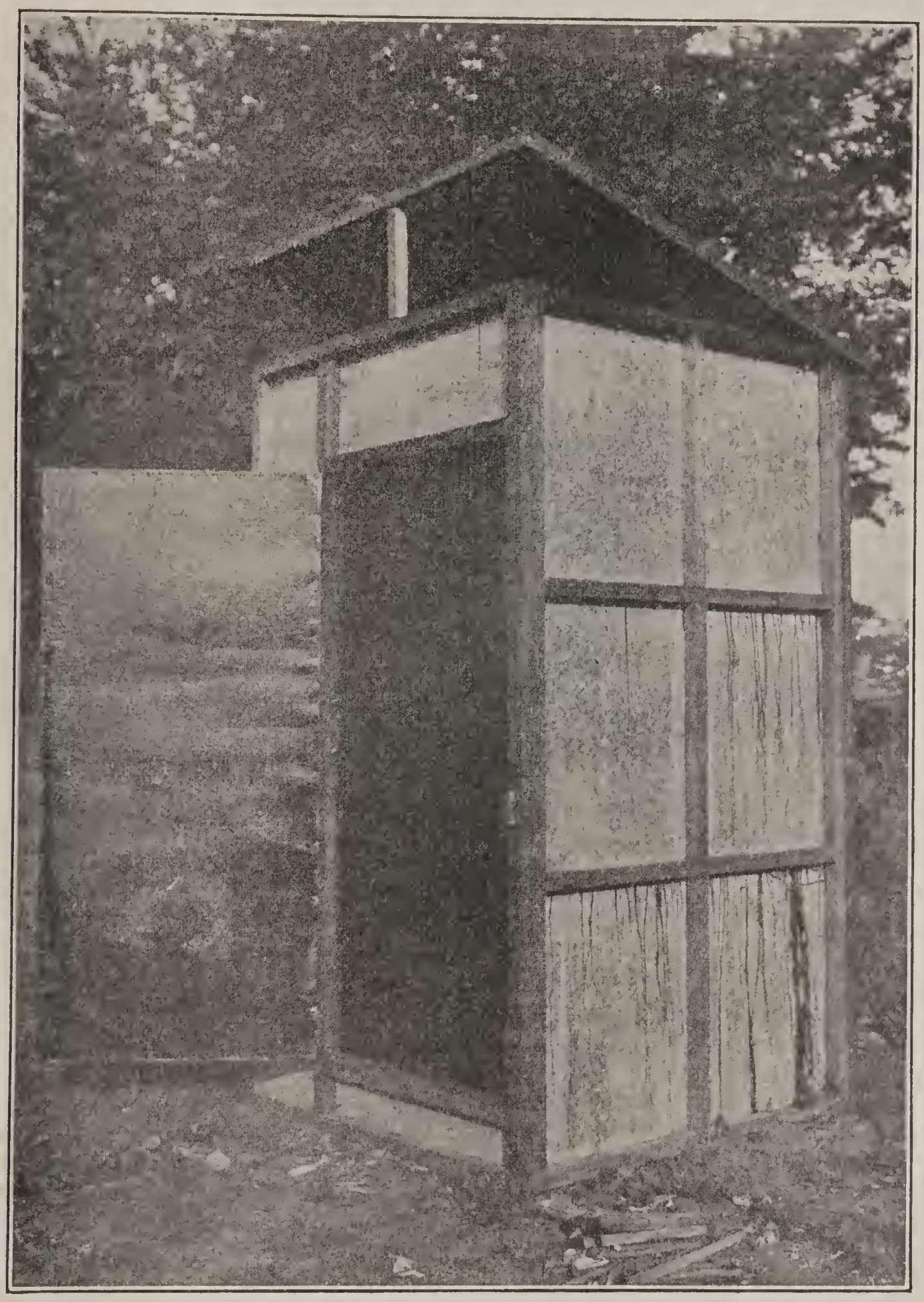
The construction and operation of a small smokehouse, which has been found to be entirely satisfactory when used experimentally by the Bureau of Fisheries, are herein described, together with the general method of treatment of the common fresh-water fishes of the Mississippi Basin and notes on the special treatment of several fishes.

Smokehouse, as described, door and top closed, draft port partly open.

CONSTRUCTION OF THE SMOKEHOUSE.

The smokehouse has four sides and a detachable top. The earth is the floor. The dimensions are 3 feet 6 inches by 3 feet 6 inches by 7 feet high, inside measurements. The house is made of five sections—the front, back, two sides, and top. Each section is separately made of 2 by 2 inch cypress lumber, covered with 26-gauge galvanized iron or painted sheet iron. The sections are held together by four $\frac{1}{4}$-inch by 4-inch bolts at each vertical edge. A detachable cover is made to fit over the top of the house, one-fourth inch larger

than the house. The door, 2 by 5 feet, is swung on three hinges on the front section, with its lower edge 8 inches from the ground. The draft is regulated by an 8-inch circular galvanized-iron plate, pivoted to cover a 6-inch hole cut in the door. The hole in the door,



Smokehouse, door and top open. (This smokehouse differs slightly in details from that described herein.)

which is hereafter referred to as the draft port, is flanged to prevent cutting and scratching the hands and arms.

Six inches from the top, on each side, are six 1-inch holes covered with slides having corresponding holes, which may be moved to reg-

ulate the outlet of smoke and steam. Corks may be used instead of the slide. On the inside of the house two 1 by 2 inch strips are nailed, 7 inches and 20 inches, respectively, from the top. These strips are supports for the rods from which the fish are suspended by S hooks made from No. 10 galvanized-iron wire, or, better, strips of wood pierced by nails upon which the fish are impaled.

The essentials of the smokehouse understood, various modifications may be introduced. If the ventilation is kept essentially as described, other materials may be used in the construction—wood, brick, or cement.

CLEANING AND SALTING THE FISH.

In preparation for smoking, the fish is first split along the belly from head to vent and the entrails removed. With some species, such as the bowfin, a short longitudinal cut just behind the vent is made, disclosing a dark mass (the kidney), which should be removed. The head is then severed and the fish thoroughly washed. The scales should be left on. Those fishes having a dark abdominal lining should be scrubbed with a stiff brush until the lining is removed.

If the fish are small, no further treatment is necessary before placing them in the brine. If they are large, weighing 2 pounds or more, they should be split down the back from the inside, severing the ribs close to the backbone, the cut being sufficiently deep so that the fish will lie flat. Extra large fish may be cut into two or more lengths and the large body pieces split as just described. This method of preparing the large fish permits the salt to penetrate more easily and insure a more evenly smoked product.

A brine is prepared by dissolving 1 pound of common barrel salt to each gallon of water. The fish are placed in the brine skin side down, and, as a general rule, should be left in the brine overnight. On removal from the brine they are given a washing in fresh water for at least half an hour, and then placed on sloping trays or hung up to drain.

The small sturgeon of the Mississippi River are only beheaded and eviscerated. Large sturgeon are dressed and skinned, cut into pieces of about 2 pounds, brined overnight, and washed 20 minutes. The pieces may be hung by pieces of cord. They are smoked slowly for five or six hours. The fire is then allowed to burn hotter to cook the fish. After having been smoked, they are scrubbed with a brush and fresh water. Lake herring should be eviscerated, brined overnight, washed, hung by the tail, and smoked three or four hours. Butterfish are treated as lake herring. The bonito is beheaded, eviscerated, split down the back inside, brined overnight, next morning washed, hung by S hooks, allowed to dry, and smoked five hours. Mooneye is treated as butterfish or lake herring. Eels should be skinned, gutted, brined overnight, and smoked five hours in hot smoke.

Bowfin are split on the belly and eviscerated. Wash, then cut the ribs on both sides of backbone, and remove the backbone along the body cavity but not in the tail section. Cover with dry salt, as this makes them tougher and better able to be suspended from the hooks. Fish salted in this way form a brine in a short time, but should be left in this brine for at least 12 hours. On removal from the brine

they should be soaked in fresh water for an hour before being placed in smokehouse.

Carp is treated as bowfin, but it is first "fleeced," i. e., the scales are removed, along with the thin underlying skin, with a sharp knife.

SMOKING THE PRODUCT.

Hang small fish to the iron cross rod by means of S hooks passing through the tail, as illustrated. Large fish, or those too tender to hold their own weight, may be hung by three hooks or by tying them with cord, or they may be cut into sections small enough to hang separately. Do not allow the fish to touch one another.

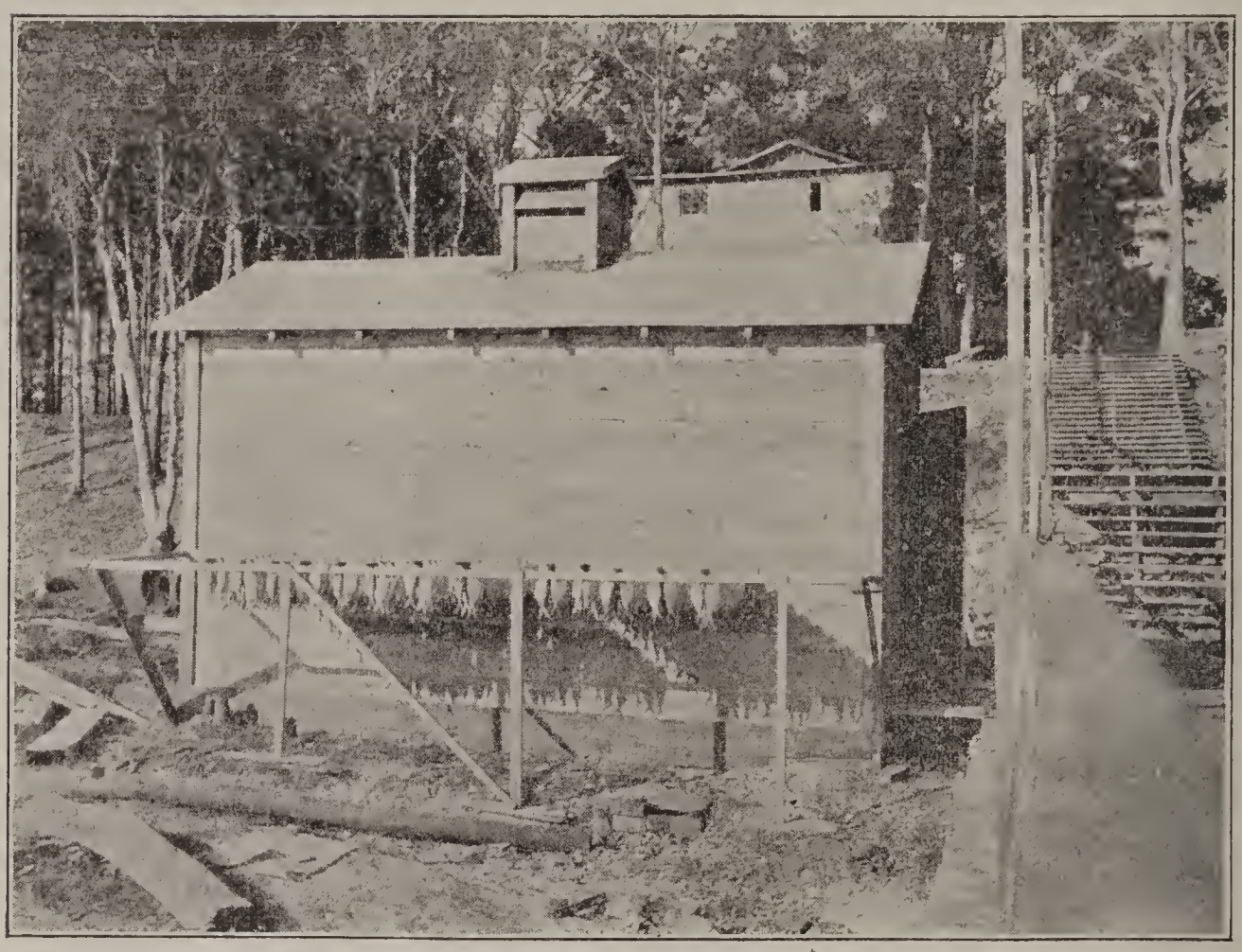
The fish are next to be dried. It is important that all surface moisture be removed from them, and it is well not to undertake to smoke fish on damp days unless necessary. If the weather is dry and clear, the fish may be hung in the sun and wind. In damp

Method of hanging small fish with S hooks.

weather they are put in the smokehouse and dried by the fire, with the draft port and the top open. Build a fire on the floor of any fuel, except resinous materials, that may be obtainable; leave door open until fire burns freely, then close door and leave port open to create a draft. This part of the process continues until the fish are quite dry on the surface. Unless properly dried, many of the fish will fall off the hooks and become a loss.

When smoking proper begins, replenish the fire and close the door, draft port, and top. As soon as the fish begin to color, open the draft port, but at no time allow the fire to blaze. Smoking must be continued until the fish are properly cooked and have a dark-brown color.

An advantage of the port opening is that through it the fire can be watched and replenished without opening the door. A good way to tell when the fire needs replenishing is to watch the escape of smoke. When it decreases, it is time to put on more fuel. If the door of the house is opened while there is a large amount of fuel on the fire, the latter may blaze up and scorch the fish. It might be well to have a small amount of sawdust at hand for this emergency; scattering a small amount over the fire will check the flame.



A frame smokehouse of larger dimensions.

The fish are dried after salting and preliminary to the operation of smoking. These fish are impaled on nails driven through strips of wood.

FUELS USED IN SMOKING.

Any dry wood, except fat pine, may be used in smoking fish. Driftwood is excellent. The sawdust and shavings from furniture and wagon factories are good, as it is easy to regulate the smoke from them. Green wood or damp fuel of any kind is objectionable because the moisture driven out with the smoke makes the fish soggy. Corncobs are quite satisfactory fuel. Pine wood imparts a resinous flavor to the product, making it very unpalatable. A small amount of pine wood may be used with other woods when better fuels are not available in sufficient quantity.

A smokehouse hastily constructed in the field. The operator is kindling a fire in the fire box, which, it should be noted, is several feet removed from the house but connected with it by an underground flue.

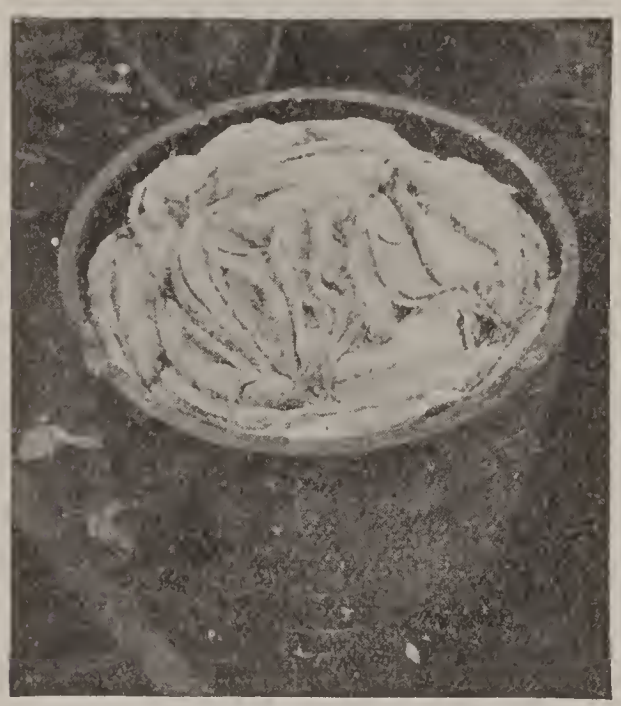
PROTECTION FROM MOLD.

Smoked fish are best kept in a fairly cool and dry place, to prevent molding. They should, of course, be protected from ordinary household pests. Dipping in melted paraffin is a good means of providing a protective envelope about the fish. If this practice is followed, the fish should be handled as little as possible after dipping and allowing to cool, as the paraffin may crack and chip off. When the fish is to be prepared for the table, the paraffin is easily removed by immersing the fish for a few moments in hot water.

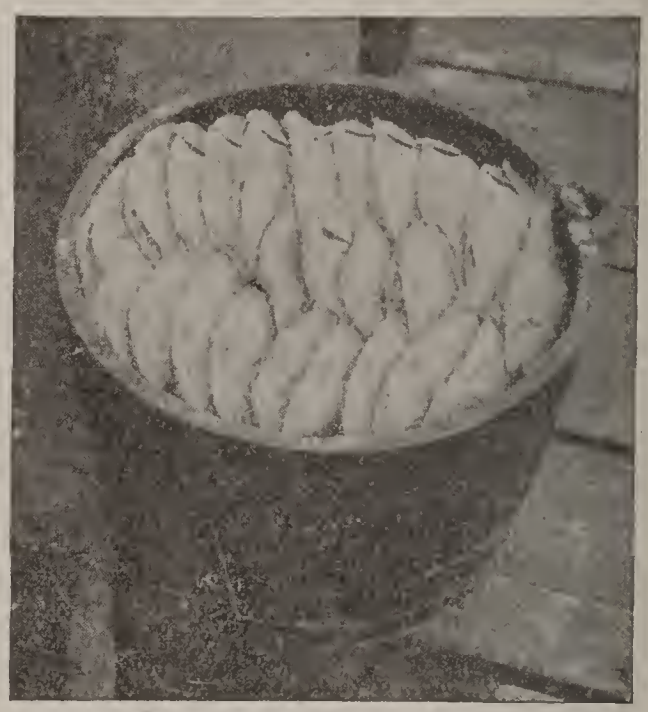
MODIFICATION OF PLAN FOR SPECIAL PURPOSES.

Certain modifications of the small smokehouse plan to meet particular conditions are suggested in the following paragraphs:

In cold or rainy weather condensation of moisture on the underside of the roof may occur, so that the dripping of water on the fish may injure the appearance, though not the quality, of the product. This difficulty has been overcome in practice by stretching a double thickness of burlap just beneath the top. This has the double effect of reducing condensation and of absorbing the moisture as it is condensed.



The wrong way to pack fish in salting tub.



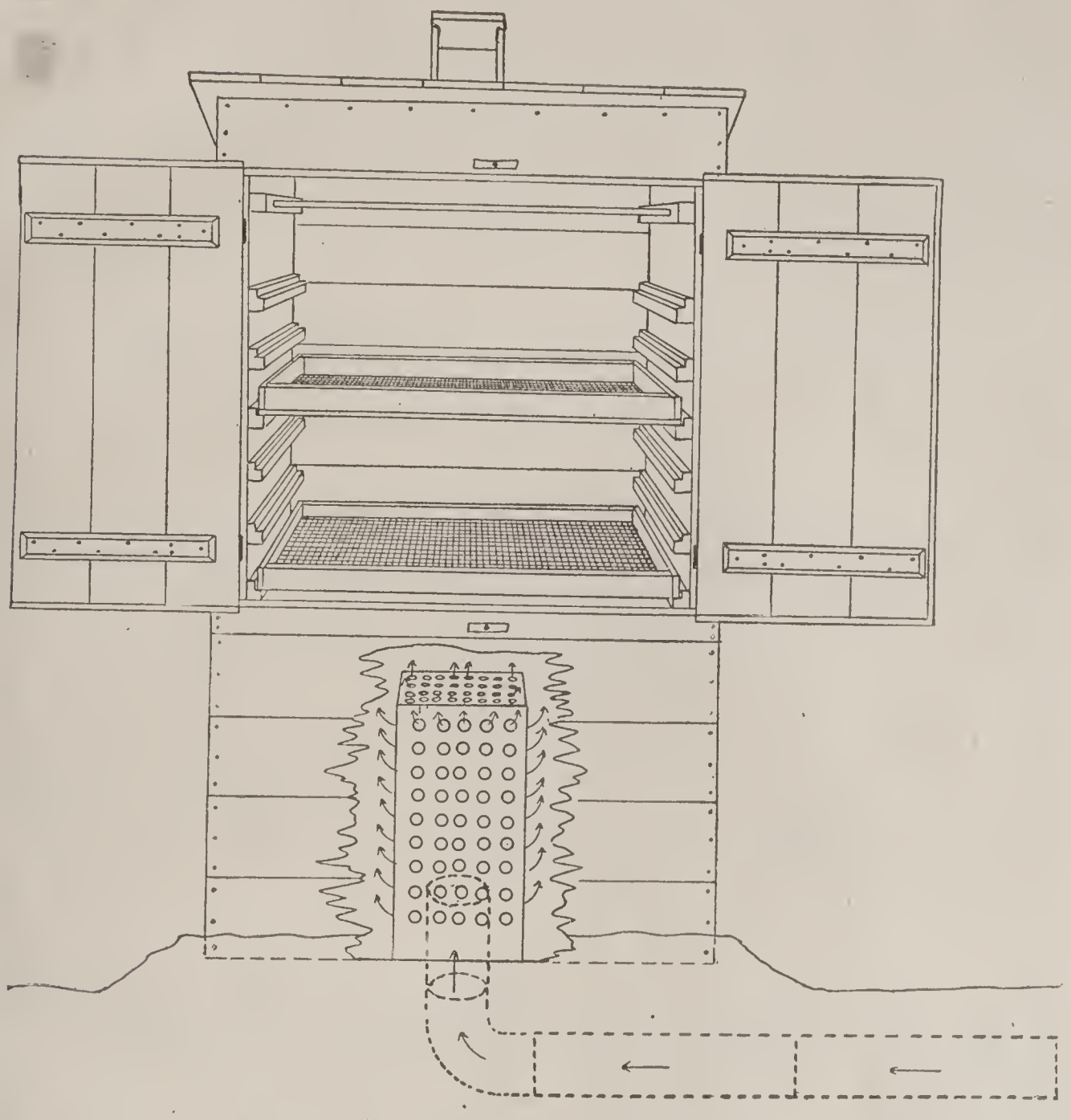
The right way to pack fish in salting tub.

In very warm weather, or in the far South, the fire on the floor often causes too high a temperature within the house to admit of satisfactory results from methods of "cold smoking." For this method, since a temperature higher than 110° F. is not permissible, it is preferable to have a fire box removed from the house, and the smoke conveyed through an underground pipe ending in an elbow joint in the bottom of the smokehouse. A common stovepipe damper is placed in the middle joint of pipe, the ordinary handle being fitted with an extension by means of which the damper is operated from above when the pipe is covered with earth. This damper is the principal fire and smoke control.

A nice feature is added by the use of a "smoke spreader," which is a rectangular galvanized-iron box, 1 foot square and 2 feet high, open at the bottom. Numerous three-quarter-inch holes punched in the sides and top permit the escape of smoke. This box is placed directly over the mouth of the elbow and causes an even distribution of smoke throughout the house. It serves also to prevent the scorching of fish by direct draft, if at certain stages considerable heat is applied.

The arrangement of fire box, smoke flue, and smoke spreader is made clear by the accompanying figures, which also illustrate other possible modifications, such as construction of wood, sliding trays, and top ventilator in roof. The screen trays should never be used if

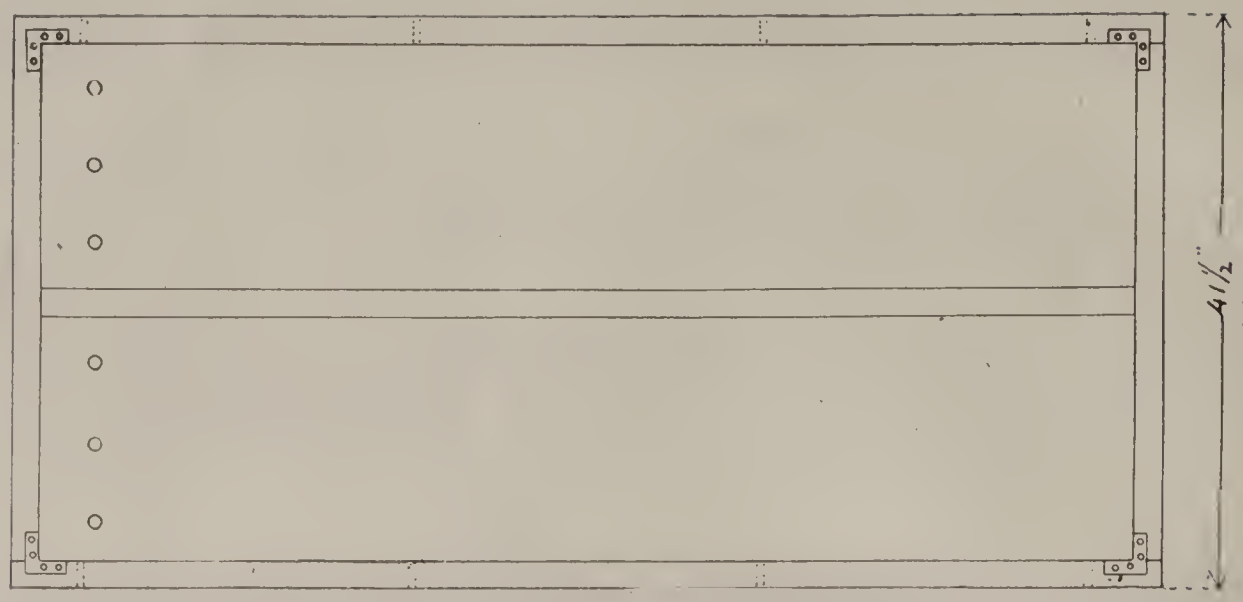
the fish can be suspended, since the impression of the screen wire detracts from the appearance of the fish. A method of suspending

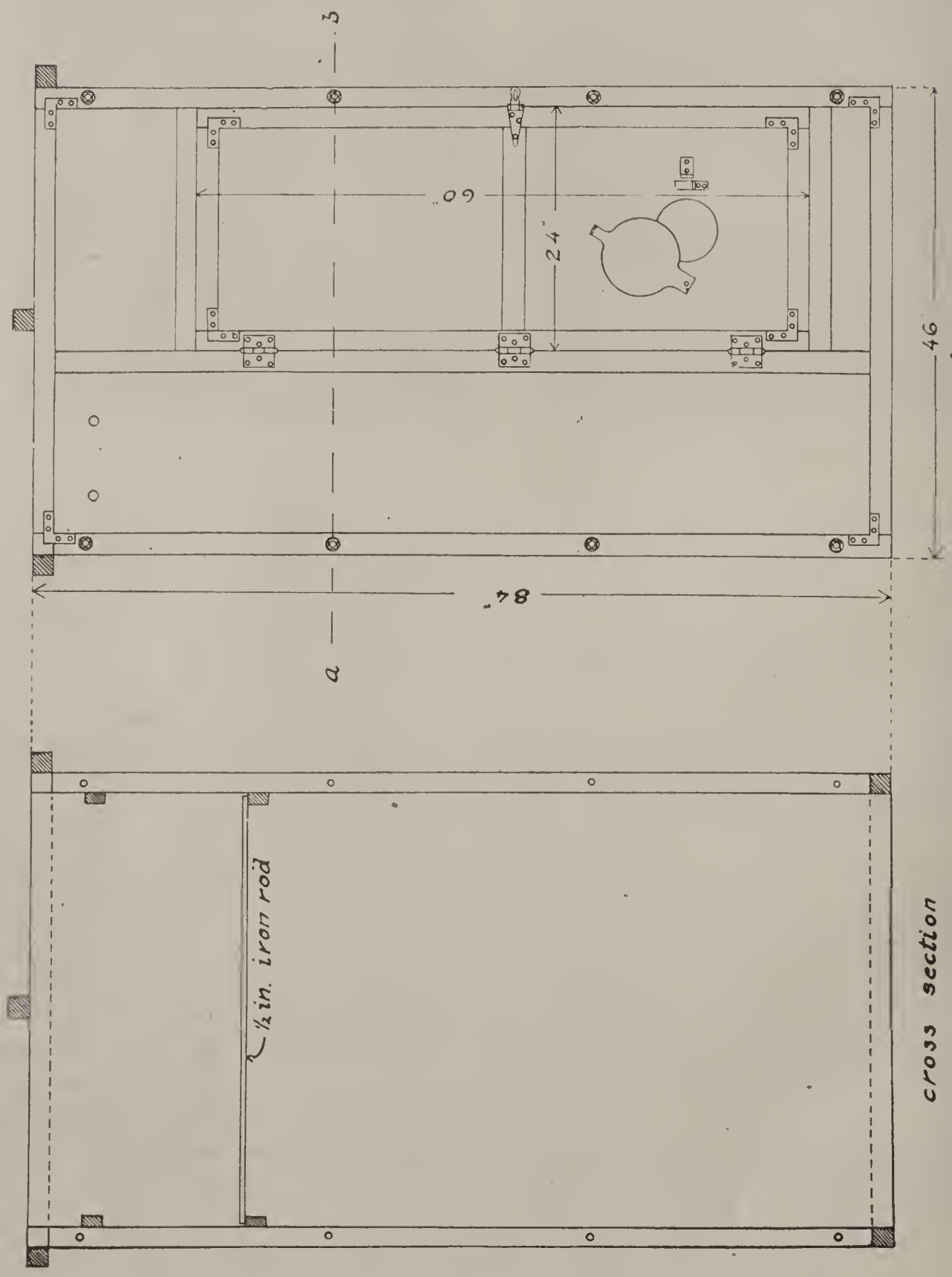


Plan of smokehouse with fire box removed from the house. Note the iron rod (one of a series) near the top from which fish may be suspended, the smoke spreader, and the ventilator on top.

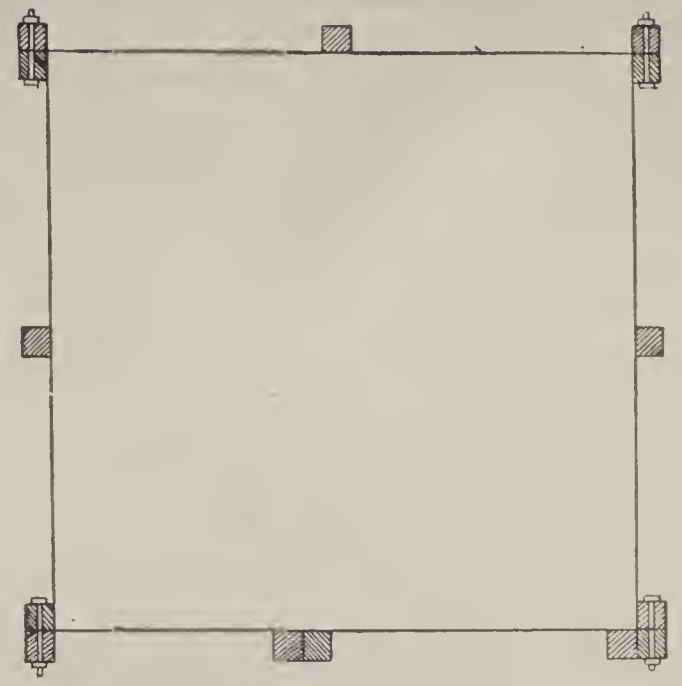
fish which has distinct advantages over the use of S hooks on iron rods, consists in the use of strips of nonresinous wood, 1 by 2 inches, with 8-penny finishing nails driven through and bent slightly upward. The fish are impaled on the nails by the heads or otherwise. Yellow pine or other resinous woods should be avoided, if possible, as material for construction, because they are too readily inflammable.

When commercial smoking on a considerable scale is contemplated and the required capital is available, a house of any desired dimension may be constructed, and being of a permanent nature, it should be built of brick or other materials providing insulation and prevention both of wastage of heat and of undesirable fluctuations of temperature. It is not the purpose of this circular to treat of the requirements and the design of large smokehouses, but plans and specifications may be had upon application to the Bureau of Fisheries, Washington, D. C.





Working drawings of smokehouse; cross section, front, and sides.



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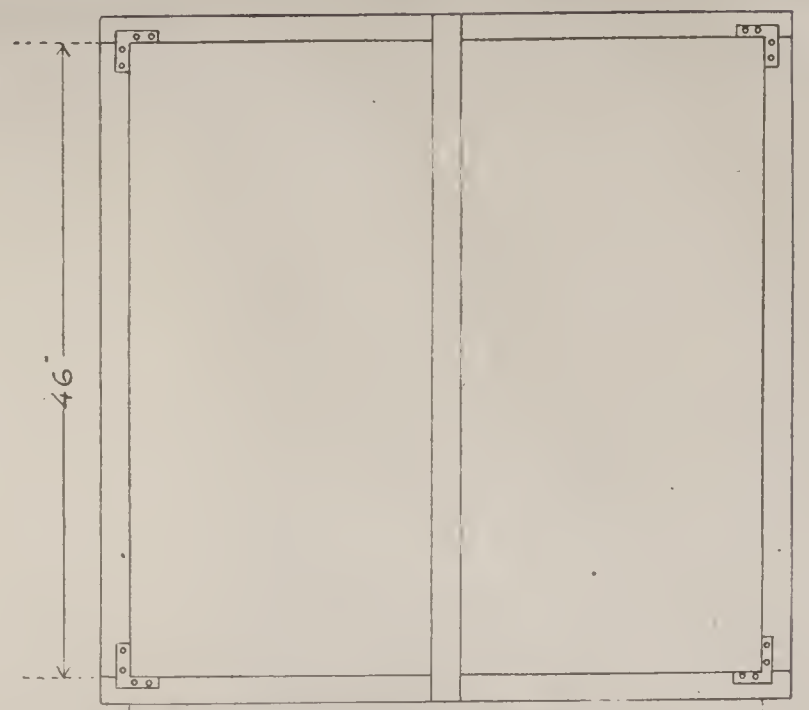

top

Working drawings of smokehouse; cross section and top.

Following is a list of the material necessary for the construction of a smokehouse of the plan and dimensions illustrated and described in this circular:

Lumber (cypress or other soft wood, dressed four sides).

12 pieces, 2 by 2 by 84 inches.
4 pieces, 2 by 2 by 46 inches.
4 pieces, 2 by 2 by 41½ inches.
2 pieces, 2 by 2 by 60 inches.
4 pieces, 2 by 2 by 24 inches.
5 pieces, 2 by 2 by 50 inches.
1 piece. 2 by 2 by 20½ inches.
4 pieces, 1 by 2 by 40 inches.

Hardware.

3 3-inch butt hinges.
1 6-inch hasp.
24 4-inch flat angles.
16 ¼-inch by 4-inch machine bolts with nuts.
32 ¼-inch washers.
1 gross 1-inch No. 10 flathead screws.
5 pounds No. 4 wire nails.
1 pound No. 12 wire nails.
1 padlock.
9 pieces ½-inch iron rod 41¾ inches long.
50 feet No. 10 galvanized-iron wire.

Sides:
2 pieces, 24 by 84 inches, No. 26 flat galvanized iron.
4 pieces, 21 by 84 inches, No. 26 flat galvanized iron.
1 piece, 15 by 84 inches, No. 26 flat galvanized iron.

Top:
2 pieces, 24 by 48 inches, No. 26 flat galvanized iron.

Above and below door:
1 piece, 24 by 8 inches, No. 26 flat galvanized iron.
1 piece, 24 by 16 inches, No. 26 flat galvanized iron.

Door:
1 piece, 24 by 60 inches, No. 26 flat galvanized iron.

Ventilator:
1 piece, 7 by 10 inches, No. 26 flat galvanized iron.

LIST OF ECONOMIC CIRCULARS ON FISH AS FOOD.

[These circulars are sent free on application. Order by number from Division F, United States Bureau of Fisheries, Washington, D. C.]

11. Canned salmon: Cheaper than meats and why; including 50 tested recipes.
12. Sea mussels: What they are and how to cook them; with 18 recipes.
13. Commercial possibilities of the goosefish: A neglected food; with 10 recipes.
18. Oysters: A little of their history and how to cook them.
19. The tilefish: A new deep-sea food fish.
20. Caviar: What it is and how to prepare it.
22. The grayfish. Try it. It knocks H out of the H. C. of L.
23. The sablefish, alias black cod. An introduction to one of the best and richest of American food fishes, with recipes for cooking it.
25. The burbot: A fresh-water cousin to the cod.
26. The bowfin: An old-fashioned fish with a new-found use.
27. A practical small smokehouse for fish. How to construct and operate it.
28. Preserving fish for domestic use.
29. Why and how to use salt and smoked fish. Sixty-one ways of cooking them.
30. Possibilities of food from fish.
31. The carp: A valuable food resource. With 23 recipes.
32. The whiting: A good fish not adequately utilized.
33. The eulachon: A rich and delicious little fish.
34. Skates and rays. Interesting fishes of great food value, with 29 recipes for cooking them.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1918