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Storage Structures and Home Storage of Vegetables and Fruits

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Storage Structures and Home Storage of Vegetables and Fruits

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Storage of vegetables and fruits will prove an economy for farm families producing their food at home. Not only is it possible to reduce the cost of the menu by using home-grown and home-stored vegetables and fruits, but the satisfaction of having a supply of fresh vegetables and fruits at all times means much to the homemaker, for she knows that the health and happiness of the family depend to a great degree upon it.

Experiments today show that some stored vegetables such as sweet potatoes, white potatoes, rutabagas, turnips and carrots, are higher in vitamins after about six months in storage.

Carrots, beets, potatoes and parsnips are considered good sources of the vitamin B complex and of vitamin C. The colored roots such as carrots and sweet potatoes are good sources of vitamin A, while white potatoes and white parsnips are deficient in this. Storage of all these vegetables is desirable for variety and for the special vitamins they contain.

The successful storage of some vegetables is not at all difficult. In fact good storage facilities such as outdoor cellars and ventilated pantries in the home already exist on many farms, while materials for constructing outdoor banks or pits are accessible to any one. And with plenty of good clean sand and the will to try, the storage of vegetables and fruits at home in Texas can develop rapidly.

Cool temperature, correct moisture, and proper ventilation are factors that must be considered in the storage of all sorts of products.

Temperature: When too high, favors decomposition; when too low, causes freezing and breaking down or change in tissues.

Moisture: When the storage room is too dry the vegetables and fruits dry out and shrivel; when there is too much moisture the growth of spoilage organisms is likely to occur.

Ventilation: Is not only a means of regulating temperature and humidity, but is also important in removing gaseous products that are injurious.

In planning storage the following points must be taken into account if the fruits and vegetables are expected to keep their fine flavor and food value.

Sanitary conditions are necessary for the retention of quality. Disinfect the room to kill rot spores. Use a spray made with 1 pint of formaldehyde in fifteen gallons of water; let dry well after disinfecting before storing products.

Only good quality products should be stored, those that are firm, well matured, of a good shape and free from spots and bruises.

The stage of maturity of each product needs to be considered for storage.

Late maturing vegetables are generally best for storage.

In the plan for production provide varieties of vegetables suitable for storage.

Check all stored products every 4 to 6 weeks for spoilage.

Each vegetable is a special problem in storage, but certain groups of vegetables can be grouped together under the larger headings, such as moist, slightly moist storage, or dry storage.

Moist Storage

To store root vegetables such as beets, carrots, parsnips, winter radishes, rutabagas, and turnips in sand, some moisture may be needed to prevent shriveling. But avoid adding moisture unless needed, because it will increase the risk of spoilage. Storing in layers of clean sand has given the best quality product. If sand is not clean it may produce an earthy flavor in the product.

Pack the vegetables in layers of sand in jars or boxes of about one bushel capacity and store in a cool, well ventilated place. In the Gulf Coast section use dry sand, but in the dryer sections of Texas a little moisture may be needed.

In packing in dryer climates slightly moisten the sand and place 2 to 3 inches in the bottom of the receptacle. Then put in a single layer of vegetables not touching each other. Then cover with one inch of sand. Then another layer of vegetables, and continue until receptacle is filled.

Select Vegetables To Store In The Sand That Are Of A Good Flavor And Texture

Beets, about 2 inches in diameter in perfect condition and of good color.

Carrots, 1 to 2 inches in diameter, roots of good color.

Parsnips, rutabagas and turnips, medium size and well matured.

Cut off the tops of beets, carrots, parsnips, rutabagas, and turnips, leaving one inch of stem. Dry one hour in the shade and store in sand.

Cabbage and celery—immature heads of cabbage and celery are best stored by lifting the roots and placing in banks or pits with the roots down, in damp sand, as close together as they will stand. Banked in this way the heads of cabbage will continue growth and become solid, and the celery will improve in texture and flavor.

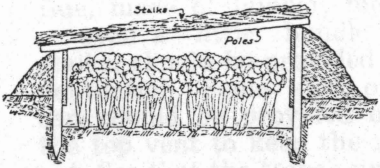

Fig. 1. Hotbed pit used for the storage of celery on a small scale.

Banks and Pits: Select a well-drained location for the bank or pit. In preparing for a bank or mound, dig a trench about 3 inches deep and 5 or 6 inches wide, to a length somewhat greater than the width of the bank or the diameter of a round mound. Cover the trench with corn stalks, sorghum stalks, or straw. This will furnish a fresh air inlet. After the vegetables are piled on this bed, further ventilation may be furnished by leaning stalks against the pile of

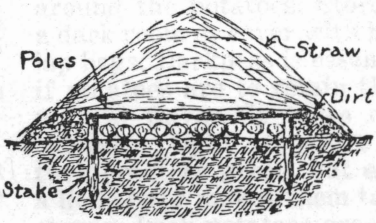

Fig. 2. Cabbage storage pen made of stakes and poles and covered with straw.

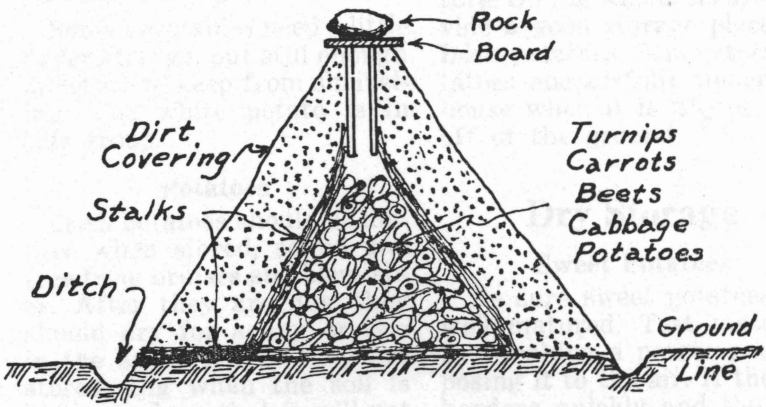

Fig. 3. Small outdoor mound for storing vegetables. A week's supply of various vegetables may be stored in each mound.

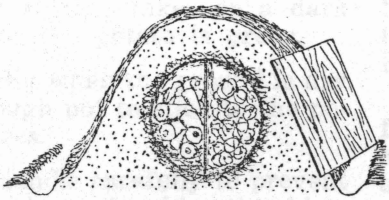

Fig. 4. Outdoor mound over a barrel laid on its side.

vegetables. Dirt is thrown against these stalks. A top flue, made of lumber, metal, or even a little bundle of stalks, should be provided for ventilation. Some kind of a cap should be provided over the top vent to keep the rain out. See that the trench under the vegetables is sloped slightly to a little drainage ditch so that rainfall will not run under the vegetable pile.

In figures 1 and 2 it is intended that the covering of stalks or straw will shed off most of the rainfall and yet will furnish some top ventilation for the vegetables.

Some vegetables need a little dryer storage, but still enough moisture to keep from shriveling. The white potato is in this group.

Potatoes

Irish potatoes should be mature when stored, sound and free from bruises and blemishes. After they are dug they should dry for a day or two in the shade before they are stored. Dig when the soil is dry enough so that it will not adhere to potatoes. Sort, grade and carefully place the potatoes in crates of one bushel capacity. The crates should be raised from the floor 2 to 4 inches, so there will be a circulation of air under and around the potatoes. Store in a dark room or cover with burlap bags. Darkness is essential if potatoes are to retain their natural flavor. It takes considerable light exposure to turn potatoes green, but even a little light makes them taste strong. Irish potatoes greened by light have been found to be harmful.

Some have successfully stored potatoes in sand just as the root vegetables are stored. This necessitates close watching. The cellar temperature found in most parts of Texas makes it necessary to keep the sprouts rubbed off during the storage months. If kept at a temperature too cool for sprouts to grow, the cooking quality will not be so good as when stored at cellar temperature. On the whole, cellars provide a good storage place for Irish potatoes. Some store potatoes successfully under the house when it is 2½ or 3 ft. off of the ground.

Dry Storage

Sweet Potatoes

Be sure sweet potatoes are well matured. Test maturity by breaking a potato and exposing it to the air. If the sap hardens quickly and the surface remains bright in color the potatoes are ready to dig.

If the sap remains sticky and the surface takes on a dark color the potato is green.

Dig when the ground is dry enough not to stick to the potatoes.

Handle carefully to prevent bruising or breaking the skins. Do not throw or drop them.

Grade and place at once in bushel crates and baskets.

Use or dispose of all broken or bruised potatoes immediately.

Preparation for Curing:

Clean the room.

Disinfect the room to kill rot spores. Use a spray made with 1 pint of formaldehyde in 15 gallons of water.

Provide a heater with which to regulate temperature in the curing room.

Dry the room out well before putting the potatoes in it.

To Cure: In a dry fall heat is not needed in the curing room. But in a moist season heat the curing room to 80 degrees F. before bringing the potatoes in.

Raise the crates off the floor so that air may circulate all around them in the place selected for curing, which should have walls that will keep in sufficient heat for curing, top ventilation for release of warm moisture-laden air, and inlets at the base for cooler air to control humidity.

Maintain an even temperature in the curing room—between 80 degrees to 85 degrees F.

Check the curing room daily for surplus moisture collecting on the outside of the crates or on the walls of the room. Excess moisture calls for regulation of the heat and ventilation.

To Store: If the potatoes were cured in a well insulated and ventilated curing house all that is needed is to cut off the heat and regulate the temperature, keeping it from 50 degrees to 60 degrees F. The potatoes may be stored in earthen banks or hills or pits. A well ventilated and dry cellar is the best storage place of all, because it keeps a cool even temperature.

Onions

Onions must be well ripened and thoroughly cured to keep in storage. Select those where the tops have ripened down or shriveled and be sure that the outer skin of the bulb is dry before they are pulled. Use immediately any "thick necks," or those that are immature or soft. At harvest the onion tops are clipped to ½ inch length. They may be placed in crates or open mesh sacks in the shade or under a shed until they have dried. This will usually require 5 to 7 days. Storage may be done on a small scale by swinging the crates down from the roof. Globe type onions keep better than the flat Bermuda type.

The essential points for the successful storage of onions are: having well matured onions, dried until they rattle when handled; storing in open crates of not over one bushel capacity; having plenty of ventilation, a comparatively low temperature, dryness; and insuring safety from actual freezing.

Pumpkin and Squash

Late maturing varieties of pumpkin and squash as a rule keep better. Another point that will add to the keeping quality is to leave about 2 inches of stem when stored. Select those that are well ripened and matured and free from bruises. Cure in the shade for about two weeks at a temperature of about 80 degrees F. in a well ventilated place to dry the skins.

Store in a dry place at a temperature of about 60 degrees F., placed so that they do not touch each other on slatted shelves or on deck in cellar or cave.

FRUITS AND TOMATOES

Fruits absorb odors easily and should not be stored near turnips, cabbage or onions.

Citrus

Oranges will keep from five to eight months in storage, while grapefruit keep from only two to three months. Valencia oranges and Duncan grapefruit are varieties that seem to keep better in storage.

Oranges left on the tree to full maturity and then packed as they come fresh from the tree keep better and will have a better flavor.

Select clean, firm, well matured fruit as nearly perfect as possible. The fruit should be free from bruises.

Different Methods Used For Storing Citrus Fruits

Paper wrapped. (1) Make a mixture of 2 ounces or 4 level tablespoons of borax with one gallon of water. Heat the mixture to 117 degrees F. or lukewarm, when it will have a milky appearance. Be careful not to get the water too hot. Use it just as cool as the borax will mix with it, or make the water appear milky.

Place the fruit in the mixture. Let it stay in the mixture one minute. Take the fruit from the mixture and let it dry, taking care not to wipe off the borax.

When dry wrap the fruit in paper. Newspapers may be used; wax paper will keep the fruit better. When wrapped, place in crates or baskets, preferably not more than three layers deep, and store in a well ventilated, cool, dry place.

Stored in sand. (2) Pack the fruit in boxes. Cover the bottom of the box with clean, dry, (best "wind blown") sand about two inches. The oranges are placed so that they do not touch each other. Another layer of sand to cover the fruit, then another layer of fruit. It is best not to have more than three layers of fruit to a box.

Cover well with sand and store in a well ventilated, cool, dry place.

Pears

Pears have a better flavor and texture if gathered after they are mature, but still green, and wrapped and stored to finish ripening in a cool dark storage, either for canning or for eating fresh.

This stage of ripening is known as the "mature green" stage. If selected just at this stage and stored two to three weeks at a temperature between 60 to 65 degrees F. they will ripen in storage. A lower storage temperature will increase time in storage a few weeks.

Apples

Storage for apples is similar to Irish potatoes. Select well matured late variety apples with good flavor and color but not too ripe. Store in baskets or crates of one bushel capacity. Store in a cool, well ventilated room just as for white potatoes.

Green Tomatoes

Green tomatoes can be harvested and stored for a month or two to ripen.

Different Methods Used:

(1) Pull vines before the freeze and hang tops down in well ventilated room where they will keep cool but will not freeze. There should be just enough moisture in the room to prevent shriveling.

(2) Pull vines, place tops in bank or pit on a well drained mound.

(3) Pick well matured green tomatoes and paint stem and scar with wax made by melting together 1 part paraffin, 1 part beeswax and two parts mineral oil. Store in cool, well ventilated place to ripen. Place them so that they do not touch on a slatted shelf, or deck in a cellar or cave.

Meats

It will be economical to keep meat stored in oil in a clean, cool, well ventilated room, so the oil will not become rancid during the season. For directions on packing meat in oil see bulletin B-94 Killing and Curing Pork.

Cellars, caves or ventilated pantries provide the best storage room for meat in oil.

Peas and Beans

To store, shell dry well matured peas and beans as soon as possible after reaching maturity. A good method of protecting them from weevils is to store the clean, dry, shelled beans in dry sterilized one-half gallon glass jars. Adjust rubber and just before screwing down lid add ¼ tsp. of carbon disulphide or "high life," in small paper holder in each jar. Let stand 36 hours, open and remove rubber, and paper holder, replace lid loosely, invert jar, let stand one week. Set right side up and screw down lid. Store in a cool, dry,

well ventilated room as this aids in keeping the cooking quality of peas and beans. Watch carefully the first few days for any signs of moisture on inside of the glass. To remove any noted moisture remove lid, tie cloth on top and place in direct sun until evaporated. Screw on cap and store.

Cellars and Other Storage Buildings

Underground rooms furnish the best protection against extreme temperatures, but may be more difficult to ventilate and to protect against excessive moisture. They usually are the more expensive, if made of durable materials.

An inexpensive above-ground storage structure made of logs is shown in Extension Service MS 133, and an above-ground storage house made of lumber is shown on Blueprint No. 202.

For the ventilation of storage rooms, air inlets should be placed in the floor, or at or near the floor line in the walls, and the air outlets in the ceiling or at the top of the walls, in order to get a natural movement of the air and not require fans. The total cross sectional areas of the inlets and outlets should each approximate 1 square inch per square foot of floor space. Underground storage rooms should have air inlet flues which lead the incoming air to the floor of the room or cellar. Some suggestions on ventilating storage structures are shown on Extension Service Blueprint No. 224. The ventilation of many of the cellars in use can be improved by an arrangement to admit the incoming air at the floor line. If the cellar has a solid door at the bottom of the hatchway a hole some 12 by 20 inches at the bottom of it will accomplish this, or if the door at the bottom of the hatchway is a screen door, covering the upper portion of it with canvas or pasteboard will also accomplish the purpose. The outer door, or storm door will be kept open or closed according to weather conditions.

All vents in any structure should be provided with doors or some means of closing them. Sometimes a desirable temperature can be maintained in a storage room by opening the vents at night and keeping them closed during the heat of the day, or by reversing the operation.

If a storage place to which rats and mice have access is used, decks or crates may be suspended by wires to protect products that are not protected by the containers.

GETTING A DRY CELLAR

Considering the various uses which may be made of a cellar, it is very desirable that it be made dry. In some locations it is very difficult to construct a dry cellar, particularly

where the ground water table is within a few feet of the ground surface. To investigate the height of the water table it is only necessary to punch a hole some 7 feet deep and protect it against the entrance of surface water. This can be done by inserting a piece of 1¼", or larger pipe, in the hole and packing soil around it at the ground surface. The height of water table is measured by inserting a very small stick, about ¼" in diameter, in the pipe. The test should be made in a wet season to get the maximum height to which the water table may rise.

Where a high water table must be contended with as in some of the Gulf Coast country it may be more practicable to build a cellar mostly or entirely above the ground, at least high enough so that the cellar floor is above the water table when it is at its highest elevation. With such a job it is necessary to mound dirt over the cellar to get desirable insulation.

A cellar, as shown in Figure 5, can hardly be expected to be dry, if the water table rises above its floor. While it is possible to build a dry cellar below the water table, it is more practical to build it above the water table.

If the lay of the ground will permit, it is well to put drain tile around the outside of a concrete cellar below the floor level and also to put a drain in the floor. Suggestions on this are shown on Blueprint No. 224. Surface drainage around the cellar mound of dirt should be provided. Where grass, such as bermuda or buffalo, can be made to grow over a cellar mound it will aid in disposing of rainfall water that might otherwise seep into the cellar. A sandy clay, or clay loam that does not crack in dry weather, is a better cellar covering than either a sandy soil or clay. The sandy soil absorbs water too rapidly and clay will crack open in dry weather.

SELECTING A SITE FOR THE CELLAR

A hillside is to be preferred as a site for the cellar if such is available within a reasonable distance from the house, because excavation costs are somewhat less and drainage may be obtained. If a hillside is not available a spot where surface drainage may be obtained should be selected. Also, a location where the runoff from the house roof will not have to be contended with is desirable.

CONCRETE CELLAR

Concrete is the best material for use in building a cellar, because it is permanent and also because vermin and rodents can be kept out by it. A concrete cellar may be built with a greater portion of it above the ground than is shown in Figure 5 and such is recommended if by so doing the floor may be placed above

the water table. A cellar may be built entirely above the ground as is shown in Figure 6 however, building a cellar in a hillside, if available, will usually make the construction less expensive.

A concrete mixture of 1 part of Portland cement, 2 parts of sand, and 4 parts of gravel is generally recommended for cellar construction. If a properly proportioned mixture of sand and gravel is used do not make the mistake of using 6 parts of the sand and gravel mixture to 1 part of cement with the expectation of getting the same results as with the above 1:2:4 mixture, since what you would be getting would be about a 1:3:6 mixture, which is too lean for cellar construction.

CELLAR WITH CONCRETE ROOF AND PLASTERED WALLS

In some localities where the soil is underlaid with caliche or a substratum of similar character a roof and roof foundation may be made of concrete and the cellar walls plastered.

One method of construction is to dig a trench about 8 inches wide where the cellar wall and hatchway are to be, down to the caliche, and then pour concrete in this trench. Rein-

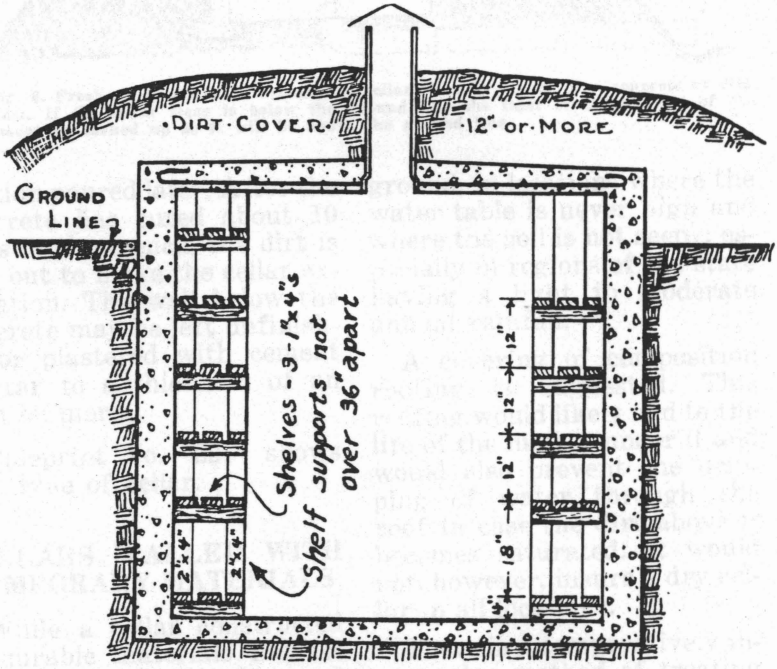

Fig. 5. Section through concrete cellar showing standard shelving. Plans for construction are shown on Blueprint No. 62.

forcing rods should be placed near the bottom of the trench to prevent the concrete from cracking. If the walls are to be extended above the ground surface, lumber forms may be put in place before the trench is poured so as to pour the full height of the wall as a unit, or the trench may be poured first and then forms placed and the above-ground portion poured later. After the concrete has cured about 10 days in the trench, the dirt is dug out to make the cellar excavation. The wall below the concrete may be left unfinished or plastered with cement mortar to a thickness of an inch or more.

Blueprint No. 228 shows this type of cellar.

CELLARS WALLED WITH TEMPORARY MATERIALS

While a cellar constructed of durable materials has its advantages, one constructed of temporary materials frequently has the advantages of lower first cost and a saving in time on construction. Blueprint No. 227 shows one type of cellar made with low cost materials such as poles and lumber. It is shown built in a hillside where natural drainage may be obtained. This type of construction is frequently used on comparatively level ground, in locations where the water table is never high and where the soil is not seepy, especially in regions of the state having a light to moderate annual rainfall.

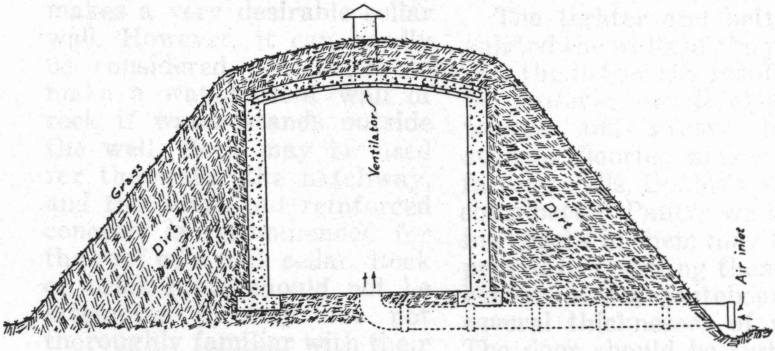

Fig. 6. Fresh air is admitted through the cellar floor by means of a concrete or clay tile duct. If the cellar floor is below the ground line the inlet or outside end of the duct must be turned up so it will be above the ground line.

A covering of composition roofing is suggested. This roofing would likely add to the life of the lumber under it and would also prevent the dripping of water through the roof in case the dirt above it becomes saturated. It would not, however, insure a dry cellar in all locations.

There is a comparatively inexpensive method of treating

poles with zinc chloride, which does not have the undesirable odor of creosote, which will greatly increase the life of the poles. Information on this treatment may be obtained from the Extension Service.

ROCK WALLS FOR CELLARS

Where rock is available it makes a very desirable cellar wall. However, it can hardly be considered practicable to make a water proof wall of rock if water stands outside the wall. Rock may be used for the walls, the hatchway, and the steps, but reinforced concrete is recommended for the roof of a rock cellar. Rock or brick roofs should not be attempted by any one not thoroughly familiar with their proper construction. Specifications for building a concrete roof may be found in Farmers' Bulletin No. 1772.

Other materials from which cellar walls may be made are brick, hollow clay tile, and hollow concrete tile. Brick or tile walls should be 8 inches or more in thickness, and rock walls should be as much as twelve inches in thickness.

VENTILATED PANTRY

Figure 7 is intended to illustrate the movement of cool air from under the house up through the pantry and into the house attic. One of the requirements for the successful operation of the pantry is a well ventilated attic. The air outlets from the attic may be openings in the gables as high up as practicable or in case of a hip roof a vent flue in the roof ridge. An air duct directly from the pantry to the outside air is not considered as effective as the ventilating method suggested above.

The tighter and better insulated the walls of the pantry are, the better the results will be, however, one thickness of tongue and groove lumber such as flooring makes satisfactory walls. Double walls are some better. Pantry walls having cracks in them may be improved by covering them with beaver board, pasteboard, or several thicknesses of paper. The door should be tight fitting without cracks around it. Slatted shelves are considered essential to aid in a free circulation of the air.

In order that cool air may be drawn from under the house, the pantry should be located away from outside house walls as near the middle of the house as practicable.

If the house has a solid foundation, some openings must be provided in it to permit the entrance of fresh air under the house. Lack of underpinning and shrubbery around the house may cause too rapid an exchange of air under the house.

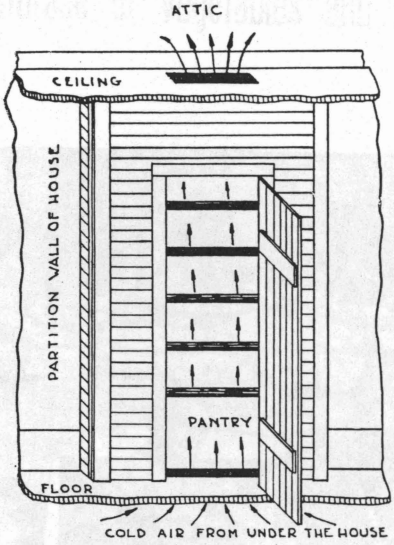

Fig. 7. Ventilated pantry. Plans for construction shown on blueprint No. 208.