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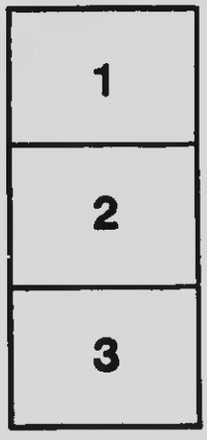
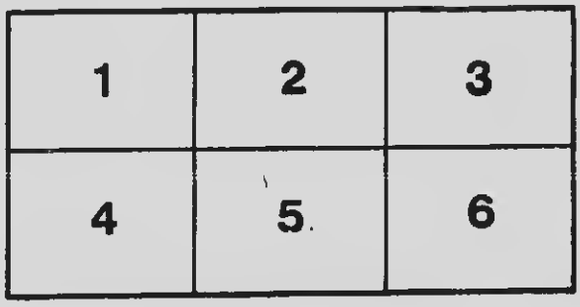
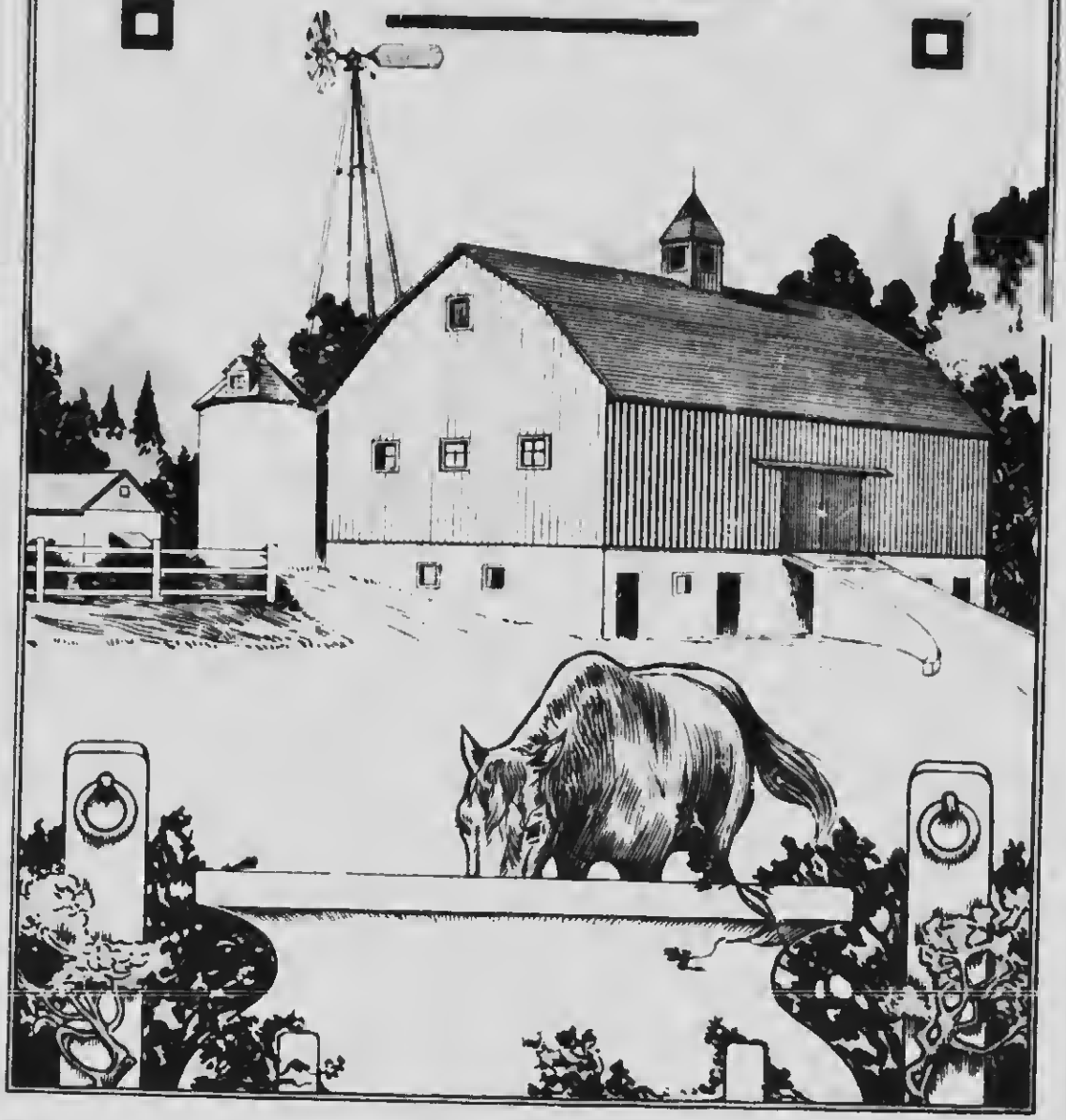




WHAT THE FARMER CAN DO WITH CONCRETE



What the Farmer Can Do With Concrete

Published by

Canada Cement Company
Limited
Montreal

Price, - - 50 Cents

"What The Farmer Can Do With Concrete."

A BAG OF CEMENT, a few shovelfuls of sand, a few more of gravel or stone, mixed with water.

Simple, easily obtained and cheap, these are the materials that go to make up concrete—and with them the farmer can work wonders in the improvement of his farm.

This 20th century has been referred to as "the cement age;" and the growing use of concrete, in all kinds of structural work, would seem to warrant the phrase.

One of the most important features of this rapidly increasing realization of concrete's great possibilities, is its recognition as the ideal material for the construction of farm buildings and farm utilities of every description.

The large number of "converts to concrete" that our agricultural communities have produced in the past few years opens up a wide field of speculation as to what we may attain in this direction, a few years hence; and warrants the prediction that, before very long, the use of any other material for the erection of a new building or the repairing of an old one, will be looked upon as an unusual and foolish procedure.

The steady advance in the cost of lumber will soon force the farmer to look about him for a substitute to take the place of wood as a building material. This is, indeed, becoming a question of great importance to the farmer, who must find a material as effective as lumber at a price which will be within his reach. It is fortunate that, while lumber has been advancing in price, the cost of cement—by reason of more scientific methods

of production and improved machinery—has been coming down, and cement is now available to every farmer. It is not only, for most purposes, as economical as lumber, but also vastly superior as a building material.

The methods employed by the Agricultural Colleges of Canada, and on our experimental farms, are in line with the belief that the salvation of our national household depends, in no small measure, upon the ability of the Canadian farmer to get the most possible out of the soil entrusted to his care. Up-to-date methods are coming to be looked upon as just as essential to success on the farm as they are in the pursuits of commercial industry: the farmer himself is alive to the fact that he has a place in the procession of progress, and that it is in his own interests as well as for the welfare of his country that he must march briskly to the inspiring music of the "1910 quickstep."

When a farmer buys his first bag of cement, and mixes it, he has taken one long step in the direction of progress.

Those to whom has been entrusted the encouragement of modern methods of agriculture, can do no more important work than to prove that the use of concrete helps toward the greatest economies and the largest profits in the tilling of the soil, the breeding of animals, and the working of the dairy—to prove, in short, that concrete is "the material beyond compare" for use about the farm.

A reading of the following pages will result in a sure grasp of the above important fact; will show the farmer how many and various are the uses he may make of concrete; and will enable him to understand the ease with which the various buildings and accessory features of his property may be constructed, by the use of this wonderful material.

For every one fortunate enough to receive a copy of this book, it will be time well spent, to read carefully every page of

it. Between its covers is much valuable information, and a too hasty turning of a single page may mean the loss of some hint that, if noted, would put hundreds of dollars into the reader's pocket.

A complete index will be found in the following pages—so that a description of whatever article or building is under consideration, may be instantly turned to.

Just as there are right and wrong methods of farming, so too, are there right and wrong ways of using concrete. It is the aim of this book to give such directions and information as will enable the reader to build with concrete surely and successfully.

"WHAT THE FARMER CAN DO WITH CONCRETE," does not pretend to fully cover the subject—the field is too large to be exhausted in one such volume. But the publishers *have* attempted to deal with as wide a variety of *types* of concrete construction as is possible in the space available.

Fuller details are given in other pamphlets, which will be furnished free to anyone who will write to the address given on the first page of this book.

Publications Issued by Canada Cement Co., Limited.

No. 1—"What the Farmer Can Do With Concrete."
No. 2—"Mixing and Placing Concrete by Hand."
No. 3—"Concrete Silos."
No. 4—"Tanks and Watering Troughs."
No. 5—"Cement Stucco."
No. 6—"Concrete Blocks."
No. 7—"Artistic House Building."
No. 8—"Concrete Chimneys."
No. 9—"Telegraph and Telephone Poles."
No. 10—"Concrete Surface Finishing."
No. 11—"Portland Cement Sidewalk Construction."
No. 12—"Concrete Fence Posts."

INDEX

SPECIAL INDEX TO DIRECTIONS.

(Mixing, Placing, Forms, Etc.)

GENERAL INDEX.

How to Make a Concrete Walk

The farmer's wife each day appreciates more keenly a concrete walk, over which she can move dry-shod in every kind of weather.

The farmer himself will recognize the value of concrete, especially in winter, as it is extremely easy to remove the snow from a walk of this material.

To the walk shown in illustration, the farmer has added an idea of his own, in the form of a curb against the flower bed. This keeps the dirt from continually washing over the walk.

The curb is 4 inches high and 4 inches thick.

In building a concrete walk, decide first the width desired—this should not be less than 18 inches, and is hardly ever made more than 3 feet.

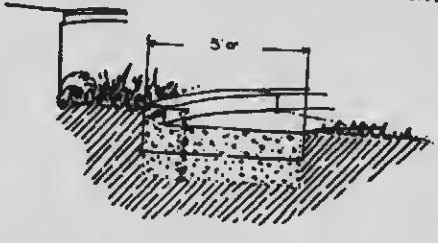
Excavate a trench 12 inches below the ground line. Fill in this trench to a depth of 6 inches with crushed stone, gravel, broken brick bats or cinders. Do not use ashes for this fill.

Make a 1:2:4 mixture of concrete, and "place" same, bringing it to the level desired for the walk. If this is above the ground level, a plank will have to be laid on edge along the outside edges of walk, to act as a Form.

There are two ways of finishing the surface of the walk. The concrete may be brought to the desired top and simply smoothed off with a trowel or wooden float. This leaves a somewhat rough appearance, but the walk never becomes slippery.

If on the other hand, appearance is the principal consideration, a smooth surface can be obtained by placing on top of and immediately after the concrete, a mixture of 1 part cement and 2 parts sand; and finishing to a smooth surface with a steel trowel.

The walk should be divided into sections of 4 to 5 feet in length. This is done by means of cutting entirely through the green concrete by means of a straight spade, or by inserting strips of sheet metal as long as the width of the walk. These can be removed as soon as the concrete is in place.



Materials Required for a Walk Two and a Half Feet Wide and Twenty Feet Long.

1 cu. yd. bank run gravel.
5 bags cement.

OR

1 cu. yd. crushed stone.
½ cu. yd. sand.
5 bags cement.

Approximate cost, at current prices of materials, 10c. per square foot of surface.

Concrete Walks Last Forever

Concrete walks are as cheap as walks of any other material with the exception of wood.

They require no repairs.

They require no painting.

They always present a smooth, even surface.

They dry off quickly after rain.

They are easily cleaned.

Grass cannot grow in the walk.

Concrete walks add neatness to the appearance of farm surroundings and consequently increase the value of the farm property.

Repairs to Farm Buildings

Since wood always fails first at the ground, the use of concrete on the farm has developed from the ground up.

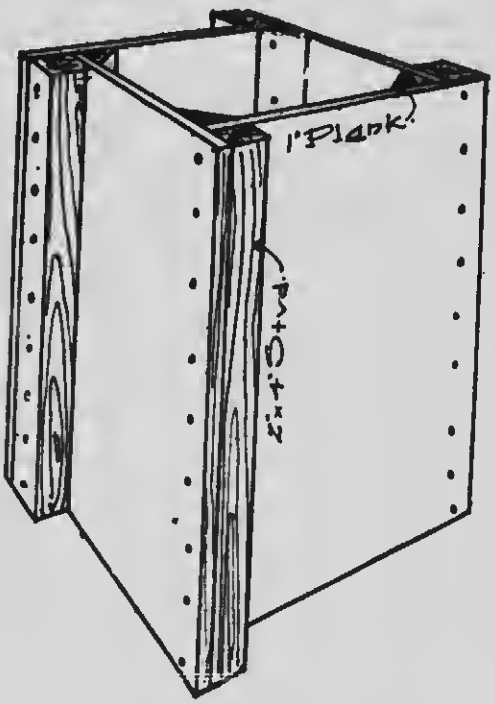
After a farmer has had to replace several sills or blocks of wood, he begins to look about him for a new material which will not rot or will not have to be replaced. Concrete is his natural selection.

Support the building by temporary struts, alongside of the post to be removed. Saw off post entirely above rotten part. Dig a hole directly under the post 2 feet deep, and slightly larger than the post itself. Build a box with sides only, with the same inside measurement as the hole already dug. The box must be long enough to reach from the ground to within a few inches above the bottom of post.

Fill hole with concrete, mixed 1:2:4.

Then place the box in position, and fill it with concrete until the bottom of the sawed-off post is imbedded about ½ inch, in the mixture.

Leave the Forms in place for 1 week and after two weeks remove the struts which have been used as temporary support for the building.



The concrete should be mixed fairly wet, and churned with a stick while being "placed."

The bottom of the foundation may be made larger than the top, by simply sloping one side of the box Form —giving the effect shown in the photograph.

Approximate cost, at present prices of materials, 20c. per cubic foot of concrete.

Why Concrete Should be Used to Repair Farm Buildings

Repairs to foundations of this kind vary greatly in size, several different-sized supports often being required for the same building. Concrete is the only material which can be used for any purpose, whether large or small, without first having to be cut to the shape and size desired. Consequently there is no cheaper known material for this kind of work.

The work can be done by the farmer, with the help of his own farm labor, at times when more important work is not claiming his attention.

Foundations of concrete are indestructible.

The Repair of Old Buildings With Concrete

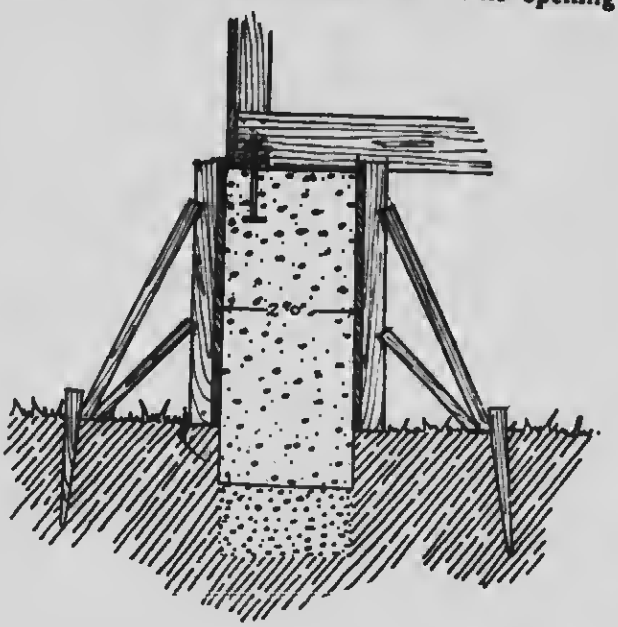
At necessary points, remove a few stones or bricks, as the case may be, inserting short pieces of heavy timber to wedge or jack up the building. Carefully raise the building, by this means, until it stands free of all foundations.

Now remove all the old stone or brick foundation that is to be replaced, and set in place the Forms for the concrete.

Small buildings can usually be raised high enough to allow working room, whereby the Form may be filled right up to the top with concrete. The mixture should be a wet one. (Proportions, 1:2½:5).

Where buildings are too cumbersome to be raised by "jacking," to a sufficient height to give head-room, it will be found necessary to make the foundations 3 inches wider than the sill. Carry the Forms to the desired height and utilize this extra 3 inches of width for placing the concrete in the Forms. The top board of the Forms may also be left off until you are ready to place the last of the concrete. In this case the last batch of the concrete should be very wet. Tamp the concrete until it comes up flush with the bottom of the sill, to the entire width of the wall.

Be sure to leave a space in the concrete wall, under and on the sides of the under-pinning support, so that the building may later be lowered back onto the new foundation and the timber removed. This opening must be slightly larger than the under-pinning support —say 5 inches by 7 inches for a 4 inch by 6 inch piece of timber. After building has been lowered, fill these openings with concrete.



Do not lower the building onto the new foundation until after a period of two weeks from time of construction.

Foundations Should Always be Built of Concrete

There is doubtless on your farm a barn or some other building, the foundations or sills of which have rotted out. This affords an excellent opportunity to demonstrate the practical economy of concrete, from the farmer's viewpoint.

In its possibilities for *repair* work, concrete is every bit as valuable to the farmer as in its importance for *new* work.

There is no reason why the farmer, either unaided, or with the assistance of one of his men, cannot put in a new foundation of concrete, as here described, without any difficulty.

A Good Place to Use Concrete

On page 17 is a picture of a barn one hundred years old—repaired, in so far as its foundations and part of the sidewalls are concerned, with concrete. It had originally been built of oak, on a foundation of rubble stone, which, in the course of years, had worn away.

Such a barn usually goes first, in its foundations, and there is many a one around the country, the life of which could be greatly lengthened by the placing of a concrete foundation and the renewing of the rotted sill and siding.

Choose a time when the hayloft is nearly empty. Tear out a five foot section of the old brick nr stone foundation, cut away that much of the old wooden sill, and replace it with a new 2x8 inch sill, renailing this new sill to the uprights from the under side.

Decide at this point, whether the work may best be carried on from the inside or outside of the barn. This may depend upon whether or not your barn is a "basement barn."

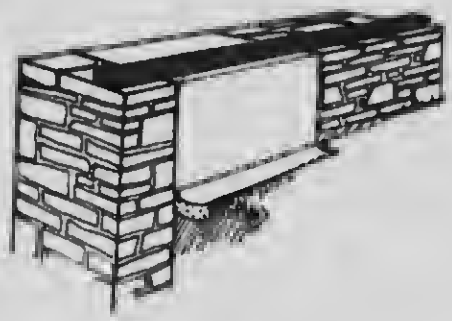
Place inside the outside Forms; and depending on whether the work is to be done from the inside or the outside of the barn, leave off top board of either inside or outside Forms so that concrete may be shovelled into place.

Use a very wet mixture of concrete, (1:2½:5), except for the top section of the foundation.

In the same manner as above described, other sections of the concrete wall may be built, leaving intervening sections of the old wall to form a temporary support.

When sufficient of the new sections have been built and after these are two weeks old, begin removing the rest of the old foundations, and complete the work by the same process. It is well to leave the corners until last.

The barn illustrated has a foundation extending 2 feet into the ground and rising 5 feet above the ground; 10 inches wide at the top and 12 inches wide at the bottom. The distance around the barn is 77 feet.



MATERIALS REQUIRED.

For 5 lineal feet of wall. { 1¼ cu. yds. gravel. / 6 bags of cement.

Approximate cost at current market prices for the above materials, including labor, for each 5 feet section, $6.00.

What a Concrete Foundation Will Do for an Old Building

This is an age of extravagance and waste. Even on the farm—where economy should be a first principle—one too frequently encounters the practice of discarding a building, simply because the foundations are giving way, and erecting an entirely new structure—when, for a small outlay for a concrete foundation, the building could be made as good as new.

If you have a building, the brick or stone foundation of which has "weathered out," or if you have a wooden building which has rotted off at the bottom by reason of the constant drip of water from the roof, then you need a new foundation for that building—and that foundation should be of concrete.

A Combined Foundation Gutter and Walk Made of Concrete

Determine the grading or sloping of the gutter bottom from observation of direction of the flow of surface water during rain storms; or from local conditions, such as location of outlet into underground drain. Excavate a trench 1 foot 6 inches in width, 10 inches deep on each side, and hollowed out to 13 inches deep in the middle. Use a straight edge or a grade cord, together with a spirit level, to give the bottom of the trench the desired slope or "fall."

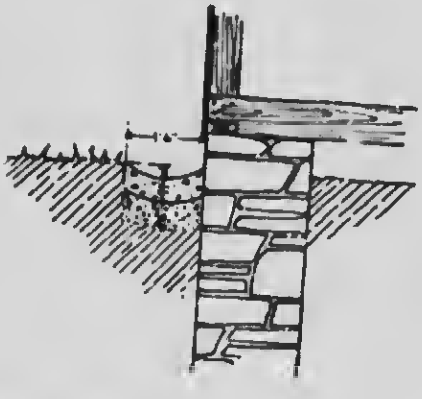
For each foot of length a slope of one-eighth inch will be sufficient.

Clean the dirt off the foundation wall with a stiff broom or brush.

In the bottom of the trench place a 4-inch foundation of well-"tamped" gravel, brick-bats or crushed stone.

Make a one-bag batch of concrete in proportions, 1 part cement to 2½ parts sand to 5 parts screened gravel or crushed rock, (or 1 part cement to 5 parts "bank-run" gravel). Have the mixture just wet enough to tamp well.

Place a 4-inch thickness of concrete to form a dish-shaped gutter 3 inches deep in the middle. Every five feet, make an expansion joint ⅛-inch wide by inserting a metal strip not less than 7 inches wide and 18 inches long, or by cutting a joint entirely through the concrete with a straight spade. Smooth the surface with a "wooden float."



MATERIALS REQUIRED.

1 cu. yd. bank run gravel. 6 bags of cement.	OR	1 cu. yd. crushed rock. ⅓ cu. yd. sand. 6 bags of cement.

Cost: From 12c. to 15c. per foot of length, without allowing for the gravel for the foundation.

The Convenience of a Concrete Gutter or Walk

It catches the water from off the rain-beaten side of the building, quickly carries it away, and, by preventing "seepage," keeps the cellar, basement, or ground-floor dry.

In sloppy, muddy weather, it also serves as a convenient walk around the out-buildings.

The small cost, the simplicity of construction and the convenience of this gutter, appeal to every thinking farmer.

An instance where many dollars may be saved by the expenditure of a few cents.

A Concrete Entrance Floor

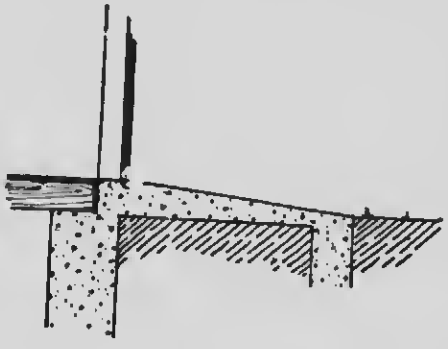
At a point 3 feet from the building, dig a trench 6 inches wide and 18 inches deep—the length of this trench to be 2 feet greater than the width of the doorway of the building.

From the edge of the trench nearest to the building, dig away the earth between trench and building to a depth of 1 foot, and place here, to a depth of 6 inches, a Fill of either coarse gravel or crushed rock. Do not, however, place any of this gravel Fill in the trench.

Now mix concrete 1:2½:5, and lay same, first in the trench, and then on top of the gravel Fill; sloping the surface so that it just meets the floor level at the doorway.

Before the concrete has had time to set, provide a runway slot for the sliding doors—or better, build little guides or humps with the concrete, to hold the doors in position.

If the doors happen to be swinging ones, place a gas pipe or iron socket in the still soft concrete, for a "shove-fastener."



Note the concrete curb on the right of entrance door. This prevents the gravel that surrounds the building, from washing down onto the approach and getting in the way of the doors. To build this curb, use 1-inch planks placed on top of the concrete floor, to serve as Forms to hold concrete in place.

MATERIALS REQUIRED.

For the fill, 1 cu. yd. of gravel.

For the concrete
1 cu. yard of bank run gravel.
5 bags of cement.

OR

1 cu. yd. crushed stone.
2½ cu. yds. of sand.
5 bags of cement.

This entrance floor was constructed in half a day, by one man.

Approximate cost, at current prices of materials, including labor, 13c. per square foot of surface.

Importance of Concrete for the Carriage House Entrance

Oftentimes small buildings on a farm are found to have earthen or concrete floors built up above the ground level, to prevent the inflow from heavy rains.

With the ordinary dirt approach to such a building, the earth will gradually wear away, leaving an abrupt rise from the "approach" to the ground floor, and making it extremely difficult to haul in vehicles.

Especially is this the case when the entrance-way happens to be muddy.

All this difficulty is done away with, and at very slight cost, by constructing a concrete entrance floor, as here described.

A Corn Crib Floor of Concrete

Rats love grain; and therefore the corn crib is usually the rat headquarters of the farm. By building corn cribs and granary floors of concrete farmer takes a long step toward rat extermination.

Lay out the building; for the foundation wall, dig a trench 12 inches wide and from 2 to 3 feet below ground level.

Set box Forms, so as to bring the surface of the finished foundation and floor 1½ to 2 feet above ground level, according to the height of the "drag" conveyor used by local corn-shellers.

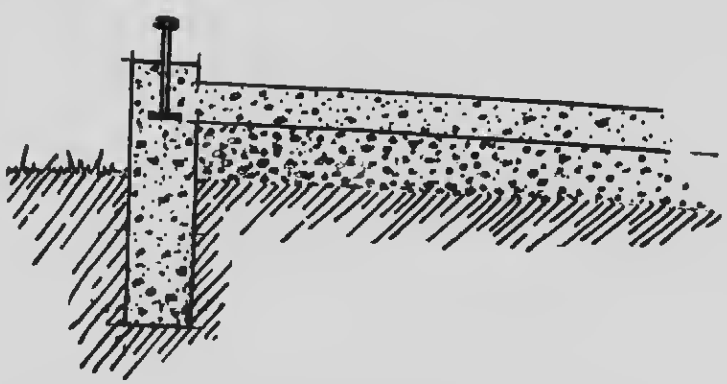
As floor will only be 6 inches thick, fill in between the foundation walls with gravel to within a distance of 6 inches of top of Forms. Soak this Fill thoroughly, and tamp and roll it well, before placing concrete on top.

Now mix concrete, (1:2:4) and fill the foundation Forms with concrete. Beginning at one end of the building, lay the concrete floor in sections 4 feet wide, and continue until the entire floor is "placed."

In order to fasten the wooden sill for the uprights to the concrete floor, ¾-inch bolts must be inserted at the necessary points in the green concrete of foundation; these bolts being long enough to pass through holes in the sill and to receive nuts and washers.

Finish the surface of the floor with a steel trowel, so as to render scooping of the grain an easy matter.

Approximate cost per square foot of floor surface, 12c.



Corn Crib Floors, to be Satisfactory, Must be of Concrete

Scientists tell us rats distribute more disease than any other single animal, and agricultural departments and municipal authorities the world over are spending large sums of money to aid in exterminating this pest. If a rat has no nesting place, he will not come to your farm.

Rats cost the farmer large amounts of money every year.

To put a stop to this waste, farmers are building their corn-cribs and granary floors of concrete. Rats cause a loss not only in the granary, but also make successful poultry raising impossible.

Another feature of concrete with regard to the corn crib floor, is that it has no projecting plank ends or nails to damage the scoop or ruffle the temper of the scooper

A Concrete Foundation for a Horse Barn

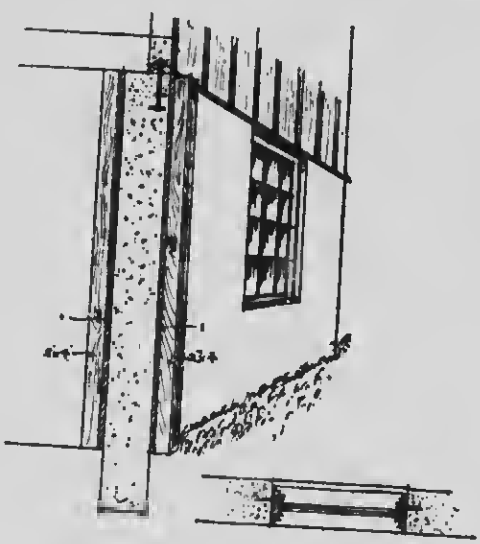
Concrete is becoming recognized as the only material for a barn. Some farmers build of this material up to the hay-loft floor; the hay-loft proper being of wood. The picture shows an excellent type of barn, with concrete wall 13 feet high, and with ground dimensions of 42 feet x 96 feet.

Excavate a foundation trench, to a depth below frost line (3 to 4 feet below the surface). In this trench "place" concrete, to form a footing or base, 20 inches thick. On the base, erect the wall proper, same being 12 inches thick.

While building Forms, place in position the necessary window frames, so that the concrete will set against them, and hold them in place. As a further means of securing the frames, some farmers insert wooden pegs in frames, allowing the pegs to project about 4 inches into the concrete.

Should the concrete extend above the windows, it is well to place reinforcing rods midway between frames and top of wall, as described on pages 153 and 154. Likewise "tie" the foundation at the corners by placing bent iron rods in the concrete, at intervals of 2 or 3 feet.

Having carried the concrete to the required height, the next step is to attach the wooden superstructure. While the concrete is still wet, place iron bolts at intervals (say every 5 feet), in the concrete, allowing the nut end to protrude above the wall, to bolt through the wooden sill when this latter is added; holes being bored in the sill at required points, to fit over the bolts.



Proportions for concrete mixture should be 1:2½:5.

Approximate cost of concrete work, at current prices for materials, and including labor, 40c. per cubic foot.

Concrete is the Best Material for a Horse Barn Foundation

In the first place, concrete foundation walls are cheaper—in first cost—than any other material except wood; and of course farm horses are too valuable for the owner to dream of depending on wood for their protection. As every farmer knows, animals attract lightning—and lightning causes fire. If your barn is entirely of wood, fire will quickly sweep it away, without giving much chance to remove the horses.

Concrete is permanent, sanitary and rat-proof. Concrete wall foundations make a building cool in summer and warm in winter.

Nowadays, the farmer shows his good sense, by being just as thoughtful of the welfare of his animals as he is of his own comfort.

To provide comfortable, cleanly quarters for horses or cattle, one must use concrete.

Farm Buildings Should be Connected by a Concrete Driveway

To construct a driveway between the various buildings of a farm, first excavate a trench 12 inches deep, this trench being the exact width that you wish the finished driveway to be. Six feet is a convenient width; but the drive should be made slightly wider than this at the corners to provide for turning of vehicles.

Place in the trench a Fill of gravel to a depth of 6 inches and "tamp" it well. On top of the gravel Fill, "place" your concrete mixture, to a depth of 6 inches on the sides, and 7 inches at the centre.

For this work, concrete should be mixed in proportions, 1:2½:5, and wet enough to pack well.

To finish, no mortar is needed. Leave the surface rough, so as to afford a better footing for the horses and cattle.

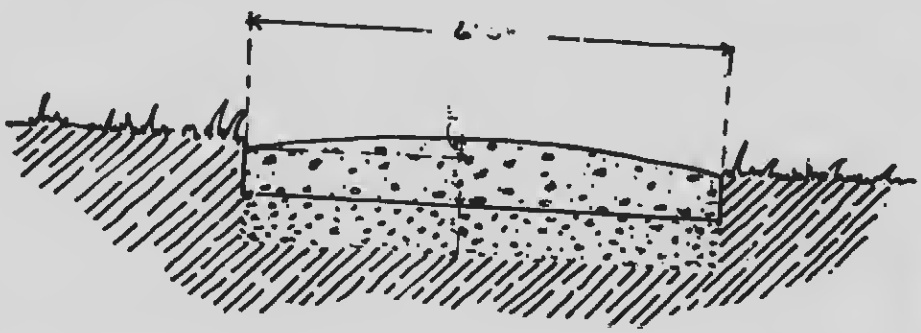
The driveway shown in illustration on opposite page is 50 feet in length.

MATERIALS REQUIRED.

1 cubic yard of gravel and 5 bags of cement will build a strip of concrete 6 feet x 10 feet.

Or, you may use 1 ½ cubic yards of sand and 1 cubic yard of crushed stone with 5 bags of cement.

Approximate cost, at current prices of materials, 6c. per square foot of surface.



Concrete is the Only Material Wherewith to Construct Driveways

By using concrete to connect up your buildings, you have a solid, substantial roadway, that will last for all time—instead of the usual muddy, untidy space that ordinarily separates such buildings. There are a few months in the summer when the sod or soil is good enough to walk on; but for the greater part of the year, it is utterly impossible for the women or children to go about from building to building, because of the marshes of mud that intervene.

Moreover, the work of the busy housewife is lightened by reason of the fact that such a driveway banishes the conditions that cause the tracking up of the porches and kitchen floor.

Such a piece of concrete work also serves as a "runway" that readily carries the water away from the buildings, leaving them dry and sanitary.

How One Farmer Improved His Barnyard by Building a Concrete Feeding Floor

At first this particular farmer had adopted the old-fashioned wooden feeding floors, which have a tendency to create filthy and unsanitary conditions. His experience was similar to that of any other farmer in this respect, that he found them hard to keep clean, there was feed wasted and the general unhealthiness and filth of the place was detrimental to the physical well-being of the live stock.

Finally, on the advice of a neighbor who had thoroughly tested their practicability, he built a concrete feeding floor, with what results may best be seen by a glance at the illustration on opposite page.

The directions he followed were such as to enable any farmer to build a concrete floor successfully. They are given herewith:

Choose a site in your barnyard, where the ground is slightly sloping, well-drained and wind protected, and convenient to feed and water. Remove manure, grass, etc.

Excavate ground to a depth of 6 inches, and fill the space thus excavated with a foundation of coarse gravel, crushed rock, tile culls or brick-bats.

Around the outside of this rectangular space, dig a trench 6 inches wide and 18 inches deep.

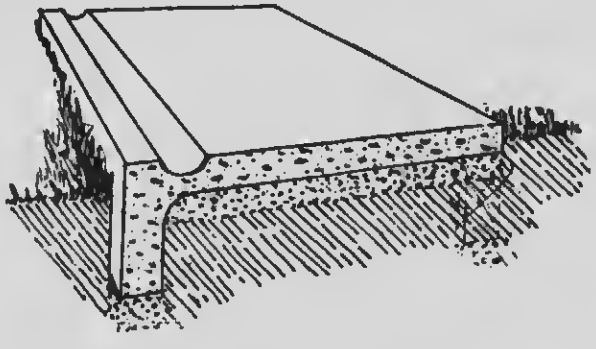
Concrete should consist of a mixture 1:2½:5; sufficiently wet so that the liquid cement or "grout" will come to the surface when the mass is "tamped."

In "placing" the concrete begin on the lowest side and lay the floor in sections 5 feet wide and extending across the entire length.

Use 2-inch timber for outside Forms, supported by stakes driven into the ground.

Obtain an even slope, by using grade cord or spirit level.

When you come to the edge, fill the trench full of concrete, thus forming an "apron" which will serve to prevent rats and surface water



from getting under the floor. No expansion joints are required, other than those afforded by the junction of the sections.

Finish the surface with a wooden float.

To save the manure from the floor, it is well to provide a gutter in the concrete, on the two low sides of the floor, and about 6 inches back from the apron—this gutter draining into a concrete manure pit or basin, located at the lowest corner of the floor. This gutter should be dish-shaped, 8 inches wide and hollowed out to a depth of from 3 to 4 inches.

Such a gutter may be easily formed by embedding in the concrete timber of the necessary thickness and shape, during the construction of the floor. Remove this timber as soon as concrete is hard enough to stand by itself.

After the concrete is placed, sprinkle it with water, as soon as it will stand it without washing out the cement. Keep wet for 48 hours, then cover with clean straw or hay, kept wet. After ten days, the floor is ready for use.

MATERIALS REQUIRED.

2 cu. yds. bank run gravel. 11 bags cement.	OR	2 cu. yds. crushed stone. 1 cu. yd. sand. 11 bags cement.

Approximate cost per square foot, 5 inches thick, at current prices for materials, and including labor, 5 cents.

There is Nothing Like Concrete for a Barnyard

By covering his entire barnyard with concrete, the farmer will improve barnyard conditions. It is no uncommon thing, in the spring time, to see a barnyard so flooded with water that the stock can almost swim in it—a condition that, to say the least, is by no means likely to improve the live stock. By covering the entire barnyard with a layer of concrete and by properly draining the floor thus constructed, you will secure absolute freedom from this troublesome condition. Such a work, on a large yard, would constitute a fairly big undertaking, if done all at once. But it need not be. It may be extended over a long period; a small section being concreted each year.

Remove manure and loose dirt, leveling and sloping the surface of the ground, to provide for drainage. Mix concrete 1:2½:5, and, beginning at the low side, lay the floor in the same manner as directed for Feeding Floors on page 28, and to a thickness of from 4 to 6 inches.

Remember that the floor is to be laid in sections, and on completion of the day's work, bring the section to a square end by placing a 1-inch plank on edge and concreting directly against it. Remove this plank before starting the next day's work.

As soon as the concrete is in place, smooth it off with a wooden float. The day after concrete is placed, throw on straw and keep it thoroughly wet for at least a week. This refers to each section of the work, as completed.

Do not be too particular to give the surface a smooth finish—a rough finish affords the animals a better footing.

It has been found that farmers cannot continue to take from the soil its fertility, in the form of crops, year after year, without putting something back. Manure is the best fertilizer.

By the ordinary method of piling manure on the ground, or storing it in wooden pens, from 30 to 50 per cent. of the manure's fertility is wasted.

This loss is brought about in two ways:

1st. By "bleaching" or washing out, due to heavy rains.

2nd. By fermentation, or heating, caused by lack of sufficient moisture.

Concrete pits being waterproof, manure may be kept in them as moist as may be necessary, and the enormous waste of fertility prevented.

Consequently, 1 load of manure from a concrete pit is worth 1½ to 2 loads of manure as usually stored.

Moreover, with concrete pits, the supply of manure is increased, as all the liquid manure from the barn gutters and the feeding floors is saved.

The richest part of the manure is saved.

Manure pits are constructed in the same way as cisterns. If a large pit is desired it can be made wide enough—and with one end sloping—to accommodate a manure spreader.

Concrete Feeding Floors Promote Health Among Farm Stock

The great advantage of a concrete feeding floor, over the old method of placing fodder or grain on the ground, must be apparent to anyone who gives the subject a moment's thought.

For hog cholera, an ounce of prevention is better than a pound of cure —Concrete floors prevent hog cholera.

The old earthen feed lot—with its surface worked up year after year—becomes a storage place that carries over the disease germs from one season to another. Clean and sanitary, the concrete feed floor does not afford a breeding place for germs. Moreover, any germs that may be deposited on the surface are easily destroyed by disinfecting.

The saving of fodder alone, resulting from the use of concrete, often pays for the floor within the short period of six months.

Wind Walls and Their Importance

To be healthy, stock needs exercise—in winter as well as summer. But few farms are provided with an exercise lot sufficiently well-protected against winter blasts to provide a safe exercising place.

Wind-walls were originally of closely planted evergreens or of wood, and afforded but poor protection.

A farm lot should be provided with a concrete wind wall, as shown in the photograph.

The exercise lot should be located on the warm side of the buildings; and on the side of the lot from which winter storms most often come, the wind wall should be erected.

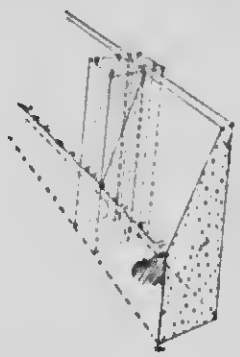
Probably the most convenient way to build the wall will be in sections of 10 feet in length. The wall will be 3 inches thick at top and 12 inches thick at the base, with the slope side toward exercise lot.

To securely brace the sections of this wall, large posts, (called buttresses), are needed. These posts are the full height of the wall and are 12 x 18 inches square. The narrow side is set with the line of fence, and the buttresses are placed 11 feet apart from centre to centre. With the slight variation in size, the Forms for these buttresses are constructed in identically the same manner as the Forms for farm gate posts, shown on pages 80-85, with the exception that a 2 x 4-inch timber is nailed vertically to the inside of each side wall of the Form, 3 inches from the back board. This leaves a slot in the finished buttress, into which the slab sections of the wall are later "keyed."

Bev the 2 inch sides of these 2 x 4 timbers, in order to make their removal from the concrete easy.

Through these 2 x 4's at points 3 and 15 inches below the tops, bore ⅝ inch holes through which ½ inch reinforcement rods will be placed and allowed to project into the wall proper.

Locate the points for the centers of the buttresses, the first buttress at the beginning of the wall. Dig a hole for each buttress 12 x 18 inches and 4 feet deep and erect the buttress Forms. Fill the Forms with wet concrete, mixed 1:2:4. Do not forget to insert at the proper time, the 3 foot lengths of ½ inch rods in the ¾ inch holes above mentioned. Brace the Forms securely, to keep them in position.



After the first two buttresses are in place, dig out the 1 x 4 foot foundation trench and, over it and between the buttresses, erect the box Forms for the slab sections, with the sloping side next to the lot. These Forms provide for a wall 3 inches thick at top and 12 inches

thick at bottom, and are made of one inch siding nailed to 2 x 4 inch studding securely braced at bottom and tied together by cross pieces at the top. On the working side, add the siding as needed, so as to facilitate the placing of the concrete.

Remove the side Forms for buttress just before placing the Forms for wall proper.

In the centre of wall, within 6 inches of the top, imbed a 10 foot length of ½-inch iron rod.

After the wall is one week old, take down the wall Forms, erect them between the next two buttresses, and proceed with the construction in the same manner.

MATERIALS REQUIRED

For each 10 foot section of wall and 1 buttress

2 cu. yds. bank run gravel.
12 bags of cement.

OR

2 cu. yds. crushed stone.
1 cu. yd. sand.
12 bags of cement.

Approximate cost, $15.00 for each 10-foot section.

Concrete Watering Troughs

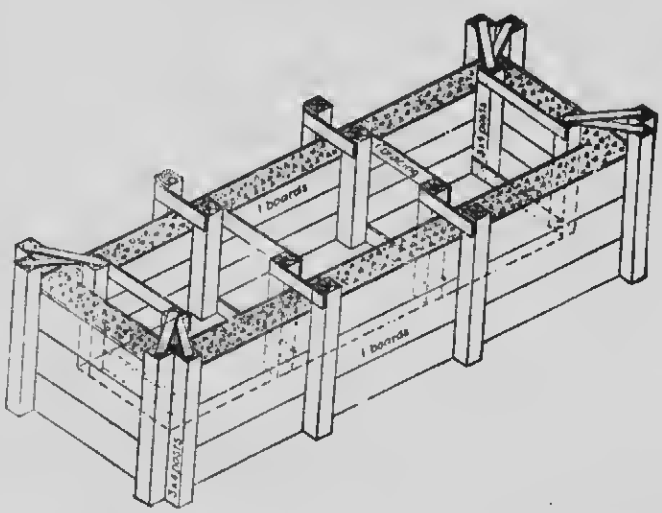
Probably in no other way has concrete been more advantageously used than in the building of tanks. If one will stop to consider the use to which tanks are put, their diversity of location, and the great variety of shapes into which convenience moulds them, it will be understood why concrete is an ideal material for their construction.

The importance of a sanitary condition is becoming more and more recognized for both men and animals, as new scientific investigations go to prove that all diseases arise from lack of proper sanitary measures. In consequence, the ability to easily clean a tank is considered of prime importance. Nothing is easier than to drain a concrete tank and scrub out the inside whenever desired. Not only that, but practically all the impurities which can accumulate are brought in by the water itself, and the surface of the concrete does not absorb them as does a porous material such as wood.

In order to perfectly hold the water or other content, a tank must act as one piece. A concrete tank is, owing to the way it is built, a one-piece tank, without joints, and therefore cannot crack or separate. The settlement of the house or foundation cannot crack it if properly constructed, and the building of a concrete tank as part of the house very often strengthens the house.

A concrete watering-trough is one of the easiest and simplest tanks that can be made of concrete, and will never rot. They are frequently built not only in the barn-yard or near the house, but, where large numbers of stock are pastured, they are built in the fields to hold water from a small spring which would not be otherwise available.

The illustration on page 35 shows one of the easiest constructed and simplest of tanks. It is 3 x 8 x 2½ feet deep, with walls 4 inches thick and a 6 inch bottom.



Select a place convenient to the water supply and level off the

ground for a space a little over 3 x 8 feet, sloping slightly in the direction in which the water is to drain from the trough. "Tamp" the ground thus leveled, until it is perfectly solid.

Drive four nails in the ground, forming a rectangle 8 feet 8 inches x 3 feet 8 inches, and stretch a string around these four nails.

Drive two 3 x 4 posts at each corner and two more along each side, securely into the ground on the outside of the string. These posts should be about 3 feet 6 inches long.

Nail 1 inch surface boards to the inside of these posts, bringing the Forms to a height of 3 feet above ground.

This completes the outside Form.

For the inside Form, get eight more 3 x 4 posts; and, by nailing 1 inch surface boards to the outside of the posts, make a box without top or bottom and 2½ feet deep, 8 feet long and 3 feet wide on the outside. Space the posts as described under "Forms"—one at each corner and two along each of the long sides, opposite the posts already driven into the ground. Brace the box at the bottom by nailing 1 inch boards between the posts. This completes the inside Form.

Bend a piece of woven wire fencing from bottom up into the sides and ends, and around the corners of sides and ends of form. This constitutes a simple reinforcement.

Fill in the bottom, directly on the ground, to a depth of 6 inches with concrete. The one great essential of a trough is that it shall not leak. To insure this the concrete should all be placed in one operation, and a mixture of 1:2:4 used—enough water must be added to make the mixture sloppy.

Smooth the concrete off on top to within 4 inches of the edges. This forms the bottom of the trough.

Now set the inside Form so that 4 inch space will be left between the inside and outside Forms. Nail 1 inch boards between the tops of the inside and outside posts, to hold the inside Form in position.

"Place" the concrete in the space between the two Forms, keeping it as nearly level as possible on all four sides.

The Forms should be left in position for about twelve hours after the concrete has been placed, and immediately on removal of the Forms paint the inside and outside of the walls, with a mixture of cement and water, about the thickness of cream.

To provide for draining, a hole must be made in the low end, at the floor level. This is done by inserting a round, tapered piece of wood between the forms, 6 inches above the ground. Oil this plug before placing it, and after the Forms are removed, it can be driven out and a permanent plug inserted from inside. This will hold the water in and can easily be removed when it is desired to drain the trough.

During the time the concrete is becoming hard, after the Forms are removed, it should be kept moist and protected from the sun. This can be done by covering it with a pair of horse blankets kept thoroughly wet, and at least once a day, the trough should be sprinkled.

About two weeks after being built, the trough is ready for use. Such a trough has a capacity of 14 barrels of water.

MATERIALS REQUIRED.

1¼ cu. yds. of bank run gravel.
10 bags cement.

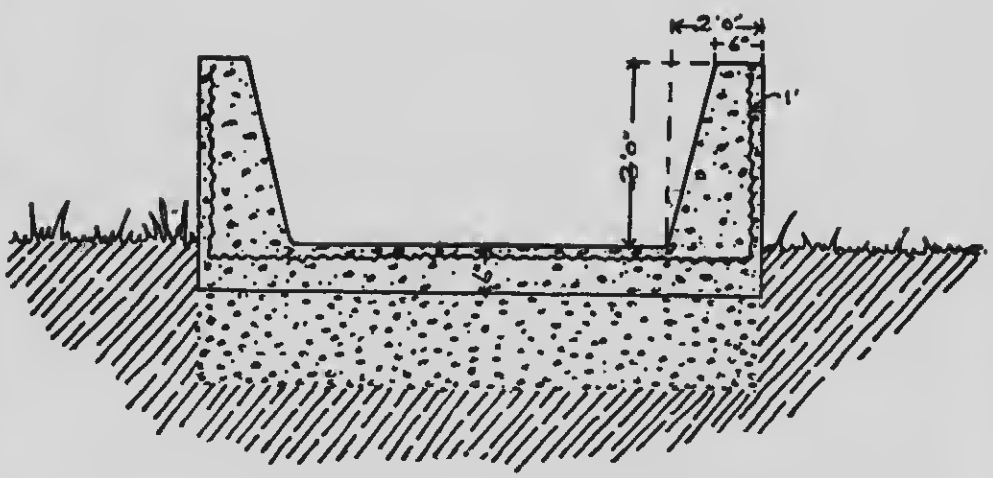
OR

1¼ cu. yds. stone.
⅝ cu. yds. sand.
10 bags cement.

It takes two men a day and a half to build it.

Approximate cost at current prices of material, and including labor, $12.00.

See page 38 for a description of the trough here illustrated.



The diagram gives correct measurements for the tank shown in above illustration.

When water in a tank is likely to freeze, it is better to make the top edge of the side walls 3 inches thick, and where the wall joins the floor, 5 inches thick.

With the outside of the tank vertical, this gives a slope or "batter" on the inside of 2 inches in 3 feet. Water expands in freezing, and in case the inside of the tank were made straight up and down, the freezing of the water might burst the tank. With the inside of the walls "battered" as above suggested, the ice will push upwards as the water freezes.

The tank shown in picture on page 37 is provided with a cast iron heater which sets within the tank and keeps the water at a temperature suitable for drinking purposes during freezing weather.

The heater is fed by dropping the fuel (coal, charcoal or wood) in at the top, which projects above the water line.

The Forms for this tank are the same as those described for the first tank—except that a slightly different shape is used.

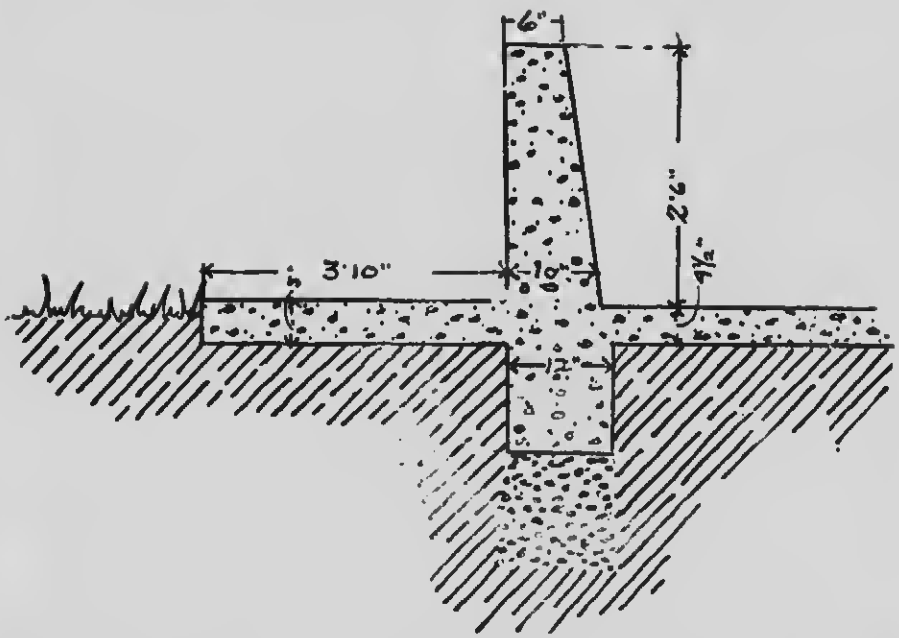
It will be noted that this tank has a wooden cover which keeps the water warm in winter and shades it from the sun in summer. Such a cover is also serviceable in keeping poultry and dirt out of the tank.

Sometimes it is desirable to build a trough of either circular or partly circular shape. The one shown in the illustration on page 39 was made in the shape shown, partly because that shape was best adapted to the space available in the particular location desired.

Another recommendation of this type of trough is that it affords drinking room for more stock than any other shaped tank of equal capacity.

It must also be said for such a trough that it is more artistic in appearance than the rectangular ones. Nowadays, the average farmer is not satisfied with half tumble-down farm buildings and fences. Everything must be spick and span, and the *appearance* not only lends a charm to farm life, but lessens the cost of maintenance and increases the value of the farm.

See page 38 for a description of the trough here illustrated.



The diagram gives correct measurements for the tank shown in above illustration; also for the concrete pavement which surrounds it.

How to Build Hydraulic Ram Houses —and similar Buildings

An hydraulic ram is a self-acting machine, used for pumping stream water to storage reservoirs.

Such a machine acts by direct water pressure, and must therefore of necessity be located close to the banks of a stream. Since concrete cannot be injured by water, it is the ideal material for housing the hydraulic ram.

To build the house shown, dig a trench of 6 feet square, this trench being 6 inches wide and 2 feet deep. Fill the trench with a 1:2:4 concrete mixture and at the same time lay a concrete floor 6 inches thick, and form the base for locating the ram. The dimensions of this base depend on the size of the ram, and it is made in the same manner as described for an engine base on page 52.

Over the concrete foundation, erect wall Forms, to provide for a thickness of 6 inches, and carrying same to a height of about 6 feet.

Now "place" concrete for walls.

Do not omit to set ½-inch bolts in the top of this wall, with which to fasten the 2-inch by 4-inch wooden "plates" for the roof.

After the Forms are erected, place door jamb, between inner and outer wall.

Remove the wall Forms after a period of four days, and build the peak roof shown.

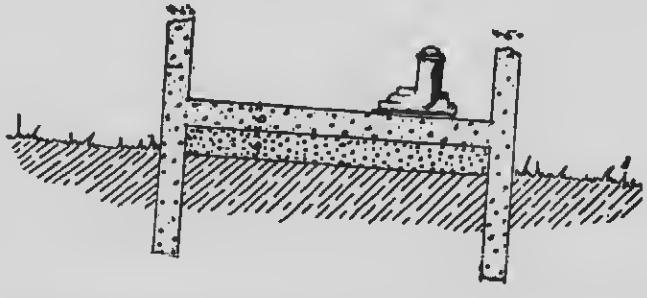
MATERIALS REQUIRED

4 cu. yds. bank run gravel.
24 bags of cement.

OR

4 cu. yds. crushed stone.
2 cu. yds. sand.
24 bags of cement.

Approximate cost, at current prices for materials, $25.00.



All such Buildings should be of Concrete

Lack of space prevents the illustrating of every kind of building that should be made of concrete. It may be stated, however, that all small buildings on the farm are built in exactly the same way as a ram house.

The one here pictured and described might answer equally well for a dog kennel, smoke house, ice house, tool house, gasoline storage house, acetylene gas plant, or for a storage house of any kind where freedom from fire, and durability, are required.

This building might have been rendered entirely fireproof, as well as still more durable, by covering it with a concrete roof, instead of using wood, as was done in this particular case.

An Elevated Water Supply Tank

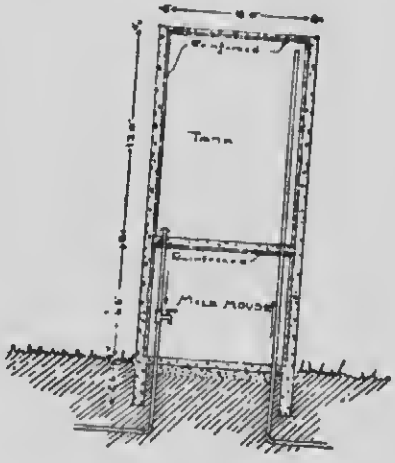
Along with other progressive steps taken by the farmer in recent years, has come a more general tendency to provide against the inconvenience and loss occasioned by shortage of water supply for his live stock. In making such provision, concrete affords great help.

Without the use of this modern building material, it would be impossible to arrange for the splendid water supply equipment now found on many of our best farms. Such an equipment consists of an elevated concrete supply tank with drinking tanks located in each of the different pastures, and wherever required on the farm. The supply tank is filled either by wind pump or by gasoline engine, drawing water from a well.

The choice of a site depends upon the location of the water supply and of the buildings and pastures to which it is desired to pipe the water.

Elevated tanks are either supported on reinforced-concrete legs or on a solid wall, as is the one shown here. The latter arrangement permits of the use of the space under the tank as a coal house, tool house, shower bath, gasoline storage, acetylene lighting plant, or milk house.

This lower room is especially well adapted to dairy uses. The concrete walls, together with the supply of cool water overhead, combine to ensure a permanently cool house, ideal for keeping milk and butter sweet.



The lower portion, or support, is 8 feet in diameter inside, with walls 8 inches thick. The ground floor is 4 inches thick; while the floor of the tank is 8 inches thick, as are also the tank walls.

The roof consists of a flat concrete slab 4 inches thick.

All concrete used in tank is of a mixture of 1:2:4 and must be thoroughly reinforced. Care must be taken to use a wet mixture, and same should be "spaded" as described on page 151.

MATERIALS REQUIRED

19 cu. yds. bank run gravel.
23 barrels cement.

OR

19 cu. yds. crushed stone.
9½ cu. yds. sand.
23 barrels cement.

Approximate cost, at current prices of materials, $100.00.

No Farm is Complete Without a Concrete Water Supply Tank

With such a tank, built of concrete you can always be sure of a supply of water, whether wind blows or engine runs. A child or a woman can control the watering of the stock, if you have such a tank on your farm.

This particular tank affords water pressure for land and garden, supplies the house and distant tanks, and provides for the washing of carriages, horses, automobiles, barn floor, etc.—in addition to providing fire protection.

In the course of a very heavy cold spell, ice has been known to form 8 inches thick on the inside of this tank without any ill effect—a striking instance of the superiority of concrete for this particular purpose.

The Construction of a Concrete Milk Vat

Dig a pit to a depth nf 1 foot 6 inches and place wooden Forms in such a way as to provide for tank walls 6 inches thick and 1 foot 8 inches in height. This will bring the walls only 8 inches above ground level—which makes it easy to lift the milk cans in and out.

Use a wet mixture of concrete, of proportions 1:2:4.

Place as described on page 151; and be sure to build walls and floor at the same time. The floor should be 6 inches thick.

The vat described, has a partition 6 inches thick, dividing the tank into two chambers, each chamber being 6 feet 9 inches long.

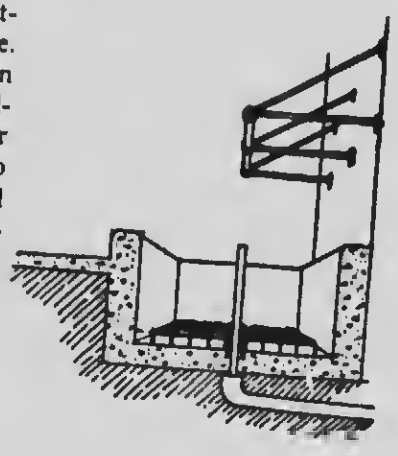
An iron grating is placed in the bottom of the tank to allow free 'culation of cooling water around and under milk cans.

In this instance, the water is pumped by an hydraulic Ram from a concrete Ram House at the spring, to a concrete reservoir, and thence drawn to this milk house, in which the vat is set.

Such a milk vat is, however, equally advantageous in connection with this or any other type of water supply.

Arrangements must be made for inlets and outlets. The inlet pipe can be simply placed above one end of tank.

A hole must be provided at the other end of tank, in the bottom, and conneeting, by an iron pipe, with the drain tile. Into this hole a removable upright iron pipe is fitted, the length of pipe depending on the depth of water desired for the cans. This allows the water to come only to the top of the pipe and provides an overflow outlet at the proper height. The pipe must fit tightly into the hole.



Time required to build:—1 day with three men on the job.

Approximate cost at eurrent prices of materials and including labor, $16.00.

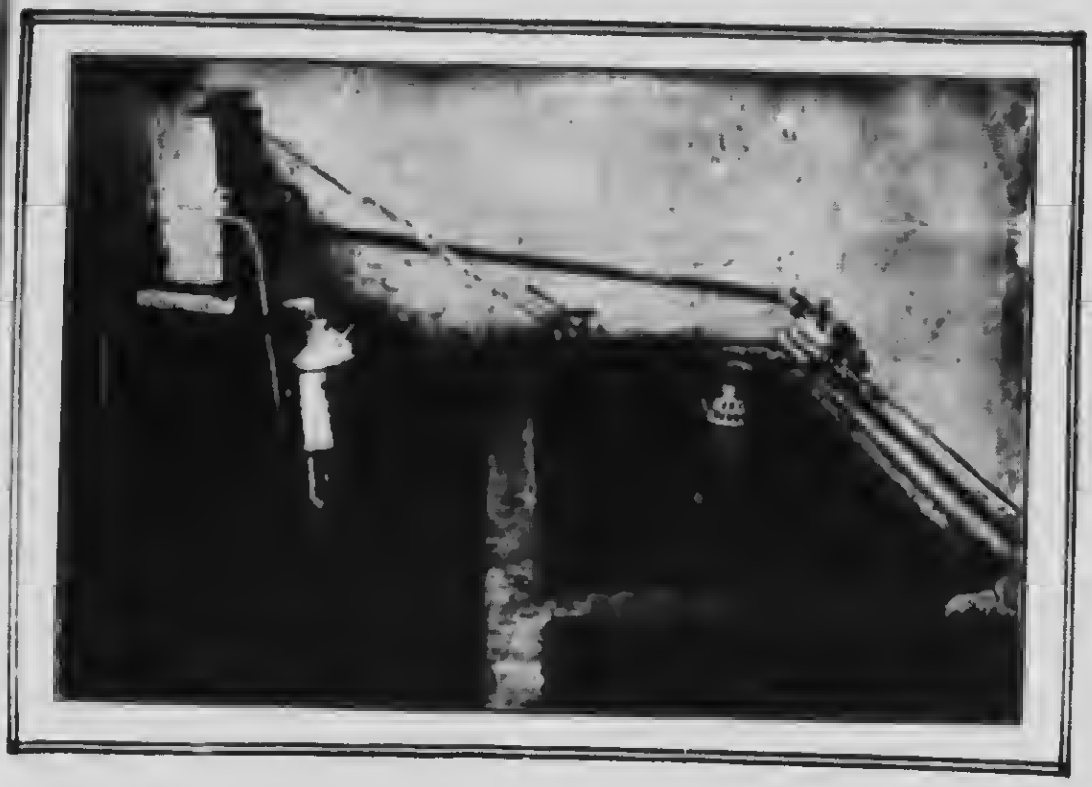
MATERIAL REQUIRED

3 cu. yds. bank run gravel.
20 bags cement.

OR

2 cu. yds. sand.
1½ cu. yds. sand.
20 bags cement.

To the left of the picture is shown an erator or milk cooler.



Everything in Connection With the Dairy Should be of Concrete

Of all the uses of concrete on the farm, possibly the most apparent in its importance, is that in connection with dairying. Even if concrete were an expensive material—which it is not by any means—it would be well to use it for the milk vat and its surroundings, because of the fact that cleanliness must, in the dairy, be the consideration that rules everything.

Concrete walls and floors, being easily washed down and kept clean, prevent the accumulation of odors and the consequent contamination of the milk.

As far as the vat itself is concerned, an added advantage arises from the fact that it cannot rot or rust.

A Concrete Milk House or Dairy

The illustration shows a simple form of milk house, with walls, floor and vat all of concrete. The vat, in this particular instance, is fed from a spring about 300 feet distant.

Dimensions of the house are as follows: Length, 16 feet; width, 12 feet; height, 8 feet; and rise of roof peak, 3 feet. The walls are 6 inches thick, and the roof is of wood, covered with a cement-tar preparation.

Dig a trench for foundation, 3 feet deep and 12 inches wide, in such a way as to bring the milk house wall in the centre of foundation. Fill trench with concrete, 1:2½:5, up to the ground level.

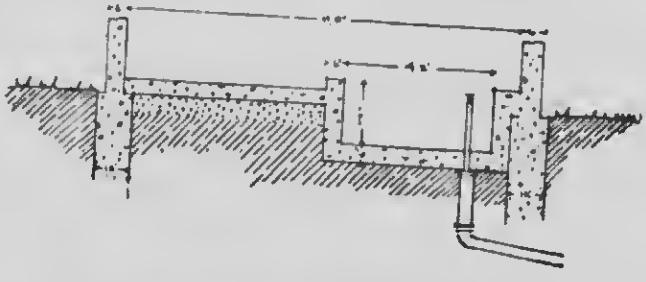
Make Forms of 1-inch siding on 2 x 4 studding, as described on pages 155, 156, 157. Proportions for wall concrete are 1:2:4. Place the all Forms on top of foundation, and shovel in the concrete. The door and window frame should be arranged in proper location in the Forms, before any concrete is placed.

Leave the Forms in place as long as possible, to prevent the concrete from drying out too quickly.

If surfaced plank be used for face of Form, no finish is required; but should the house present too rough an appearance, this roughness can be taken off by rubbing surface of concrete with holy stone and water. In the concrete over window and door, place three ½-inch rods, extending on either side of the door jamb or window sash. The same provision can be made for inlet and outlet as mentioned under "Milk Vats."

The concrete floor may all be "placed" immediately on completion of foundation, or, if preferred, after the building is finished. If placed before the side walls, there is danger of its being injured by walking on it, before the concrete has become thoroughly hard. It is, therefore, recommended that the floor be placed after building is finished.

For description of floor construction, see pages 48, 49. This floor is so made as to provide for draining of scrub water, this being effected by sloping the concrete floor slightly toward the doorway.



Perfect Cleanliness Can Only be Ensured by the Use of Concrete

There is no substance so readily tainted as milk.

Concrete walls and floors are waterproof, and consequently do not absorb the liquids that tend to give off bad odors and spoil the milk.

Even the milk inevitably spattered on the wall, is absorbed by wood or brick, and produces an unsanitary condition. Such a condition cannot obtain where the walls are of such an easily-washed material as concrete. In concrete dairy houses, with concrete vats, the milk will keep sweet longer than in surroundings of any other material.

Dairy experts all admit that no other material can take the place of concrete for such purposes.

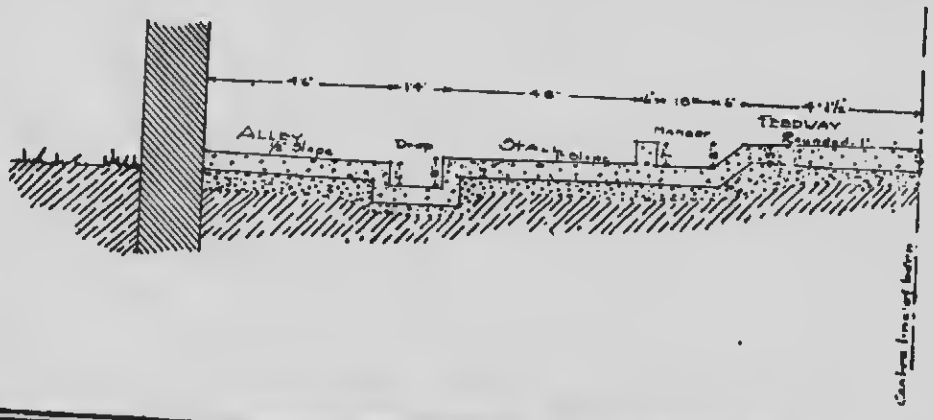
Concrete in the Cow Barn

Every section of the country has at times been subjected to an epidemic of infectious disease directly traceable to milk. Provincial health officials are giving this matter close attention, and in their opinion continual cleanliness is the first requisite of a healthful source of milk supply. Farmers who experience difficulty in keeping their dairy premises just as neat, clean and odorless as they would like, will find their greatest aid in concrete. The stalls of dairy barns are arranged with the cows in the opposite rows of stalls standing with heads or heels toward each other.

Remove all manure and other foreign matter together with such humps of earth as may be necessary to give the floor a slight slope in the direction in which the manure will be removed. Begin the construction of the floors at the two sides of the barn so that the middle and ends may be used as working space.

Consider a barn planned to have the two rows of cows facing each other. On the earthen floor, at a distance of 4½ feet from the side walls of the barn, set on edge a line of 2 by 6 inch boards, extending the entire length of the building. Support these boards by stakes driven firmly in the ground on the side of the board away from the barn wall. By means of a carpenter's spirit level and a grade line, see that the tops of these boards have an even slope (say ⅛-inch per foot) towards the manure pit. Allowing a clear intervening space of 10 inches, set up in a similar way a line of 2 by 8-inch boards with the supporting stakes inside of the 10-inch space and with the top of this board 2 inches higher than the 6-inch board. In this space the drop gutter will later be constructed.

Between the wall and the 6-inch board tamp in sufficient gravel to even off all irregularities in the ground surface and to allow the building of a 5-inch thickness of floor, sloping ½ inch from the wall to-



wards the gutter. Mix the concrete 1:2½:5, tamp into place, and finish the surface with a wooden float or a wire brush. The roughened surface thus produced gives the cows a good footing.

With the alley finished, begin the construction of the floor of the stalls proper. For the average sized cow, the usual length of stall is 4 feet 8 inches from stanchion to drop gutter. The stall floor should slope not less than ½-inch toward the drop gutter to provide for drain. The adjustable stanchion fastener is set in the centre of the 6-inch manger wall and the length of the stall regulated by this device. For a stall 4 feet 8 inches long set the outside board, (2 by 12 inches) of the manger wall 5 feet 2 inches from the drop gutter. The top of this board will be 7 inches above the finished floor. This extra height provides a Form for the manger wall.

In this space, place the 5-inch floor in the same manner as the alleyway was laid. If gas pipe stall divisions are to be used later, make mortises in the floor at the proper points by tamping the concrete around a core of the right size, removing the core when the concrete has stiffened. As soon as the floor of three stalls has been concreted and while the concrete is yet green, build the concrete manger wall upon the new stall floor. The projecting 7 inches of the 2 by 12-inch board already in place serves as the outer wall Form. "Toe nail" two 1 by 6-inch boards together at their edges, thus providing a 7-inch height for the other manger wall Form and a bearing plate to rest on the green stall floor.

Set this wall Form so as to leave a 6-inch space for the manger wall. Cross-brace these wall Forms upon each other and if necessary drive an occasional nail through the bearing plate into the new concrete. Fill the space between the Forms with concrete, setting the stanchion fasteners at the same time. Continue in the same manner until the stall floors are finished. If desired, the back wall of the manger may be given a dish shape for a swinging stanchion as shown in the picture.

Then commence the work on the other side of the barn, constructing the floor of the alley way and stall in exactly the same manner.

Wih the alleys and stalls finished, begin work on the feedway. If possible, this should be at least 8 feet wide.

As the bottom of the manger should be on a level with the stall floor and since the top of the feedway floor must be at least 8 inches above the bottom of the manger, place sufficient gravel Fill (well tamped) to bring about this result. To hold in place the 5-inch concrete of the feedway alley floor and to provide for sloping front walls of the mangers, set a 2 by 10-inch board, spaced (from the other wall of the manger) 1 foot 6 inches at the bottom and 1 foot 10 inches at the top. These sloping walls allow all feed to be swept back into the mangers and all trash to be easily removed from them. Build the 5-inch floor of the feedway, rounding it to 6 inches thick in the middle. The pictures show a shallower concrete manger with steel divisions which can be raised and lowered when the cows are watered or the mangers cleaned.

With the floors properly finished, begin laying the bottom of the gutters. (The gutter Forms have been removed as the floor has set up and have been used again). Remove a 5-inch thickness of earth in the gutter trench, being careful to undermine both edges of the floor 3 inches back of the edge.

Place a 5-inch gutter bottom of concrete and, by measuring down from the top of the graded floor, see that the gutter has the same slope towards the manure pit as the floor. Carefully work the concrete under the edges of the floor. Build the manger bottom in the same way. If the manger is also to be used as a watering trough, set all inlet and outlet pipes at necessary stages of the work. Be sure the sides of the gutter are straight. A sloping side causes many a misstep, with resulting wrenched shoulders and knees of cattle.

If the dairyman prefers to stand the rows of cows, heels toge[illegible] the plan described above may be easily adapted to this situation. A width of 8 feet 6 inches in the driveway provides sufficient room for a manure spreader.

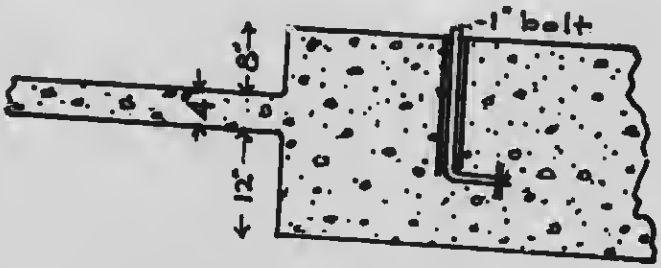
A Solid Concrete Base for a Gasoline Engine

The scarcity of labor is making necessary the use of other than hand and horse power on the farm. Many engines, of various types, are now used to cut feed, grind grain, separate chaff, for separating and churning cream, and for pumping water.

To form a base for the support of a small engine, first excavate a pit 2 feet 4 inches deep, and 1 foot larger both in length and width than the dimensions of the engine base.

Fill the pit with a mixture of concrete, (1:2½:5), and then construct a Form which will carry the concrete to a height 4 inches above the floor level or to the height desired.

Bolts should be set in the concrete, before it dries; these being sufficiently long to bend 4 inches at right angles, and to extend 1 foot deep into the concrete, with bent end down. They should be placed with the upright part surrounded by gas pipe of twice the diameter of the bolt, and of a length sufficient to come flush with the surface of the concrete. The open space formed around the bolt by the pipe will allow for slight errors in locating bolts, so as to meet the holes in the engine base.



Keep the concrete wet for 24 hours after placing, by sprinkling.

After six days, set the engine, adjust the bolts, and fill the spaces around the bolts with cement mortar, mixed 1 part cement, 1 part sand.

Do not use the engine until the concrete base is at least two weeks old.

Material required for an engine base 7 feet x 5 feet x 2½ feet deep:

2¾ yds. gravel. 14 bags of cement.	OR	2¾ yds. crushed stone. 1⅜ yds. sand. 14 bags of cement.

Approximate cost, at current prices for materials and including labor: $10.00.

A Concrete Base Adds Years to the Life of an Engine

Concrete forms a base that is heavy and unyielding, thus preventing the racking and consequent quick deterioration that always attend the use of an engine set on other kinds of bases.

A concrete base may be cheaply and easily constructed with unskilled labor.

Most farms nowadays have at least one such engine; and the manufacturers of standard engines recommend the use of a concrete base, such as here described.

Surely it is better to invest a few dollars in a concrete base rather than allow an expensive engine to rack itself to pieces.

Improving a Field Spring by Concrete

Springs in pastures are most valuable as watering places for live stock, but too frequently this advantage is neglected.

If not properly cared for, the pasture spring remains merely a filthy mud hole, unfit for animals to drink from. Clean water is important for animals as well as human beings.

Concrete is the most cleanly building material known. A spring improved by its use cannot become contaminated by germ-infected mud and manure: nor can the ground water mix with the drinking water.

Open up a channel and drain out all the water possible. Clean out the well of the spring, and lay up loosely with concrete blocks *without mortar*, until a point is reached above inflow points of the spring.

Complete this wall, either with blocks laid in 1:2 cement mortar, or, using wooden Forms, with a 6-inch solid wall of 1:2:4 concrete

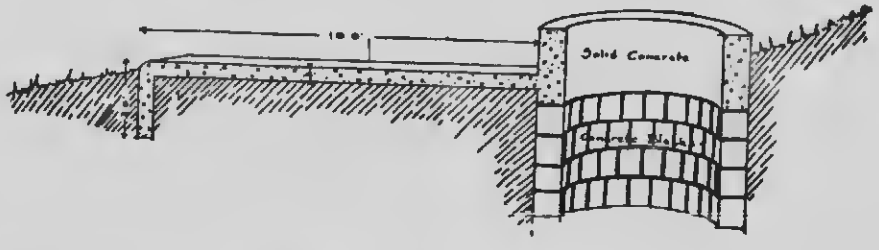
Carry the wall to sufficient height, (say ½ foot) to form a drinking tank, or so that water may be piped, (under ground) for other use.

Lay a 4-inch floor of 1:2½:5 or 1:5 concrete (upon an 8-inch gravel or crushed rock foundation) 10 feet around the tank on all sides.

At the edges of the floor, turn down a concrete "apron" or foundation, 2 feet into the ground.

Make provision for the overflow, at a point where it can be carried to the stream by a gutter in the floor, or a drain tile under it.

Approximate cost, at current prices of materials, 4c. per square foot of surface floor, and 20c. to 30c. per each barrel of capacity.



The "Reason Why" of a Concrete Spring Well and for Its Surrounding Floor

The concrete floor around the spring well, prevents the cutting up of the ground, keeps the stock clean, and affords no breeding place for flies and mosquitos. As there is no mud hole around the spring, the stock cannot mire, and the udders of the dairy cows are thereby kept clean.

By piping or the use of a trough, water can be carried to adjacent fields.

Cool running water may be supplied for distant milk vats.

The cleaning of a spring increases its flow.

A spring is in reality nothing more or less than a reservoir for filtered ground water, and will collect the greatest quantity of water if protected in this way.

Making a Spring Thoroughly Sanitary

The picture shows a spring walled up with loosely laid lime stone The spring well is covered with loose boards upon which rests a pump placed there merely for use in dry weather.

To improve and render sanitary, use concrete.

First, clean out the spring-well.

Next, lay up a wall of cement blocks wit' loose joints; laying up the two top feet in cement mortar. The loose joints are left to permit the water to flow into the spring.

If desired, instead of using cement blocks for the top two feet of wall, you may build here a solid concrete wall. Whether it is of blocks or of solid concrete, however, it must be carried on up to a height of 12 inches above the ground level. This prevents "seepage" of surface water into the spring and keeps out flood water.

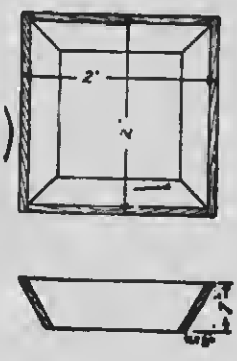
Now construct a removable slab cover of concrete, (1:2:4). This slab should be 6 inches thick and reinforced with wire fencing, placed 2 inches from under side.

If preferred, you can build—instead of this removable slab cover—a stationary concrete cover, 6 inches thick and provided with a manhole. Such a cover should be built upon a temporary wooden floor, firmly supported from beneath, but so constructed that it may be easily removed afterward.

The manhole opening may be made by constructing a bottomless wooden box, 2 feet square, with sides sloping inwards towards the bottom, thus giving a beveled joint to support the cover. This box is set on the wooden floor, and when concrete has been placed and box removed, you have a hole 2 feet square, with bevelled edges.

The slab for manhole cover may be formed in a wooden mould, with inside measurements a fraction smaller than the clear dimensions of opening.

By another method this slab may be molded right in position. After the wooden Form for the manhole opening is removed, place several thicknesses of wrapping paper around the edges of the opening and fill in the concrete for the slab. Bring same to the height of the already-constructed floor surface.



In either case, the cover should be reinforced with 4 half-inch iron rods laid criss-cross within two inches of under surface of slab. Do not omit to place a lifting ring in centre of slab.

After two weeks remove the temporary floor.

Why a Spring Should be Improved by the Use of Concrete

Such an improvement makes a sanitary spring; keeps out rats, mice, rabbits, etc., and enables the farmer to use all the water which the spring yields.

The spring here shown was, by means of this improvement, transformed from the untidy, useless affair that the illustration shows it to be, into a farm utility of real value, supplying fresh, cold water to the cooling vats of the milk house 600 feet distant and which stood 6 feet above water-level of the adjacent over-flow brook from the spring.

Concrete is above and beyond other methods for the building of thing that comes into contact with water.

A Simple Method of Making a Well Cover

The well cover here shown is placed over a 3-foot bored well, that has been walled up with brick. This brick wall merges, at the top of the well, into a sewer pipe having a "bell" 40 inches in diameter.

A concrete walk has been constructed, leading up to, and around, the well.

For the well-cover proper, mix concrete in the proportion of 1:2½:5.

This cover can be moulded in a sand mould. Or, better still, take a sewer pipe, the same size as the one in the well, place it on end with the "bell" up, and fill it with sand up to the beginning of the "bell." Place several thicknesses of wrapping paper on the inside edges of the bell to prevent the concrete from sticking to the pipe.

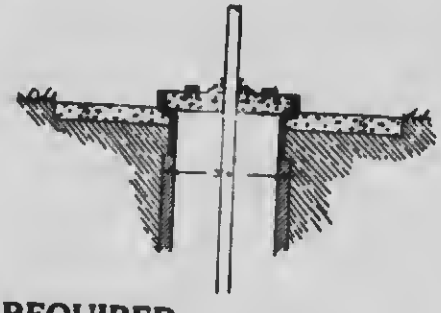
Pour the concrete mixture into the space thus formed, the sand in the pipe supporting it until set.

Thus you will obtain a cover of a thickness equal to the inside depth of the "bell;" but the diameter, instead of being the same as the bell, will, by reason of the wrapping paper, be only 39½ inches, leaving a slight play when cover is set in position.

Reinforce cover with woven wire fencing, placed within one inch of the bottom, and extending to within 1 inch of edge.

During process of construction, set a "core" in the concrete to form a hole for pump pipe. The core should be well greased so as to be easily removed. Also while placing concrete, set bolts in it, head down—so located as to meet holes in pump base; the nut ends being up, so that the pump base may be removed at any time.

Likewise place in the concrete 2 large staples with their ends bent in opposite directions, in order to engage the concrete; and projecting above concrete surface about ⅜ inch. These staples will provide fastenings for lifting ring for the removal of the well cover.



MATERIALS REQUIRED

3 cubic feet bank run gravel.
¾ bag cement.

OR

3 cubic feet crushed stone.
1½ cubic feet sand.
¾ bag cement.

Approximate cost at current prices of materials, and including labor: $1.00.

Wherein Concrete excels as a Material for Well Covers

Here is another instance of the importance of concrete for everything with which water comes in contact—especially drinking water.

As compared with wood, for such a purpose, concrete is infinitely cleaner and more sanitary.

If you have children about the farm you should also consider the important fact that concrete makes an absolutely safe well cover. Loose boards, in such a position, can be removed too easily to be safe.

A concrete well cover, as here illustrated and described, makes it impossible for scrub water to flow into the well from the walk which surrounds it.

Combined Cistern Cover and Walk

Build a wooden temporary floor within the cistern, and 6 inches below the desired height of finished concrete cover. This floor should be both strong and tight.

Floor is supported on strong studding (say 4 x 4-inch pieces) which will, of course, rest on the bottom of the cistern. Place wedges between the top of the studding and the temporary floor, which will render easy the removal of floor after the concrete has set.

The height of the top of the finished concrete cover must now be determined. For instance, if this happens to be 6-inches above the ground—which is about right—place a plank on its edge, extending 6 inches above the ground, and on a line with outside edge of cistern wall. This is to hold the concrete while it is being placed, acting as a Form.

Now, to provide for manhole opening—have a tinsmith make a round, bottomless tin form 6 inches deep, and 2 feet in diameter at top and 1½ feet in diameter at the bottom (just like a large dishpan without any bottom). Grease the tin and place it on the temporary floor, in the position where the manhole is to be.

Have on hand an old bridle bit or hitching post ring, which will constitute a lifting-handle for the concrete manhole cover. In placing this in position, the ring should be provided with a knob of twisted wire, or with a nut, to firmly fix it in the concrete.

Mix concrete 1:2½:5, and "place" it over the entire wooden floor to a depth of 2 inches. Lay, on top of this layer, a large piece of heavy woven wire fencing to serve as a reinforcement. Around the manhole opening give extra reinforcement by placing ½-inch iron rods 2½ feet long around the opening and 3 inches from edge of opening—thus forming a "square" of reinforcement.

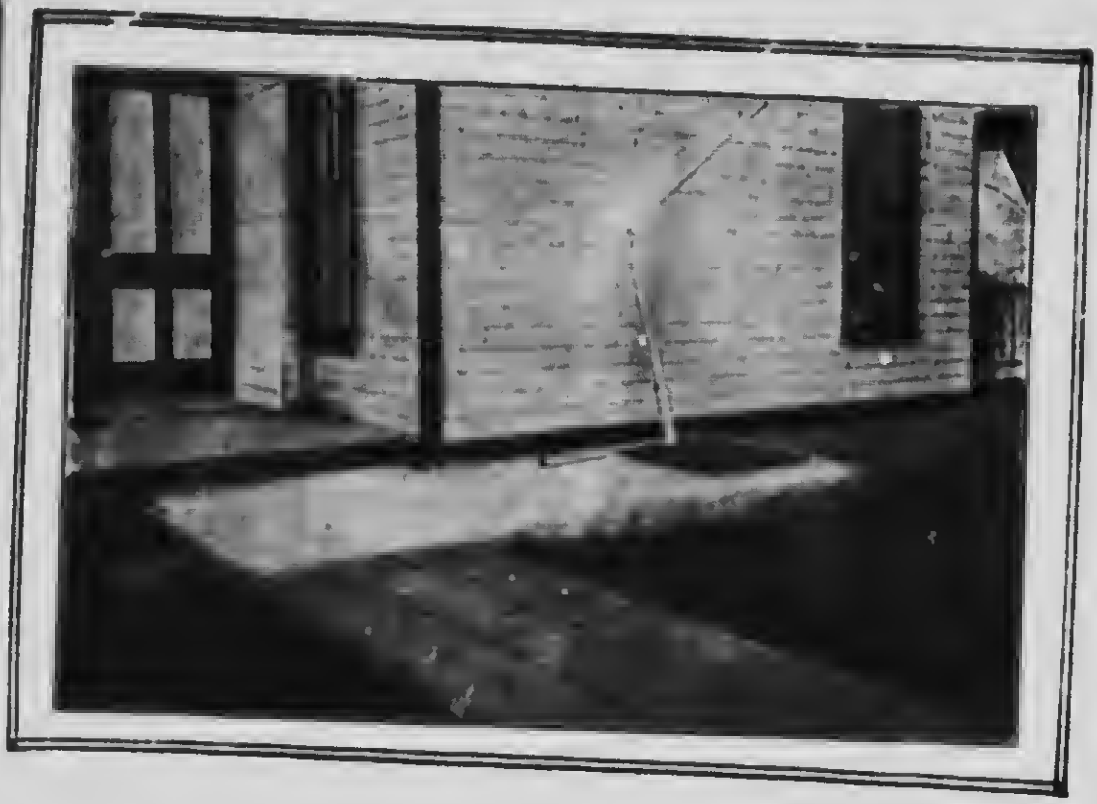
Now "place" remainder of concrete.

To reinforce manhole cover, use 4 short ½-inch iron rods, placed criss-cross, 2 inches from bottom of slab and 2 inches back from its edge.

In two weeks, you may remove manhole cover, bore a hole in wooden floor, saw an opening, descend and loosen the wedges—then remove temporary wooden floor.

The necessary openings for down-spout and for removing water may be made by embedding tile of proper diameter and length in the concrete, thus leaving an opening into which pipe may later be inserted.

Approximate cost, at current prices for materials and including labor, would be 10 cents per square foot of surface.



Concrete Provides the Only Proper Protection for a Cistern

Any receptacle for water should be kept clean, and should be protected against the possibility of animals falling into it.

If your cistern is covered with a wooden cover, the latter will in the course of time become rotten and dangerous—to say nothing of the disease germs which it is bound to accumulate. Rain and scrub water will filter through a wooden cover, polluting the cistern water. Mice, rats, minks, rabbits, frogs and small poultry will fall into the cistern and remain there unnoticed, until they putrify and give the water a bad odor.

Moreover, a manhole cover of wood is a source of danger to small children, who can easily displace it and fall in.

All such difficulties are removed by having your cistern cover and the manhole slab made of concrete.

New Style Cistern Built on Top of Ground

The photograph shows a cistern, 6x6x12 feet, inside dimensions, with walls and floor 6 inches thick and roof 4 inches thick.

Dig a pit 12 inches deep, and of the size of cistern desired. "Place" here a well-tamped fill of gravel to a depth of 6 inches.

Now mix concrete 1:2:4 and "place" it to a depth of 2 inches over the surface of the Fill. Lay, on top of this, sections of heavy woven wire fencing. The mesh of the wire fencing should not be greater than 7 inches square. This wire should be laid in such a way as to extend 6 inches beyond the outside edge of foundation—the ends being bent up, so as to stand upright, 3 inches back from the edge of the concrete flooring already "placed."

Immediately lay the remaining 4 inch of concrete floor. Give surface a finish with a wooden float to within 6 inch of edge.

Without delay, set the Forms, made up in the required sections, resting the inside Form on the concrete floor and the outside Form on the ground.

Place the inside Form first. After setting the inside Form, place woven fence wire with a mesh not greater than 7 inches square, supporting it against inside Form by means of staples driven lightly into the Form and holding the wire 3 inches away from it.

Care should be taken in placing the concrete, that the wire is kept near the centre of the wall. This reinforcement is carried 1 foot beyond top of wall. This projecting wire mesh will later be used to "tie" the concrete roof to side walls.

The timber required for the Forms will be 1 inch siding and 2x4 uprights.

In "placing" the concrete in the Forms, it will be easier to leave off the two top feet of planking of outside Form until the concrete reaches its level. Then add this planking and fill the two top feet. The concrete will probably have to be passed up to a man on top by means of buckets.

Build a wooden platform inside the cistern, even with the top—using a studding of the inside Forms to support same. On this platform place 2 inches of concrete, upon which lay heavy woven wire reinforcing; allowing the edges of wire to extend to within 1 inch of the outside line of walls.

Now bend down the wire which has been left projecting from the walls until it touches the wire fencing in roof, this serving as a "tie" between the roof and the walls.

Place an additional 2 inches of concrete over the wire mesh on roof, increasing the thickness of the concrete as you come toward the centre, so that it is 1 inch thicker there than at the edges. This is in order that water forming on the roof will flow off.

MATERIALS REQUIRED

45 bags cement.
9 cu. yds. bank run gravel.

OR

45 bags cement.
4½ cu. yds. sand.
9 cu. yds. crushed stone.

Approximate cost for a tank of 103 barrels capacity, at current prices of materials—$45.00.

Advantages of a Cistern Built on Top of Ground

The luxury of soft water for the bath, and its advantages for laundry purposes, are understood better by farmers than by their city cousins.

Cisterns were originally built in the ground, but a thinking farmer used concrete to build a cistern on top of the ground, no doubt taking the idea from the old-fashioned rain barrel.

This is the most economic form of cistern. While it requires more Forms and more reinforcement than a cistern built in the ground, yet the large cost of digging a deep hole in the ground is saved.

As the water is piped to the house, direct water pressure is provided. thereby giving the farm house all the advantages of a city water system.

This method. moreover, does away with the necessity of a pump or of carrying water.

An Underground Cistern

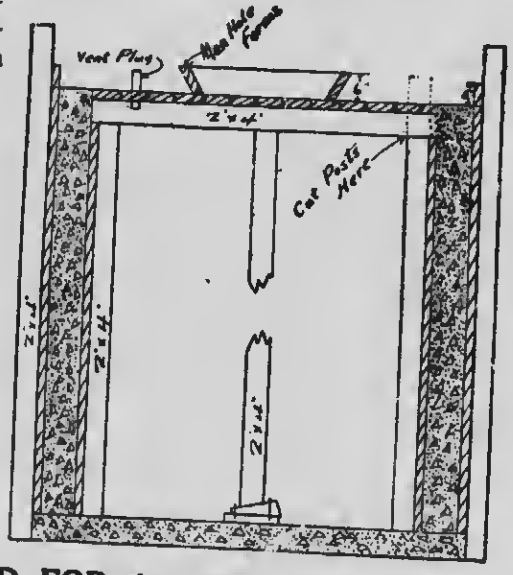
For cisterns, wells, or tanks below the ground, practically the same procedure is followed as described on preceding page; outside Forms are unnecessary. In placing a cistern, select the site, and mark it out, allowing for the thickness of the walls. The ground in which the hole is dug will usually be stiff enough to stand up without bracing, and if this is the case, should be used as the outside Form. Inside Forms can be made as described for above-ground cistern and lowered into the hole. The concrete is then "placed" by dumping from the top.

The thickness of the bottom and of the walls, and the amount of reinforcing, will be the same as those already described. If the ground is not stiff enough to stand up alone, and it is necessary to slope the sides, outside Forms become necessary, and are built in the same way as described for tanks above the ground.

All cisterns and many wells are provided with coverings, and these can easily be made of concrete. Their advantage is obvious from the standpoints of both cleanliness and permanence.

After the concrete for the side walls has been brought to the proper height, place a 5-inch board above it, and nail to the posts of the outside Forms (See plan.)

Saw, or cut, off the posts of the inside Forms 6 inches below the top of the concrete, and nail 2 by 4-inch joists to the top of these. Then place a 2-inch board or two 1-inch boards on the concrete in the bottom of the tank, and on this place a row of posts under each 2 x 4-inch joist, to support them in the middle. If these posts are not cut the exact length they can be raised into place by wedging between the board on the bottom and the lower end of the post. These posts can be of either 2 by 4 or 3 by 4 inch lumber. "Toe-nail" the bottom of the posts, and fasten the top by nailing through the "2 by 4" from the upper side. Now cover the top of the tank inside the walls with 1-inch boards. There is no reason for using surfaced stuff, but the boards should fit tightly together. In case cracks are left between, after placing, they can be filled by smearing a little clay in them.



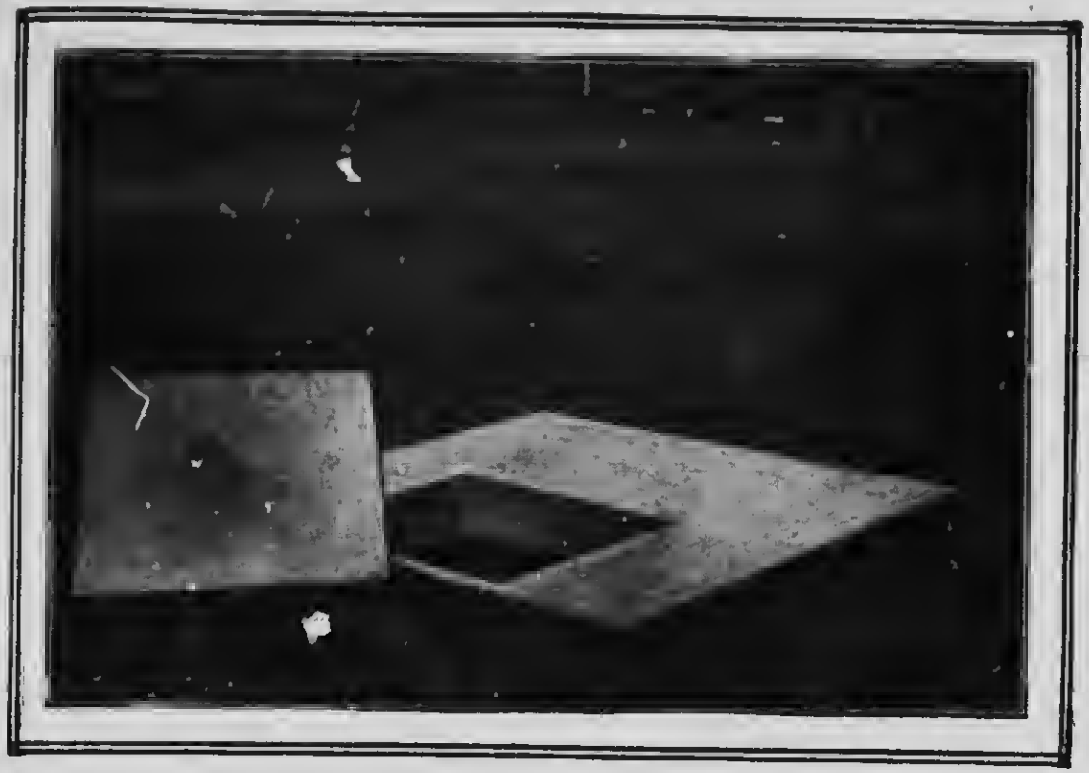
MATERIALS REQUIRED FOR A CISTERN 8 x 8 x 8

8 cu. yds. bank run gravel.
54 bags cement.

OR

8 cu. yds. crushed stone.
4 cu. yds. sand.
54 bags cement.

Approximate cost, at current prices of materials, $60.00.



Concrete Tanks will not Rot or Dry Out

No tank is always full of water, no matter how carefully the water-supply is planned. Both wooden and iron tanks go to pieces rapidly when alternately wet and dry; the wood from rotting and the iron from rusting, particularly where they are subjected to extreme changes of temperature and a lack of circulation of air. Cisterns of wood dry out in hot weather, and as they can never be built in one piece, the joints are sure to open if the tank is left empty in summer. This is usually the time of shortage in water-supply.

The materials necessary for the construction of a concrete cistern are usually close at hand. Sand and gravel can be obtained almost everywhere. Portland cement can be obtained, in small or large quantities, from dealers in every town.

Method of Construction for a Concrete Dipping Tank

There are three essential features of a dipping tank:—First—A slope at the entering end, steep enough to shoot the animal in.

Second—The tank must be narrow enough to prevent the animal turning around when once in, long enough to give him a good bath, and deep enough to force him to swim at least part of the way across.

Third—As the animal comes out of the tank, the slope must be gentle enough to permit his easily scrambling to the ground level.

Select a well-drained site convenient for a chute leading from a small corral. At the end of the narrow section of the chute lay out the tank, the entering slide being against the end of the chute. It is easier to dig the deep part of the tank first, sloping the earth under the entrance and exit chutes afterward. Now lay the outlet pipe so as to extend above the bottom as high as the top of the finished concrete floors when completed.

Mix concrete in proportions of 1:2½:5, and lay the floor directly on the earth. The floor for the slopes should be mixed fairly dry, so that it will stay in position on the slopes while being placed.

The sides will require Forms. Make these of 1-inch boards with enough 2x4 studs, braced on the inside, to be rigid.

With the concrete "placed" in the bottom and slopes, lower these Forms into the pit, and "place" the concrete in the sides.

The entrance-chute should be smooth, to easily slide the animal into the tank. Trowel this surface. The opposite slope, however, must be rough, to afford a foothold. A heavy wooden grating is sometimes placed on this latter slope, to make it easy for the animal to get out of the tank. If this is done, insert bolts in the green concrete, to hold the grating firmly at top and bottom.

After 24 hours, sprinkle the concrete floors and chutes twice daily for two days. The side wall Forms may be removed after one week; but do not use the tank for three weeks.

A drain should always be provided in the bottom, connecting with a drain tile, through which the contents of the tank can at any time be removed. If this is not done, the farmer is forced to the necessity of pumping or bailing out the chemical, a costly and tedious operation.

Such tanks are used for horses, cattle, sheep and hogs, and as the sizes of all these animals vary, the size of the tanks must also vary, according to the use to which it is to be put.

Why Dipping Tanks are Used

To rid stock of such pests as lice, mites, ticks, fleas and bugs, nothing as effective as dipping has ever been found. Agricultural departments are recommending and using dipping tanks not only for the above-described purposes, but also for the prevention of such dangerous diseases as mange, sheep scab and Texas fever.

The only method of applying the chemicals surely to all parts of the animal, is to plunge it into a tank containing the solution. Hence the dipping tank.

A Concrete Hog House

The comparatively high market prices of grain have brought about common sense methods of feeding and housing by means of which farmers are increasing their profits. Along this line, of equal importance with the concrete feeding floor, is the concrete hog house.

Choose a *well drained* location. Lay out the building, allowing sufficient space for roomy brood pens and a wide alleyway. Dig trenches for the foundation walls 3 feet deep and 8 inches wide. Fill the trenches with a 1:2½:5 concrete. Set in place previously framed box Forms (1-inch siding on 2 by 4-inch studding) and carry the 6-inch walls to the desired height. Have ready the door and window frames (well soaked in water) so that they can be placed at the necessary points as the work progresses. If the building is to have a wooden roof, set iron bolts in the green concrete so that the plates may later be securely fastened. Concrete roofs, reinforced, according to the plans of a competent concrete designer, make the building more thoroughly germproof.

To bring the finished floor above the surrounding ground, fill in 8 inches of coarse crushed rock or gravel tamped in 4-inch layers. Upon this lay a 3-inch floor of concrete provided with a drainage slope, in the desired direction, of ¼-inch per foot of width. To make possible the breaking up of the floor into brood pens, at the necessary points set sections of drain tile or of large gas pipe with their tops flush with the floor surface, into which may be placed temporary posts supporting the siding for these pens.

If the hog house must be located in a *paarly drained, damp* place, the floor may be kept entirely free of the ground by building foundation walls across the building, and 1 foot above the ground and by laying floor slabs on top of them. These slabs can be moulded on a *tight* wooden floor or platform. Make bottomless boxes of the necessary length, 5 feet wide and 3 inches deep. Grease the floor so that the concrete will not stick to it. Place a 1-inch thickness of 1:2:4 concrete and upon it lay heavy woven wire fencing with a mesh not exceeding 5 inches. Place the remaining 2 inches of concrete and finish the surface rough with a wooden float or wire brush. In this concrete use no stone greater than ¾-inch in size. Protect the slabs from the sun, sprinkle them twice daily and do not move them for 10 days. Set them in place with the finished side up and fill the cracks between the slabs with a 1:1 cement-sand mortar mixed fairly dry.

Most modern hog houses are now built so that they may be used either as brood pens or as one general shelter place. To give the maximum amount of sunlight, houses sufficiently wide for only one row of brood pens should face the south; all others should be turned opposite so as to catch both morning and evening sun.

Concrete Hog Houses are Best

Concrete hog houses are warm in winter; therefore, the animals do not need so much food to produce the body heat necessary for their comfort. Concrete hog houses are cool in summer; consequently they afford a comfortable resting place for the fattening hog. Thus the hog is sooner ready for the market and a saving in feed and labor is effected.

Concrete hog houses are easily kept clean. No woven wire is needed on a concrete floor to prevent the hogs from rooting. There is no mud about a concrete floor to carry over cholera germs from year to year. Hog houses entirely of concrete can be thoroughly disinfected, even sprayed with oil and burned out if necessary. There are no cracks in concrete hog houses through which the winter winds can sift the snow.

Many Farmers now Build their Barn Approaches of Concrete

For purposes of drainage, concrete barns are often built on the side of a hill, the lower storey being used for the live stock while the second floor is used as a wagon house, and for feed and storage. This arrangement necessitates a "barn approach."

Originally these approaches were simply of earth, piled up in front of the door; and quite often the earth extended beyond the ends of the barn.

Economy of space made it desirable to provide a retaining wall to hold the earth in position—and concrete naturally came into use for the purpose.

The earth Fill already in place in front of the barn door, should be cut out to the desired width and a trench dug along both sides below the ground level to a depth of 2½ or 3 feet, and 1 foot wide.

Only outside Forms are needed, as the earth Fill in the barn approach acts as an inside Form. These outside Forms may be made up in sections as large as desired, of 1 inch planks, with the necessary upright studding.

Mix concrete 1:2:4.

"Place" the concrete in the foundation, erect the Forms, holding these in position by nailing to stakes driven back of Form in the ground.

The concrete can be placed with greatest convenience, from the top of the earth Fill that forms the approach.

In "placing," however, be careful that the concrete strikes the wood Form instead of the earthen side, as concrete mixed with earth does not give the fullest possible strength.

In building the approach shown in photo, the farmer has added an additional feature—namely, a reinforced concrete bridge between the end of the approach floor and the sill of the door.

MATERIALS REQUIRED

12 cubic yards bank run gravel.
16 bbls. cement.

OR

12 cubic yards crushed stone.
6 cubic yards sand.
16 bbls. cement.

Approximate cost at current prices, $100.

The Advantages of a Concrete Barn Approach

With a wall of this description the earth Fill is not continually washing away with every rain.

By not allowing the approach Fill to come right up to the barn, the lower story of barn receives the full benefit of light and ventilation on all four sides.

The concrete bridge gives a shelter for wagons, etc.; while a root cellar may be conveniently built under the barn approach.

Such an approach adds greatly to the appearance of the barn and its surroundings.

Sometimes the Entire Barn is Built of Concrete

This handsome and durable structure is twelve sided, 60 feet in diameter, with each side 16 feet long; making it 192 feet around the outside of the barn walls.

These walls are made of solid concrete, 30 feet high above the ground floor, reinforced with heavy woven wire fencing. Further reinforcement is given above doors and windows by placing old iron in concrete.

The foundation is 3 feet 6 inches wide at the bottom, sloping in from both sides to the surface of the ground, where the main wall begins, 12 inches thick.

Walls are 12 inches thick up to one-third of the height, the next third, 10 inches thick; and the final third, 8 inches thick. There are 31 windows, all protected inside and out by wire screen; the screen frame being held in place by wood screws tightened up against the concrete.

In this barn there are no window frames or door frames to rot out; the window sash fits right into the concrete, being held there by ordinary window bolts, which fasten into small oak blocks in the concrete. The doors are hung on rollers.

The approximate cost of such a barn, at current prices for materials, and including labor, is $2,000, provided much of the work is done by the farmer and his help.

The ground floor of the barn is all of concrete, and has a driveway running through the centre, with a row of stalls and mangers on each side.

A round barn such as this, encloses as much barn space as a square one, 42 x 72 feet, effecting a saving of 32 feet of outside wall, and saving 25% of roofing and floor costs.

Concrete is Cheapest in the Long Run

The farmer who might hesitate to build his entire barn of concrete will do well to consider that, although the first cost of such a barn will be greater than if built of wood, concrete construction entirely eliminates the necessity of repairs—and thus the final cost may safely be figured as less than if any other material were used.

It should also be kept in mind that concrete is fire-proof.

If a careless farm hand drops a lantern in the hay on a barn floor, nothing can save a wooden barn. If the barn is of concrete, although the contents may be destroyed, the building cannot be. In case of fire, there will be time to remove stock, implements, etc. Fire in a wooden barn will spread so quickly that this can rarely be acccomplished.

Concrete Cellar Steps and Hatchway

Among the first uses for concrete nn the farm were steps. Owing to the fact that concrete can be nioulded into any desired shape, it is particularly desirahle for this use.

Some people like steps with a low rise, and particularly wide tread, while others prefer a high rise and narrow tread. Concrete can easily be fitted to either.

The determining feature is usually the space to be occupied. The door into the cellar way limits the depth to which the steps are taken, and therefore the height of the rises; while the room the cellarway is to take outside the line of the wall, determines the width of the tread. If possible, the rise of each step should be from 6 to 8 inches, while the width of the tread should be from 9 to 12 inches.

In erecting, first excavate the hole to the width of steps desired, plus one foot. This allows for a 6-inch wall on either side.

Slope the ground from 1 foot back of where the top step is to come to 1 foot back of where the bottom step will be.

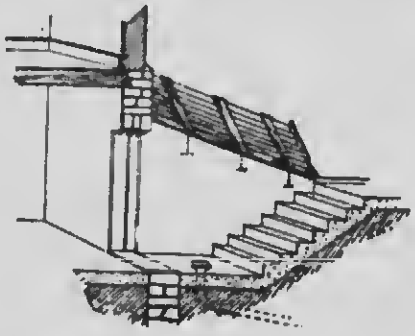
To form the steps, saw out a plank just as you would a "horse" for steps, and nail planks where the rises come, holding the two "horses" the proper distance apart. This is placed upside down, resting on the top and bottom, with the edge of the top and bottom rise where you wish the bottom and top steps to come.

Fill this Form with concrete, starting with the bottom step, and continuing upward to the top, bringing the concrete in each step to the top of rise.

Side Forms for the walls may now be placed, braced apart in the centre properly, and resting on the back of the horses. These can be carried to any height desired to give the hatchway doors a proper shape for shedding rain and snow.

Forms will have to be built on the outside of these walls above the ground line to hold the concrete in place.

If the bottom step does not come to the wall line, the flat landing in the bottom should be covered with a 5-inch thickness of concrete. Here is a convenient place to locate a drain, to carry off the water used in sluicing down the steps, and any which might leak through the cellar doors.



Before the concrete sets in the side walls, bolts should be placed, with heads in the concrete, by means of which wooden sills are fixed to the walls for fastening the cellar doors by strap hinges.

Features of Concrete that Recommend it for Cellar Steps

Cellar-ways are particularly liable to leak and cause a damp cellar. This cannot happen if made of concrete. There are no cracks through which the water can come. Wooden steps last no time, particularly where heavy barrels and similar weighty loads are taken up and down.

As wooden or brick area-ways are always damp, the steps rot quickly, thus requiring constant renewal. Few things are more dangerous to limb, and even life, than a step giving way under the weight of a heavy barrel and the man who is carrying it into the cellar.

Safety, as well as economy, suggest the use of concrete for all such construction as this.

Nothing can Equal Concrete for Root Cellars

The increasing use of roots, as winter feed for animals, has brought about the construction of root cellars, as a means of preserving this valuable food. A root cellar must be sufficiently warm and dry to keep roots from freezing or rotting.

Choose a well-drained site, and dig a pit in the earth to the desired depth and with an entrance-way so sloped as to make provision for concrete steps, which will have a rise of 7 inches and a tread of 10 inches.

The cellar shown in the photograph extends 5 feet below, and 2 feet above ground level. The walls are 5 inches thick, and are made of concrete proportioned 1:2:4.

Build a floor of the same thickness as the walls. Set inside box Form and fill the space between this Form and the earthen side walls with the wet concrete.

Above the ground level an outside Form must be used. The top of this outside Form, as well as the inside one, is shaped to give the arched roof shown in the picture, with a centre rise of 2 feet.

The roof must be reinforced and tied to the side walls in a manner similar to that described for the above-ground cistern on Page 62.

Ventilators are provided in the roof, by embedding in the concrete, lengths of sewer pipe, just as was done in the case of the above-ground cistern for inflow pipes.

By referring to page 74, there will be found a description of how to build a hatch-way and steps.

Immediately after the side wall Forms have been erected, the door frame should be placed in its required position, before placing concrete.

Similar structures are also used for bee, vegetable and fruit cellars.

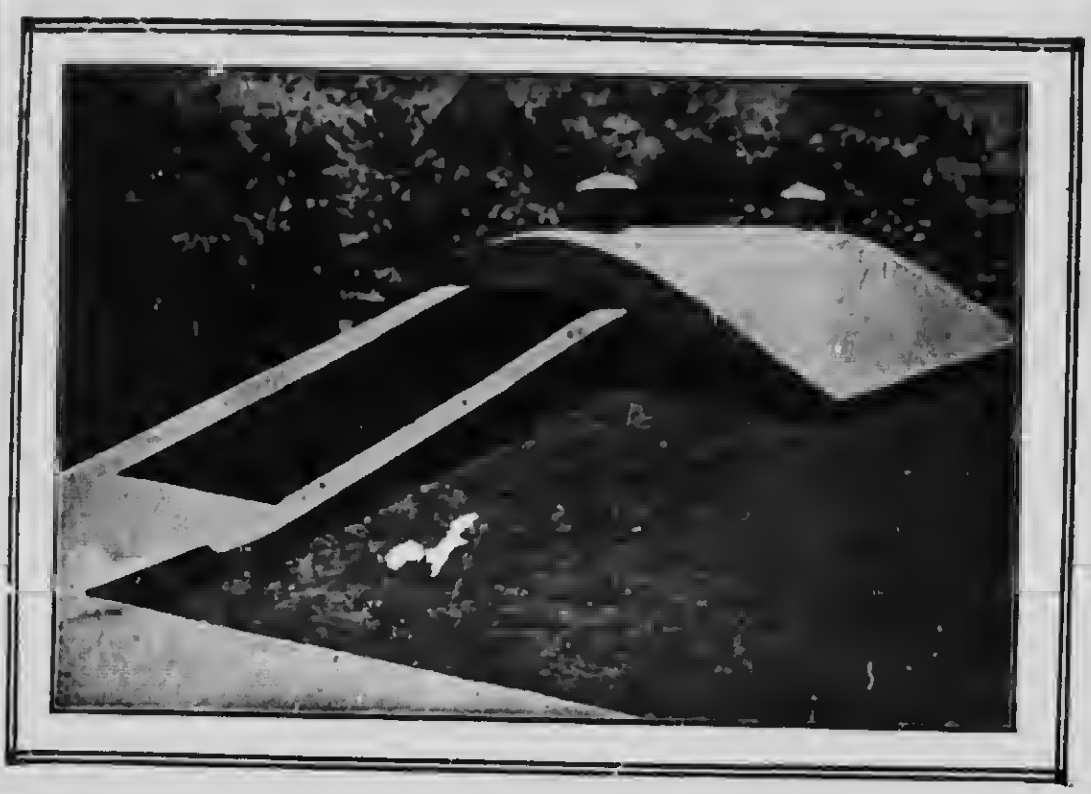
MATERIALS REQUIRED

11 cubic yards bank run gravel.
60 bags cement.

OR

11 cubic yards crushed stone.
5½ cubic yards sand.
60 bags cement.

Approximate cost of root cellar at current price sof materials, $55.00.



Concrete Keeps Roots from Freezing or Rotting—also good for Bees.

In addition to the reasons already given for concrete construction of such a cellar wherein to keep roots, it may be well to point out the importance of the use of this material in the building of similar cellars for keeping bees.

In cold climates bees must be warmly housed in winter, lest they freeze to death. In no way, can you provide so even a temperature or so dry an atmosphere, as by the use of concrete.

Concrete cellars are water-proof; and, since they do not rot, the possibility of the air within the root cellar becoming foul, is reduced to a minimum.

Rats and mice cannot gain an entrance to a concrete root cellar.

How to Preserve Gate Posts

A sagging gate post rotted at the ground line gives all the surroundings an unkempt appearance. A very simple remedy is afforded by the use of concrete.

First, brace the post in such a way as to prevent its falling. (See Fig. 1.). Then excavate around it, to a depth below frost line. With the post exposed, cut away that part of the wood which is found to be rotten.

Pull the post into proper position and re-nail the brace.

Now, drive stakes and place them against rough boards, (as shown in Fig. 2.), allowing the boards to project 6 inches above the ground. This makes a box around the post, into which the concrete is poured.

Nail together several small boards and place them on the ground in such a position that they can be readily shoveled from. Mix your concrete on this platform and shovel it, when mixed, directly into the box, tamping with a 3 inch by 4 inch piece of lumber.

Proportions of concrete are, 1:2½:5.

When filled, finish off with a steel trowel, leaving the concrete slightly higher where it rests against the sides of the post than at the edges. Braces and Forms may be removed after two days and the earth filled around the concrete, up to the ground level.

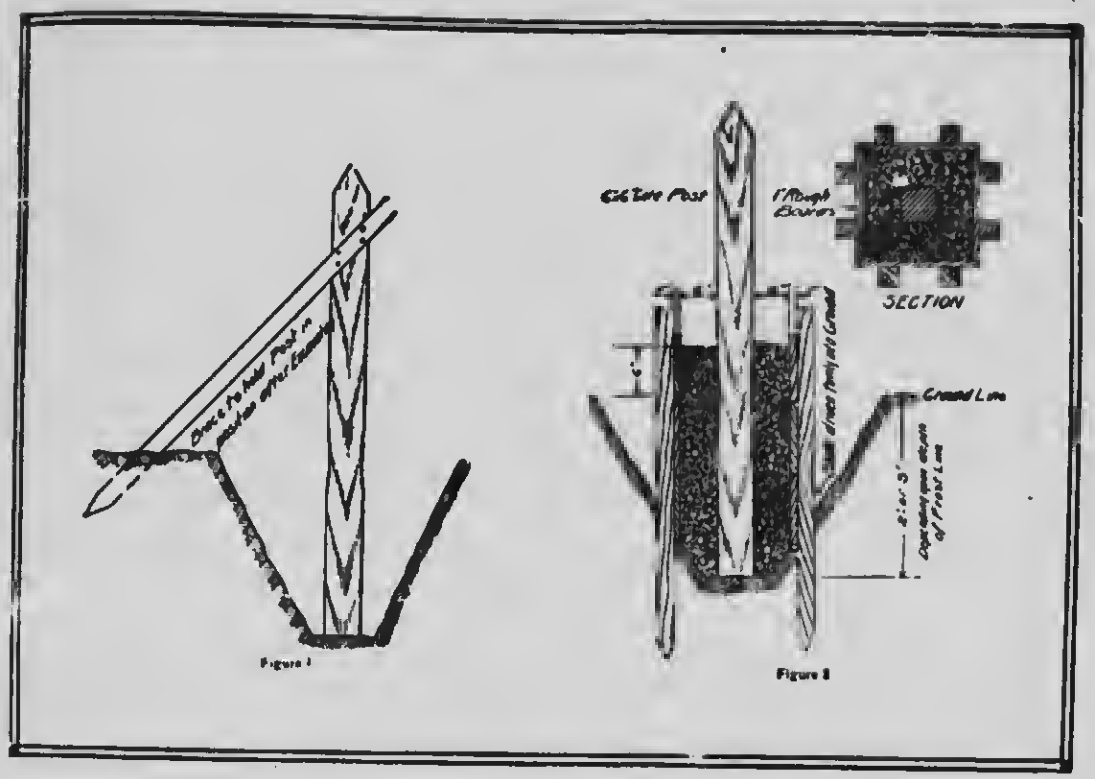
It will, of course, be understood that posts that have become very much rotted for their entire depth below ground, cannot be renewed—even by the use of concrete. The time to put in practice the above directions, is now—before the fence begins to give way. If, on the other hand, your fence is already in very bad shape, do not attempt to repair it. Put in a new one—this time using concrete posts, as described on pages 80-84.

Material Required for 6 x 8 Inch Post

5 cubic feet of bank run gravel.
2½ cubic feet sand.
1 bag cement.

Time required: About an hour, with only one man on the job.

Approximate cost, at current prices for materials, including labor, 50 cents for each post.



Advantages of this Method of Preserving Posts

Gate posts rot at the level of the ground much faster than at any other place.

A gate post usually fails by this "local rotting" and the post in other places is often found to be still in good condition.

The method of repair suggested, does not disturb the connections between the post and the gate, or between the post and the fence, as the case may be.

By repairing the posts, the entire fence is kept intact, and much labor is saved.

This method is often used in placing new wooden or iron posts; it adds many years to their life.

Concrete Fence Posts, and How to Make Them

The high price of wooden fence posts and the desire for permanent fences has led to the introduction ot the reinforced concrete fence post. Years of actual use in the fence row have gained for concrete fence posts the stamp of approval, and they are now in use by many governments, agricultural colleges, railroads and farmers in all parts of the world.

Concrete posts possess all the advantages of the wooden ones. In first cost they are usually cheaper than posts of timber, and as strong as wooden posts of the same size. After three years' service in the fence row, wooden posts lose one-half to one-third of their strength; concrete posts actually become stronger as they grow older.

Weather and fire do not injure them. Even forest fires cannot harm concrete fence posts. Well-built concrete posts last for ever. Fences built with concrete posts have an attractive appearance. Furthermore, since such fences are a permanent improvement, they add greatly to the general value of the farm property.

Moulds for concrete posts are made of either steel or wood, for single posts, or in sets or gangs. Steel moulds make the neatest, cleanest-appearing posts and are also handiest in operation. Often two or more neighbors buy steel moulds in partnership. Most farm papers and concrete magazines contain advertisements of manufacturers of steel moulds.

However, any person handy with saw and hammer can make good wooden moulds. Such moulds are usually made to form a four-sided post with either straight or tapering sides. The only reason for the taper is that it adds a little to the appearance of the post.

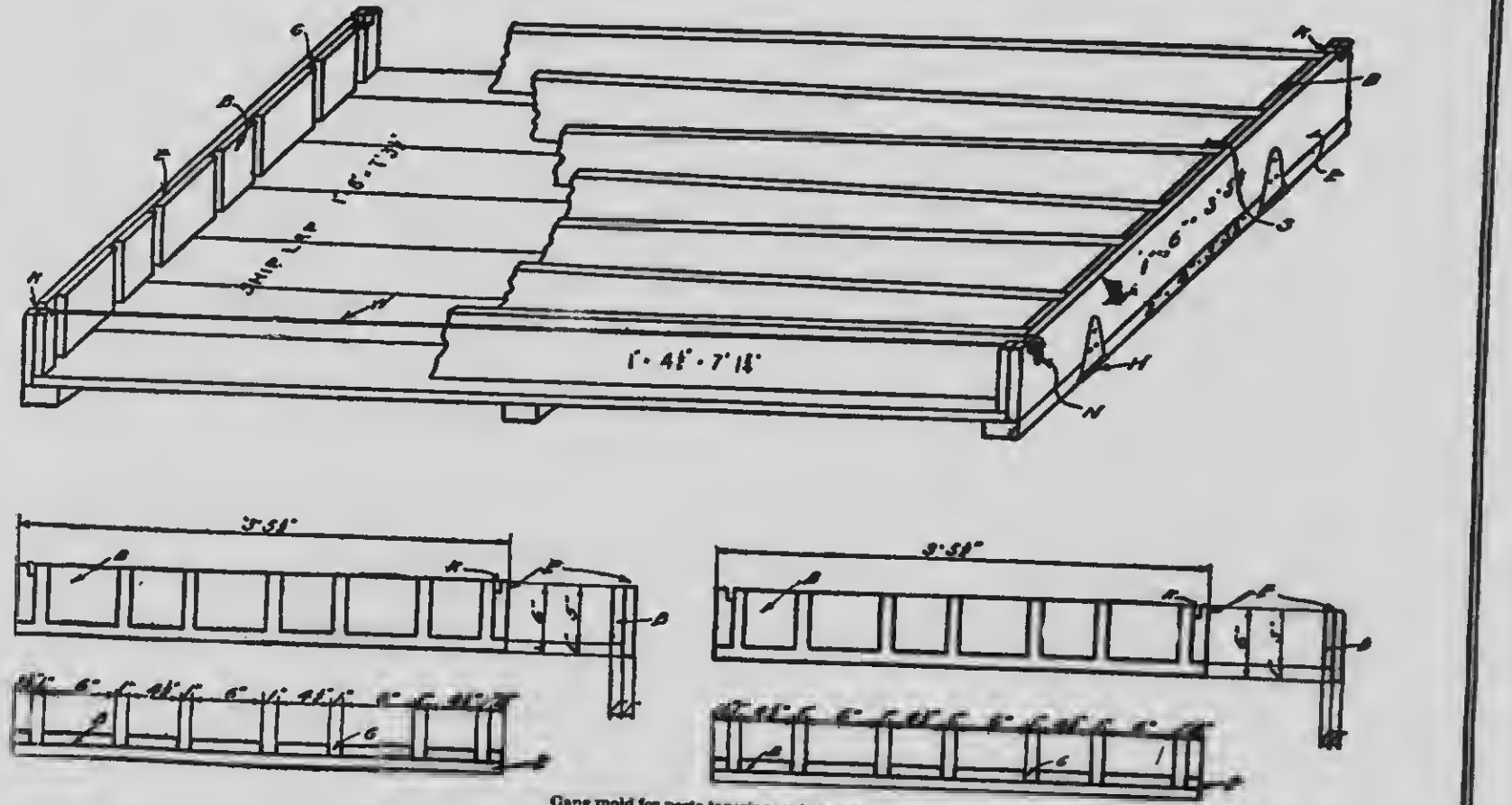
The most popular form of wooden mould is the six-post gang mould, shown in plan on Page 82. This shape produces a post tapering on two

sides, from 4½ by 6 inches at the butt to 4½ by 4½ inches at the top. The length is 7 feet. Adjoining posts lie in the mould, butt to top.

On account of the rigid method of construction, all lumber used in this mould, with the exception of the 2 x 4-inch stringers, is of 1-inch dressed boards. The bottom is of what carpenters call "ship-lap" lumber, cut to dimensions indicated on the drawing and nailed tightly to the three stringers. The end-pieces (E) are each made up of one board, to which are nailed end blocks (B) 1 inch in thickness—first a butt block 6 inches wide and 4½ inches deep, next a top block 4½ inches square, then again another butt block, and so on alternately until the six posts are provided for.

It will be readily seen that in arranging the blocks on the opposite end piece, a top block must come first.

The end pieces are hinged to the bottom with strap hinges (H) in which the fixed pin is replaced by a loose pin or nail. This arrangement allows the end pieces to be removed at will.



Gang mold for posts tapering on two sides.

The Form is set up ready for use in this manner: The end pieces are placed in position by inserting the loose pin of the hinges. Lengthened wagon rods (W) with crank meets (N) are dropped into the slots (K) and the side boards are then placed in the grooves (G) between the blocks on the end pieces. All the pieces are then drawn together by tightening the crank meets (N).

As concrete has a tendency to stick to either steel or wood, soft soap or crude oils should be applied sparingly to the inside of the Forms.

Reinforcement may consist of either 3-16 or ¼-inch round bars or single No. 8 or two No. 12 wires twisted together. The reinforcement should extend to within 1 inch of each end of post and should be long enough to allow the end of each wire or rod to be bent back on itself 2 inches. (*Continued on next page.*)

Four rods are used in each post and are placed one in each corner, ¼ inch from the outside of the posts.

Mix the concrete 1:2:4. Place sufficient in the bottom of the moulds to form a compact layer ¼ inch thick. On this lay 2 of the reinforcing rods as above directed.

Then "place" the concrete to within ¼ inch of top of Form, lay the remaining two reinforcing rods on same, and fill the Forms with concrete to the top.

It is a great mistake to believe that when the moulding is done, a concrete post is finished. The green post should be left in the mould until thoroughly hardened, which means usually for two or three days. The side boards may then be removed and used on the bottom board of another gang. But the posts must stay on their bottom board in a shady place and must not be disturbed for at least a week or 10 days. During this time they must be kept damp and covered with moist canvas, burlap or straw.

After ten days, if the space is needed, the post may, with care, be placed on end, in the same manner as are timber posts.

Concrete posts should not be put in the fence row until three months old. Therefore a well seasoned supply should be kept on hand.

The simplest and cheapest way of fastening wires to a concrete post is by encircling the post with a wire, and by twisting this wire around the strand of fence wire.

Material Required for Each 6 Posts

1-3 cubic yards bank run gravel.
2 bags of cement.

OR

1-3 cubic yards crushed stone.
1-6 cubic yards sand.
2 bags of cement.

Approximate cost, at current prices for materials, 25c. for each post.

The picture on page 83 shows a corner post made in the same manner as line posts except that an offset or bracket is formed in the moulding, to take the necessary braces running to the ground.

Concrete Farm Gate Posts

Farm gate posts are made in the same way as corner posts. An extra amount of reinforcement should, however, be placed in these posts.

Hinges and catch for the gate are inserted in the post while concrete is yet green.

On this page is shown a picture of a good type of farm gate post.

An important advantage of the concrete gate post is that it will never sag and allow the gate to droop.

Ornamental Gate Posts of Concrete

Gate posts are built of conerete in mueh the same manner as you would construct a concrete foundation or wall; that is to say, it is necessary to excavate to a depth below frost line, (say 3 or 4 ft.), and after putting in the foundations, you build the post with Forms. The only difference is, that instead nf having long, narrow Forms, as in the case of foundations and walls, in building gate posts you use a square Form, just like a box without any top or bottom. The Forms may be removed after six days.

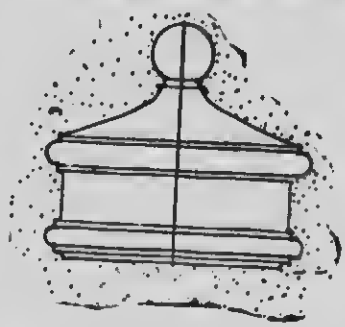
The concrete mixture should be of proportion 1:2½:5.

There are a number of concrete surface finishes which ean be made by the farmer himself. If a smooth surface is desired, the rough impression left by the Forms may be rubbed down by a holy stone or pumice stone—even a hrick-bat will answer. If this is done, the Forms must be removed in 24 hours.

The posts shown in the photograph, however, have had no finish treatment, and, it will be observed, present a most artistic appearance without it.

After the concrete in the posts proper has set, add the caps. In order to have these exact, it is well to employ the services of some one who understands sand moulding, but if a less fancy cap is desired, the farmer can himself prepare moulds in sand or of plank. In placing the cap use a layer of cement mortar (1 part cement—1 part sand). The caps may be set exactly level by the use of this mortar.

Hinges are placed before concrete sets, in proper position for the gate to swing on, also fastener in the opposite post for the gate to fasten. Holes for these appliances may be made by placing a greased wooden peg in position in the concrete; remove peg with the Forms; then insert the appliance, securing the latter in position by filling holes with cement mortar.



The posts here shown are 2½ feet square, and 8 feet high.

MATERIALS REQUIRED

2½ cu. yds. bank run gravel.
12 bags cement.

OR

2½ cu. yds. crushed stone.
1¼ cu. yds. stone.
12 bags cement.

Approximate cost, at current prices of materials, including labor, $10.00 for each post.

From an artistic standpoint Concrete cannot be surpassed

To demonstrate the fact that concrete is as ornamental as it is useful, this picture is reproduced. Could anything be more impressive or pleasing to the eye than these concrete posts?

The only other way to obtain an effect nearly so attractive would be by the use of iron, brick or cut stone.

Any of these materials would be much more expensive than concrete, and none of them so permanent.

Concrete posts, once built, are built for all time, and neither summer rain nor winter snow can in the slightest degree mar their appearance.

Horse Blocks and Hitching Posts are often Made of Concrete

A hitching post is built in the same way as any other post. (See pages 80-84), except that it is convenient to insert a staple and ring while the post is being built.

Very few localities afford natural stones large enough to make a convenient horse block. Therefore, concrete, the manufactured stone, at once suggests itself.

Select the location of the stepping-stone, build a box Form without top or bottom, and of desired size—and fill this Form with a mixture of 1:2:4 concrete.

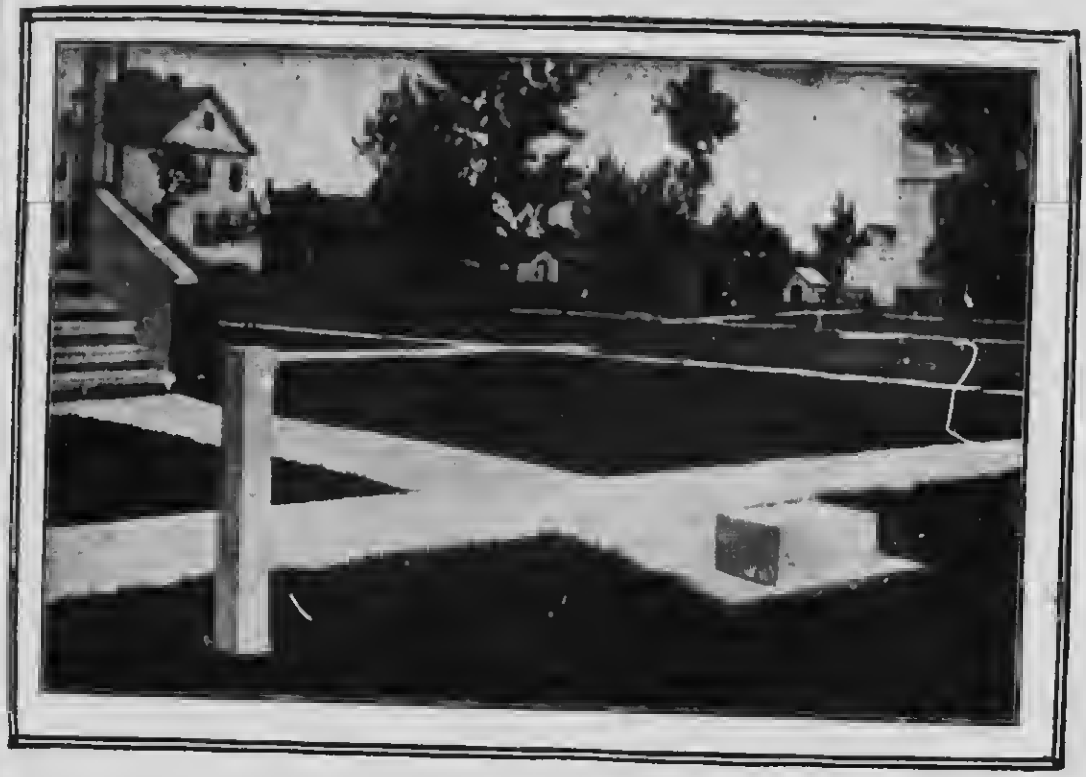
If a smooth stone is desired, finish off the top of concrete with a steel trowel immediately after the placing. The edges may be rounded with an edging tool, or, if necessary, use the trowel.

Remove box Form after the concrete has been in place 24 hours, and paint the outside with a mixture of cement and water of the thickness and consistency of cream.

A description of foundation for stepping-stone has been purposely omitted, as, if a foundation is placed, it is impossible to move the block from one location to another. This is sometimes desirable; and while such a concrete block is heavy, it can easily be moved with the help of two small pipe rollers and a plank.

Contrast the "trim" appearance of the landscape shown in the picture with any similar place you know of, where wood is the material used for walk and for hitching block.

Directions for the construction of the concrete walk are given on page 10 of this book.



Concrete may be used anywhere, instead of stone

The time is fast approaching when every farmer will realize that the most important material about the farm is a bag of cement. Not only is it available for hitching posts and carriage blocks; but any small object or farm utility otherwise requiring stone, is easily built with the help of cement.

Until a few years ago the word "Concrete" conveyed to the mind an idea of bulky construction such as immense foundations, the principal requirement of which was great strength. In recent years, however, this conception has been greatly modified, if not entirely changed. It is true that concrete continues to serve as an indispensible material for foundations, but it has gone further, and now is found to be a material with almost unlimited possibilities.

A Good Type of Concrete Culvert

Culverts of all sizes and shapes are nowadays being constructed of concrete, not only where the roads have been fully developed, but also on many farms.

Culverts vary greatly in size. The one illustrated on the next page has a circular opening 6 feet in diameter. Other culverts, for spanning larger or smaller streams, may be constructed on the same lines and by similar methods.

Culverts are, of course, best built during the dry season.

When the width of the stream is such that it is not possible to divert the water running through the centre in a sluice trough, then build a dam above the spot where the culvert is to be placed, and divert the water temporarily to one side, by means of a ditch.

Excavate trenches for the foundations, deep enough to be below freezing line, and about 3 feet wide.

Lay the "footing" directly on the earth at the bottom of trench—unless the ground is found to be marshy, in which case excavate to hard soil and fill with gravel. The concrete for such work should be a 1:2½:5 mixture.

For the Forms for wing walls, use 1-inch boards laid horizontally against 2 x 4 inch studding; the inner wing wall being cut to the shape of the arch.

The culvert shown in the photo has an opening of 6 feet diameter, the foundation extending 6 feet below the under side of arch.

The arch ring or barrel is 1 foot thick, with the bottom width of foundations 2 feet.

The head walls along the sides of the road are 18 feet long, 9 inches thick at top and 18 inches thick at base.

The width of roadway in the clear is 16 feet.

The arch is reinforced with steel rods.

MATERIALS REQUIRED

25 cu. yds. bank run gravel.
35 bbls. cement.

OR

25 cu. yds. crushed stone.
12½ cu. yds. sand.
35 bbls. cement.

Time required: five days with five men on the job.

Approximate cost, at current prices of materials, and including labor, $140.00.

Culverts should always be built of Concrete

First cost is not the only thing to consider in the building of a culvert.

While it is true that a wooden culvert can be built at less cost than a concrete one, it must be borne in mind that the wooden one will rot out in a very few years—while a concrete culvert will last practically for all time—and is thus the cheapest in the long run.

Another feature of concrete construction is that, by its use, a culvert can be made to appear quite attractive—as against the unsightliness of the wooden affairs.

Farmers are awakening to the importance of *permanent* construction—hence the increasing use of *concrete* for culverts and all similar structural work.

A Highway Bridge and Subway

In these days of the speedy automobile, grade crossings are becoming a matter of great danger to stock crossing the road from one pasture to the next. By putting a concrete floor under the bridge, stock can cross from field to field in safety. They cannot get mired while walking in the bed of the stream. In dry weather, watering tanks and feed racks are necessary in only one field.

Select a dry season, when the flow of water is small, or the stream bed entirely dry.

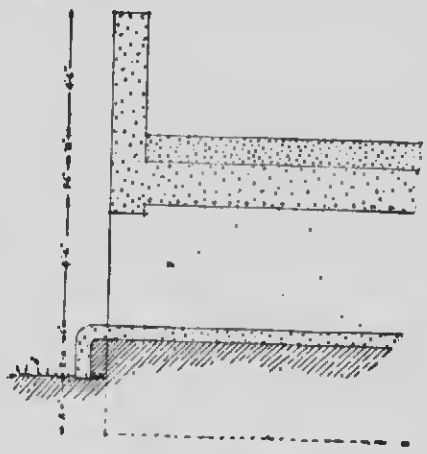
If necessary, carry the water, during construction, through the centre, by means of a wooden trough or sluice-way, extending from a small dam built on the up-stream side.

Floor the stream bed with concrete, 4 to 6 inches thick, carrying this floor into a trench at either end; this trench being about 2 feet deep (as shown in sketch) to prevent water from under-mining the floor.

Then dig a trench to solid ground (2 to 4 feet deep) for the wing-wall and side-wall foundations.

The bridge shown in illustration on opposite page is 30 feet long in the barrel, with a width of 8 feet and a height from the stream-bed to spring line, of 4 feet 6 inches—with an 18 inch "rise" to the arch.

The length of the wing-wall is dependent upon the height of the road grade or the depth of the "fill." In this case the wings are 6 feet in length, and 6 feet high at the low end—8 feet in height at the high end.



The arched floor or barrel of the bridge is 1 foot thick, as also are all the walls. The concrete is reinforced in both directions with 1-inch iron rods placed 1 foot apart and 2½ inches above lower surface of arch. This reinforcement also extends into both wing-walls to bind them to the arch proper.

Proportions for concrete mixture is 1:2½:5.

After the bridge is completed, place over it 2 or 3 feet of gravel fill for road.

MATERIALS REQUIRED

41 cu. yds. bank run gravel.
180 bags cement.

OR

41 cu. yds. crushed rock.
20½ cu. yds. sand.
180 bags cement.

Time required, five days with three men on the job.

Approximate cost, at current prices of materials, and including labor, $175.00.

A Concrete Bridge is Everlasting

Unlike bridges constructed of other materials, concrete bridges once built, need no repairs, and actually become stronger with age.

Bridges built of other material, even with the best of attention, last only a limited time. Therefore, concrete bridges not only pay for themselves in a short time, but permanently reduce the bridge tax. With all bridges and culverts built of concrete, the funds formerly spent for bridges may be used for other permanent road improvement.

The natural color of concrete harmonizes with nature's own colors, and adds a distinct charm to the landscape.

Gravel and sand suitable for concrete are usually found in the bed or banks of the stream.

This Farmer Added a Concrete Coping to His Old Stone Wall

If there is, on your farm, an old retaining wall such as that shown in the illustration, you can add 100% to its appearance and 100 years to its life, by crowning it with a "coping" of concrete.

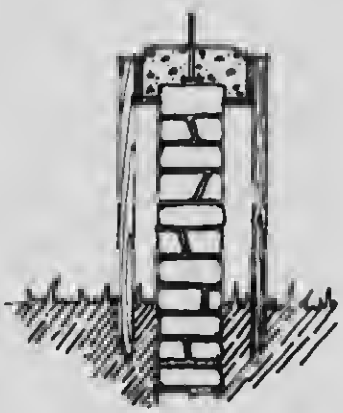
Usually such a wall, when built of stone, has a top surface which gives it the appearance of having been thrown together in a hurry and the top left uncompleted.

Concrete is ideal to finish off the job.

Construct wooden Forms of 1 inch material laid up alongside the stone wall and held in place by stakes driven upright in the ground; the Forms may be spaced by cross-ties of proper length, nailed to the tops of Forms.

Mix concrete 1:2½:5, and lay it along the top of wall to a depth of about 4 inches, finishing the surface and rounding off the corners with a steel trowel.

It is sometimes preferred to allow the concrete coping to project 1 inch on either side beyond the side of the wall. When this is done, a "spacing strip" 1 inch thick must be nailed to the inside of each Form, and so located that its top surface is even with the top of the old stone wall.



A still further touch of beauty might easily be added by an ornamental balustrade. To provide for this, during process of construction, set ½ inch bolts in the concrete, at necessary intervals, to hold balustrade securely.

The coping shown in the picture, 1,500 feet in length, is 12 inches wide and 4 inches thick. 1 cu. yd. of concrete was used for each 80 lineal feet of coping.

Materials Required for Each 80 Feet Section

1 cu. yd. bank run gravel.
7 bags cement.

OR

1 cu. yd. crushed stone.
½ cu. yd. of sand.
7 bags cement.

It was found that three men would construct about 80 lineal feet of coping in a day.

Approximate cost at current prices of materials, including labor, 15c. per lineal foot.

Concrete Adds Just the Right Finishing Touch

Such a coping, it will be readily understood, provides protection for, and stops further "weathering" of, the old stone wall—adding years to the life of the wall, and thus saving the cost of eventually building a new one.

A wall unprotected by a top coping, absorbs the water during a rain; and when, as often happens, this water freezes, it dislodges the stone or brick of which the wall is made, and—as the result of this—occasional brick or stone will surely fall out of the wall.

Equally important is such a coping, from the standpoint of appearance. It gives a neat effect to the general finish of the farm structures and thereby enhances the value of the farm property.

Retaining Wall Steps

It may be convenient to have a terrace held up by a neat retaining wall. This arrangement saves a considerable amount of space which would otherwise be taken up by the slope of the ground.

If the wall is high, steps are necessary. A most convenient arrangement of steps and one easy to build is here shown. The bottom step comes flush with the wall, is really a part of it, removing all liability of falling over a projecting step in the dark.

Where the steps are desired, insert a plank across the retaining wall Forms, to prevent the concrete from going to the full height of the wall. The bottom of this plank should be kept at a height above the bottom of the wall sufficient to form the first step.

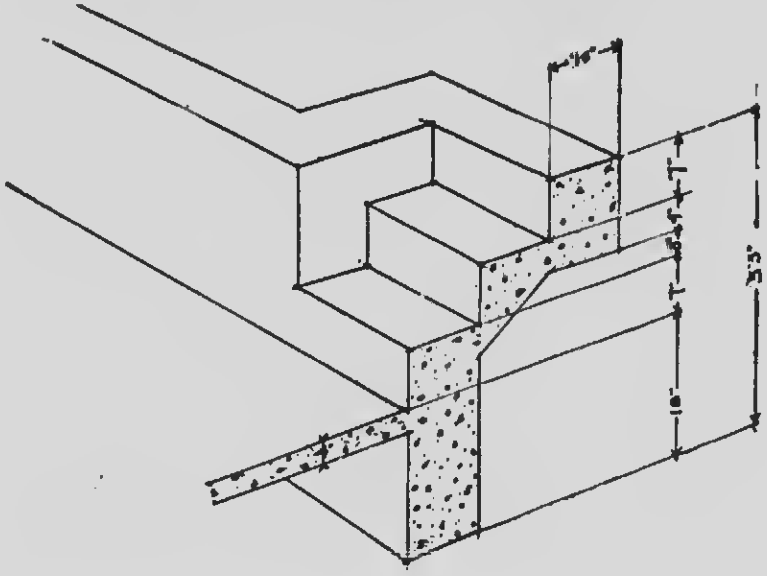
After the concrete for the wall is placed, remove that section of the Form where the steps are to come, and cut out the earth to a depth sufficient to accommodate them.

The steps are formed in the same manner as those described on page 74; a plank being sawed out in the same manner as a "horse" is made for wooden steps. Planks are nailed where the "rises" come. These planks hold the two "horses" apart.

Place the wooden structure thus formed upside down, with the edge of the top and bottom rise where it is desired to have the bottom and top steps. Inside Forms for the side walls should now be erected—and braced apart in the centre—resting on the back of the "horses."

The Forms are now ready to be filled with concrete. Start placing the mixture at the bottom, and continue upward to the top, bringing the concrete in each step to the top of the "rise."

No outside Forms are required; as the concrete wall, already built, together with the earth itself, will answer this purpose.



Concrete Makes the Ideal Retaining Wall and Retaining Wall-Steps

Wherever there is a double ground level—that is to say, a section of the farm where the earth abruptly drops a few feet, either naturally or as a result of alterations—it is well to have a Retaining Wall of concrete, forming a neat "terrace" as shown in the photograph.

It would indeed be a pity to spoil such an arrangement by placing wooden steps—especially when it is so convenient and easy to construct steps of concrete, and since, moreover, the placing of concrete steps adds practically nothing to the cost of the Retaining Walls.

The plan here outlined results in the neatest possible arrangement for such steps, and precludes the possibility of accidents such as might be occasioned by a flight of steps that project beyond the wall line.

Concrete Makes an Excellent Porch Floor

Remove the old wooden floor, taking care to place props under the porch roof and outside the line of the proposed porch floor. The pillars themselves must also be supported, the supports for these being removed as the concrete is placed.

Excavate a foundation trench about 18 inches deep and 8 inches wide. Above this trench, set Forms, to bring the foundation to the desired height of the finished floor.

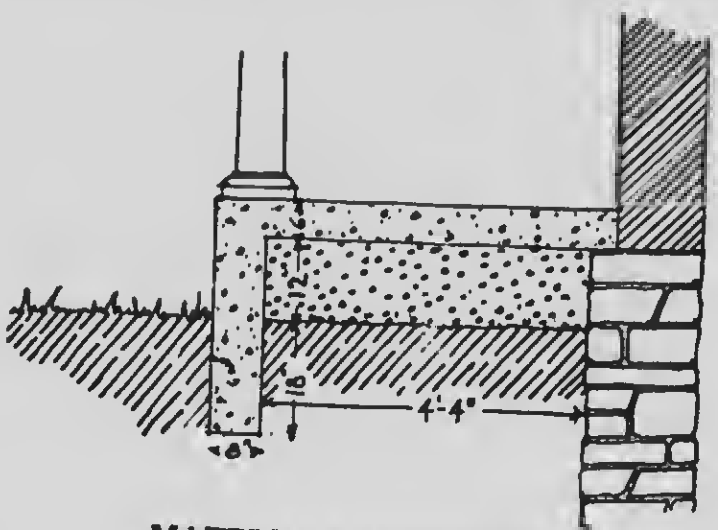
Mix concrete 1:2½:5.

After filling the foundation trench with the concrete up to the level of the ground, fill the space inside the trench with gravel, to within 6 inches of the top of the Form, placing Fill and balance of concrete at the same time. This Fill serves as the inside Form for the concrete, and also as a support for the concrete floor. This should be thoroughly "tamped." In placing the concrete, begin at one end of the porch and "place" floor and foundation wall in one continuous process.

After removing the Forms, finish the surface with a wooden float or steel trowel.

A pretty effect may be obtained by placing on the floor a wearing surface of one part cement to two parts crushed marble, this being done as the concrete work progresses. This surface should be left to harden slightly (about 12 hours) and then rubbed over with pumice stone—thus exposing the marble enough to give the floor a fine finish.

Dimensions of porch are 5 feet by 16 feet.



MATERIALS REQUIRED

3½ cu. yds. bank run gravel.
16 bags cement.

OR

3½ cu. yds. crushed stone.
1¾ cu. yds. sand.
16 bags cement.

Approximate cost of porch floor and foundations, at current prices of materials, including labor, $10.00.

Desirable Features of Concrete in Repairing the Porch Floor

Such construction, in concrete, is as cheap—in the first cost—as other materials; whereas from the point of view of endurance, upkeep cost, and cleanliness, Concrete is of course infinitely superior to any other possible material.

A concrete porch is not subject to deterioration.

It is fire-resisting, clean, free from vermin—and needs no repair.

It becomes stronger and stronger as the years go by.

The farmer who considers his wife's interests will use concrete wherever possible around the house, just as he uses it for his own best interests about the farm.

A House of Concrete

Adequate fire protection is unknown in outlying farm districts; and thus, to the ordinary dread of fire is added, in the farmer's case, the feeling of complete helplessness in the face of such danger.

This danger can be, to some extent, lessened by an adequate farm water supply, arranged in such a way as to be available in case of fire. But why not altogether prevent fire destruction, by building all possible buildings of concrete?

In no direction has the use of cement made such strides as in that of fireproof construction.

Many reports are furnished by owners, heads of fire departments and insurance officials, to the effect that the concrete of which certain buildings are erected, prevented the spread of fire and the structure remained practically undamaged after the ordeal.

It is scarcely believable that the fire loss in farm districts in this country amounts to a per capita charge of $3.65 per year. Originally so-called "concrete fire-proof houses" were constructed by placing metal lath or wire mesh on the outside of wood or brick and plastering this with cement mortar. But this is not strictly fire-proof construction.

A house built of solid concrete cannot burn. Walls may be built with an air space on outside, taken care of by furring or plaster; or by making the air space in the wall itself.

The Forms and foundations for a house are constructed in much the same way as those for a barn; with house floors and roof placed the same as in the case of a cistern cover or roof.

Any desired form of exterior finish may be obtained, and some of our most beautiful homes, in both city and country, have been built of concrete.

It is impossible in the short space available to give complete directions how to build a house of concrete. Each house, on account of its size, location, arrangement and architectural detail, presents a problem of its own; and if the greatest economy is to be practised, a competent architect or engineer should be employed.

A Comfortable House at Small Cost

The house here photographically reproduced is of concrete. It was built with farm labor, and by the use of rough plank Forms, and is of extreme plainness from an architectural standpoint.

It is, however, practical, comfortable, easily constructed and cheap—costing only $1,500.00.

It is not entirely fire-proof, as the main roof and porch roof are of shingles; but even so, the fact that walls and foundation are of concrete reduces the likelihood of destruction by fire to a minimum.

Concrete simply will not burn.

Concrete Block Construction

Most of this book has been devoted to descriptions of the use of what is known as "monolithic" (solid) construction.

But in many farm districts, concrete blocks have been successfully used. Sometimes these have been made in iron moulds purchased from the manufacturer by one farmer, or a group of farmers—a pooling of interests.

The advantage of building of blocks rather than of monolithic concrete is that the blocks can be made up in the winter and used in the actual work whenever desired.

The blocks are laid up with cement mortar (1 part cement, 1 part sand) in the same way as ordinary stone masonry.

It requires skill to make successful blocks—as just the proper amount of water must be added, to make the concrete wet enough to set, and yet not so wet that the blocks cannot be removed from the moulds.

If such care is not shown the blocks are likely to be porous, and the resulting house damp and leaky.

Concrete blocks, in addition to their use for constructing dwelling houses, are also used for milk houses, scale houses, stables, and barns; as well as barn foundations.

Two classes of blocks are made—solid ones and those with a hollow air space. The latter are much the better of the two, as they make the building dryer.

Concrete blocks are frequently used in the building of silos—a picture of such a silo will be found on page 135.

The principal advantage of concrete blocks for silos lies in the ease with which the building can be constructed. They require less labor than other types of silo, once the blocks are made.

However, since the blocks are usually purchased from some block manufacturing concern, their cost often makes this kind of silo more expensive than the monolithic type; and this fact must be given due consideration.

A House Built of Concrete Blocks

In districts where sand, gravel and cement are very costly, it is often cheaper to build of concrete blocks made at a central plant and shipped to where they are to be used.

Of course, the use of blocks avoids the necessity of building Forms, but their cost compares closely with that of stone masonry.

This particular farm house does not exemplify the most artistic form of architecture that concrete blocks afford. It is given here rather because of its extreme simplicity of design and the consequent low cost of the erection.

Concrete Chimney Caps

As a large proportion of fires in residences originate in the chimney, it is well to have this part of the house as nearly as possible fireproof. It can be made entirely so by building it of concrete. If this is not convenient, at least let the chimney cap be of concrete.

These caps are cast in one piece, on the ground, and in any shape desired.

The outside form is a wooden box, with inside dimensions corresponding with the outside dimensions of the desired cap. Usually the cap is 6 inches thick. The sides of this form are held in place by woooen uprights driven into the ground. Instead, however, of making this box quite square or rectangular in shape, so arrange it that one side will have a "jog" in it, corresponding with size of the chimney top. Thus, if top of chimney, over all, is 18 inches square, make outer form 22 inches square with a "jog" of 18 inches in centre of each side, thus obtaining a cap that will have an over-hang of 2 inches all the way around.

The inside form may consist of a piece of terra cotta tile. If more than one opening is desired in the cap, use two pieces of tile or as many as there are to be openings.

Mix concrete 1:2:4, the mixture to be a thoroughly wet one.

Place in Form, after greasing outside of terra cotta so that same may be easily removed. Leave undisturbed for two days; remove Forms and place cap in position, attaching it to the brick chimney with a cement mortar, one part cement to one part sand.

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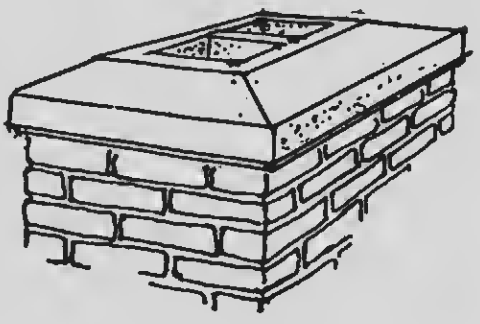


Chimney caps are also built in place; that is, on top of the chimney.

A Brick Chimney is Improved by "Capping" it with Concrete

The house shown here has, it will be noted, a brick chimney.

While the house itself was still in perfect condition, and the chimney, as a whole, unimpaired, the top of that chimney came loose. Water ran in between the bricks, froze there, and loosened them. Along came a wind storm and off came the bricks.

The owner capped the chimney with concrete, thus doing away with all trouble of this kind, and at the same time improving the appearance of his house.

This Concrete Fire Place May Easily be Built by the Farmer

Nothing adds so much to the pleasure and comfort of a room as the sight of a cheerful fire blazing in an open fire place. In houses already constructed, a fire place and chimney must be built to fit the room, and consequently concrete naturally suggests itself.

Being fireproof, concrete is the material for fire places, especially since it can be moulded into any shape. This work may be done in winter, when outside work is impossible. Ordinary box Forms care for the chimney back, sides and fire place. The hearth can be laid without Forms, directly on the floor, if a rise of a few inches above the floor is no objection. The flue is formed by placing tiles of the proper size as a centre Form, and leaving them in the concrete. The outside Form is a box without top or bottom, and can be built in one piece, or raised after each section of concrete in the chimney has set.

The photograph shows the face of the chimney decorated with Indian relics. Colored stones or tiles may be used in the same way. One way to place these is by making a mixture of cement and sand, 1:2, placing it on a flat board, and pushing the decoration into it while yet soft, forming the design. When the concrete is thoroughly hardened place it in the proper position on the inside of the chimney Form, holding it in place by wires or strips of tin. Between the face of the Form and the decorations, it is well to place a piece of roofing paper. This keeps the decoration clean. Fill in the concrete directly back of this slab in the usual way. The decoration slab will become a fixed part of the concrete. Use a 1:2:4 mixture of concrete. The mantle shelf can be finished with a coat of cement grout, 1 part of fine, clean sand to 1 part of cement. This gives it a smooth appearance.

The chimney in the photograph is a good illustration of the true "livableness" added to the room. Note the shelves at the back for holding books or a work basket.

Concrete for Fire Places is Worth Serious Consideration

Concrete is thoroughly fireproof.

Fire places of concrete have no joints to loosen and pieces to fall out. Once built, they are always neat.

Concrete fire places with concrete chimneys are a perfect fire protection. There are no cracks through which sparks can pass.

Any style of finish, of any color, may be permanently secured by the use of concrete.

No high priced, skilled labor is necessary for the construction of concrete fire places. Any man can build his own fire place.

A Picture that shows Three Uses of Concrete

Here we have an illustration that reveals the use of concrete for

1—A house foundation.
2—A cistern top.
3—A lawn roller.

As the first two subjects are dealt with elsewhere in this book, it is only necessary to concern ourselves, here, with the Lawn Roller—which may be made as follows.

Obtain a length of sewer pipe, of the desired diameter and length. For most purposes, a tile from 18 to 24 inches in diameter and from 2 to 3 feet in length, will be most suitable.

Set this tile on end, small end down, on a wooden platform; through which a hole 1 inch in diameter has first been bored, to allow for projection of iron axle of roller.

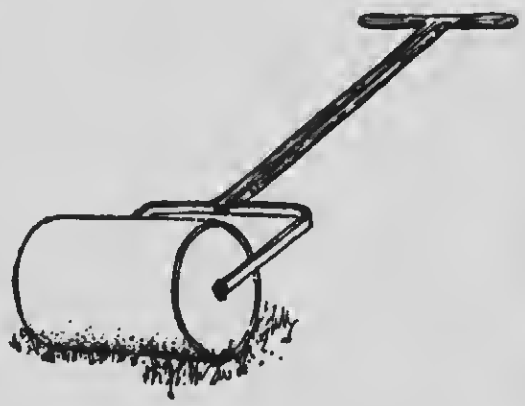
Insert in the centre of the tile, a circular iron bar, one inch in diameter, and of sufficient length to project at either end from two to three inches, to form bearings and attachment for the handles.

Make a wet mixture of concrete (1:2:4), and fill the tile with this mixture, up to the spot where the "bell" of the tile commences.

Allow the concrete to set for 10 days, when roller may be placed on side and the "bell" of pipe chipped off by blows of a hammer.

Next, attach a forked handle, as shown in the illustrations. As the axle is a firmly-fixed part of the roller, the fork ends of the handle must be provided with holes, within which the axle can turn.

A roller 18 inches in diameter and 2 feet long will weigh about 600 pounds. If a lighter roller is desired, you may used a smaller-sized sewer pipe; or several small-sized sewer pipes may be placed in the concrete to form hollow spaces inside the roller.



There is Economy in a Concrete Lawn Roller

Here is a good instance of how the farmer can save money by the use of concrete. For an iron roller that has a cylinder from 2 to 3 feet in length, you would have to pay from $15 to $20—whereas one of the same size constructed by the farmer himself, in the manner here indicated, and by the use of concrete, would cost practically nothing.

Such a lawn roller is neat and attractive in appearance, and will remain as good as when new, for years —as compared with the few years it takes for the iron roller such as one buys, to rust and go to pieces.

How to Construct a Retaining Wall for a Drain Outlet

In developing the lowlands for farm purposes—and such lands are now [illegible] valuable—immense sums are being invested in drain tile. These require a concrete "bulk head" or "retaining wall" at the outlet where they empty into the open ditch, to prevent the unprotected tile at the mouth from being washed out.

Choose the dry season of the year, immediately after the laying or cleaning of the string of tile, when the open stream is low or dry.

In this stream, excavate a trench at least two feet below its bed, 12 inches wide; the face parallel to the stream being from 4 to 6 feet long, and the wings extending from this face running back into the bank sufficiently far to prevent wash-out (see sketch).

The trench, with its wings, is shaped not unlike the top of the letter T.

Mix concrete 1:2½:5—wet enough to "tamp" well.

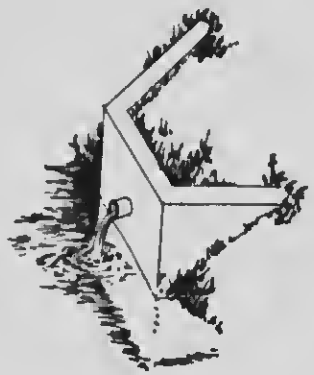
Fill the trench with concrete up to the ground level. Should the trench be full of water, "place" this part of the concrete dry.

Next set box Forms, made of 1 inch siding and 2 x 4 inch studding. Have your forms high enough to build a concrete wall that comes about 3 feet above the top of the tile or to the bank level. At proper height to meet this string of tile, place a first class drain tile at least one size larger than the regular string, with the outlet end against the wooden form.

Bore holes in the Form above and below, or at the sides of this tile and through these holes run well greased wooden or iron pegs.

Now fill the Form with the concrete, and turn the pegs occasionally so that the concrete will not set to them and thus prevent their eventual removal. Finish top of wall with a trowel.

Remove the Forms after one week. In the holes formed by the pegs, set hinges and staples for hanging an iron gate to keep out animals. Tamp in damp mortar (1 part cement 1 part sand) around staples, to hold same in place.



Fill in earth behind the wall to the height of same.

It will be noted that the photo shows a slightly different form of construction to that indicated by the sketch herewith—because of the special shape required by reason of this particular outlet having been located at a bend in the stream.

Facts about Concrete as applied to this particular use

In the case of a drain tile emptying into an open ditch, the earth—because of the sloping ditch banks—has a tendency to dwindle from an original height of 2 to 3 feet down to nothing. Result, unprotected tile at mouth washed out. Another difficulty arises from the possibility of the exposed tile being crushed in by live stock. Moreover, clay and shale tile freeze, crumble, sink down and stop the outlet. Muskrats, skunks and minks use the tile as a nesting place and the drain becomes useless—crops drown out, and the farmer loses hundreds of dollars.

All this trouble is prevented by a very small outlay of time and money in the building of a Concrete Retaining Wall, such as that here shown, with outlet protected by grate hung to the concrete.

Hens' Nests of Concrete

Poultry raisers and farmers generally, will be interested in the fact that one of the important uses of cement is in the manufacture of hens' nests.

There is on the market a patent collapsible mould, specially designed for the construction of concrete nests similar to those shown in the illustration. This has been found to be the best type of nest, as to size and shape; and when these special Forms are used, it is very easy to construct.

Forms can be made by the farmer himself, if he so desires.

Nests should be damp-proof and free from draughts, for the setting hen. Concrete nests are both.

It has been found that laying hens take naturally to concrete nests of this particular type, since they afford a partial hiding place such as the hen instinctively seeks.

Concrete nests are vermin proof. Lice, mites and bugs do not fancy concrete as a breeding place.

Such nests may be easily disinfected. Spray the nest with oil, and burn it out. Fire completely destroys the insects and cannot harm a concrete nest. Concrete is always fireproof. No other kind of nest can be treated in this way.

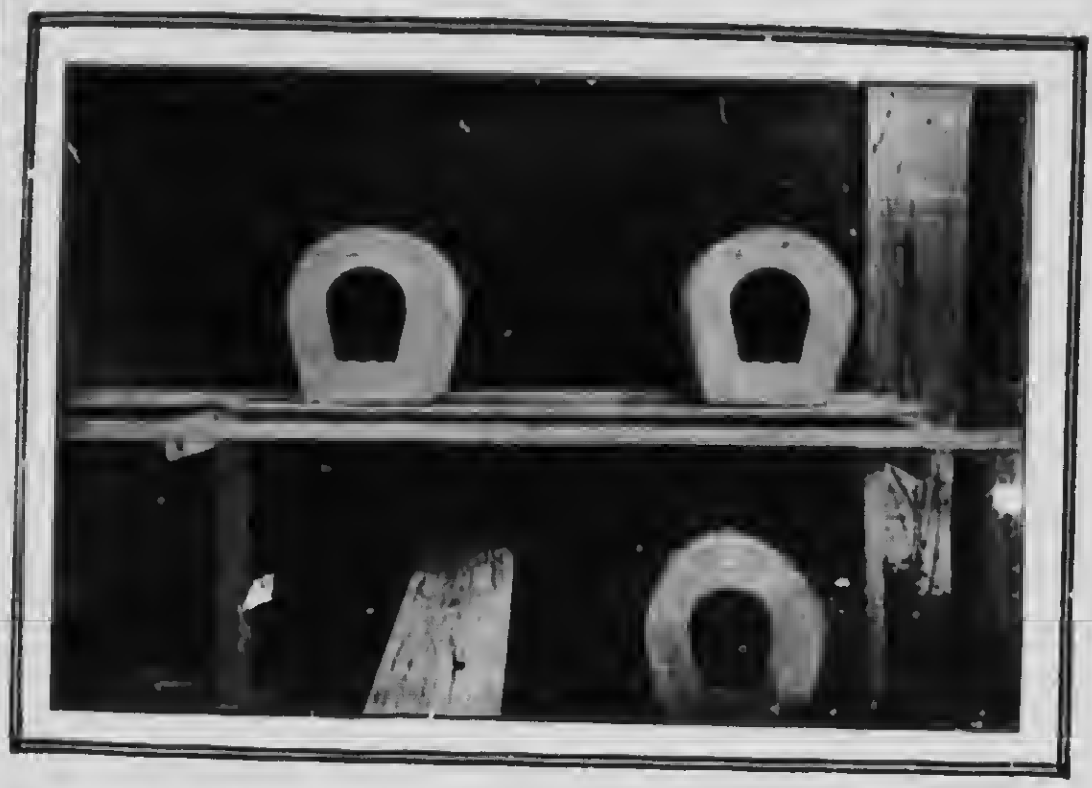
Nest eggs are also made of concrete. They are easily moulded to the shape of an egg by hand, and they never break.

MATERIALS REQUIRED

1½ cu. feet oank run gravel.

½ bag of cement.

Cost, approximately 75 cents per nest.



Features that Recommend Concrete for Hens' Nests

They are damp-proof.

They thoroughly protect the hen from draught.

They provide for her a hidden laying place.

Vermin cannot live in them.
They are easily disinfected.

As concrete hens' nests cannot burn, they can be cleaned by that cheapest and most effective destroyer of vermin —fire.

Remember that hens must be kept free from vermin in order to be thoroughly healthful and to lay the greatest possible number of eggs.

The Ideal Poultry House is of Concrete

Poultry houses are liable to be infested with lice, mites and bugs; and the old-fashioned wooden poultry house makes an excellent place for these common nuisances to live and thrive.

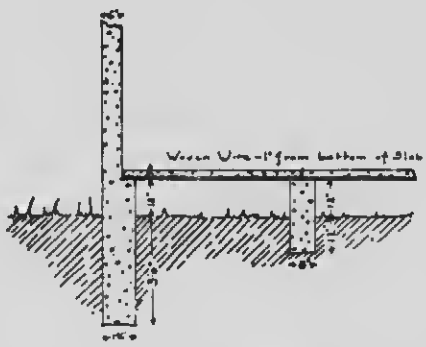
Concrete houses suggested themselves because, by spraying the inside with oil, they can be burnt out as often as desired without injury to the house. This burning-out seems to be the only way to thoroughly get rid of lice, etc.

It will also be found that poultry living in concrete houses are not subject to chicken cholera.

Dig the usual foundation trench, making same 12 inches wide and carry it about 1½ feet below ground level. Mix concrete 1:2:4. "Place" foundations, and at the same time place a 4 inch concrete floor. Forms should, however, be laid under the concrete floor, to lift the latter away from the ground, as a chicken house is better with an air space beneath the floor. Sometimes these floors are made of slabs placed on concrete stringers, which in turn rest on the ground. As the walls are being placed gas pipe may be inserted in them at convenient height to support shelves for nests and rails for roosts.

The dimensions of the house shown are 9 feet by 12 feet. It is 7 feet high at the front, sloping to 5 feet at the back. The three large windows (with centre sash serving as door) are fitted with 7 x 9 inch pegs. These window sashes can all be removed in summer.

Both walls and roof are of 4 inch thickness, reinforced with ⅜ inch iron rods spaced 2 feet on centers.



In mixing the 1:2:4 mixture, it is well to use small stone on account of the extreme thinness of the walls and roof.

The Forms are built in the usual way of flat Forms, and should not be removed until after two days; at which time the surface may be rubbed with a wooden "float."

MATERIALS REQUIRED

7 cu. yds. bank run gravel.
10 bbls. cement.

OR

7 cu. yds. crushed stone.
3½ cu. yds. sand.
10 bbls. cement.

Approximate cost, at current prices of materials, $40.00.

Some Good Reasons for Building a Poultry House of Concrete

Concrete provides a Poultry House that is easily disinfected.

Concrete insures freedom from lice, mites, bugs, etc.

When your house is of concrete such animals as weasels, foxes, minx, rats, etc., cannot get at the chickens.

Concrete makes the Poultry House germ-proof and disease-proof.

A concrete house is cool in summer and warm in winter.

You will have no rotting sills and wall—and there will never be any occasion for repairs, except in the window sash, which is the only part of the entire house that is of wood.

Hot Beds and Cold Frames

In order to have a few vegetables in the winter or early spring, many farmers are using small hot beds and cold frames. The two are constructed exactly alike; the only difference is that one is supplied with artificial heat, while the other is a frost-protected space drawing its heat from the sun and manured earth. One bed may be used for both purposes.

The construction of hot beds and cold frames is extremely simple. Choose a sunny, wind-protected spot on the south side of a building. Dig a 6-inch trench 2 feet deep and fill it with 1:2:4 concrete, with plank forms, carry the 6-inch walls 6 inches above ground on the south side and 12 to 18 inches on the other side of the bed, depending upon the width of the frame. This slope allows the glass sash to drain and bends the sun's rays more directly upon the plants. To hold the sash in place provide a rabbet or groove in the concrete wall in which the window frames may rest. This may be easily done by temporarily imbedding in the green concrete at the inner edge of the wall, a wooden strip the thickness of the sash and of a width not less than 2 inches to provide for the lap. While placing the concrete, some farmers prefer to set bolts or iron cleats to hold the frames in place. Lay iron tie rods or wire in the concrete, around the corners of the bed.

Division walls may be built in the same manner, either at the time the outside walls are constructed or later. These may also be moulded as slabs and then placed in position.

Concrete Makes for Success in Market Gardening

Farmers who engage in market gardening generally develop their vegetable plants in a greenhouse, before transplanting them.

But what many farmers *fail* to do, is to provide a really adequate accommodation for the early plants.

The picture shows how one farmer built a really satisfactory series of hotbeds of concrete.

In considering the available materials for such a purpose, it is to be borne in mind that in addition to the *general* features of concrete—such as durability and cleanliness—there is also the important advantage that concrete is a material superior to all others as a non-conductor of outside heat or cold as the case may be. It is therefore the ideal material wherewith to protect the young vegetable plants.

Scales Settings or Foundations

On the more up-to-date farms nowadays, there is always to be found a set of farm scales.

And it is a fact worthy of note that almost invariably these scales are "set" in concrete. Thus, it would appear that the farmer who is really alive to his own best interests, not only realizes the importance of scales, but also understands that concrete is the farmer's modern material and the one best suited to his many requirements.

No scales are of value unless they weigh *correctly*. The accuracy of scales depends upon their foundations or settings. There is only one foundation material which will not rot out or weather away, which will keep the scales in perfect balance—that material is concrete.

To set the scales in concrete, excavate for the foundation according to the instructions sent with your pit or pitless scales. Be sure that the trenches (1 foot wide) for the foundation proper, extend below frost line.

If scales are not to be covered by a house or shed, lay a drain tile to carry away such water as may drip through the scale platform.

Fill the foundation trenches with 1:2½:5 concrete and carry these outer walls at least 1 foot above ground level to keep out flood water. Do not forget to leave the necessary offsets (usually 6 inches wide) to support the steel scale frame. Openings in the wall for connections to the scale beam may be secured by imbedding sections of drain tile at the necessary points. Set such bolts, as may later be needed, as the work progresses and while the concrete is yet green. Upon the solidly tamped earthen bottom of the pit lay a 4-inch concrete floor. Build two concrete approaches as directed under "Entrance to Carriage House," page 20-21.

To give a good purchase for the horses' hoofs, corrugate or roughen these approaches by cutting their surfaces with the wedge-shaped edge of a 2 by 4-inch timber. Lay the necessary surrounding floor according to directions on pages 48-51. The scales may be installed after the concrete is 1 week old, but wait at least another week before using them.

Where accuracy is Required, there use Concrete

The fact that concrete is so thoroughly durable makes it, above all others, a material to be depended on.

Because it cannot weather away, or rot, concrete forms the ideal foundation.

And when it comes to *scale* foundations, the advisability of using concrete becomes so strong as to be properly termed a necessity.

For without the use of concrete for the settings, you cannot be sure of absolute accuracy.

Any farmer who may have his scales set otherwise than in concrete, will do well to give immediate consideration to the importance of accuracy and the manner of obtaining it here described.

Hay Caps and Tarpaulin Weights

With the usual shortage of farm labor during the harvesting season, and the frequent occurrence of summer showers, it becomes necessary, in order to ensure a sweet, unmolded, well-cured crop of hay, to cover the shocks while waiting to store the hay in the barn. For this purpose, either canvas or muslin may be used—either of these forms of hay cap requiring weights to hold it in place. Formerly the farmer used 6-ounce iron washer nuts for this, but concrete weights are replacing these..

Such a concrete weight is nothing more than a round concrete cruller (or doughnut) with a hole in it.

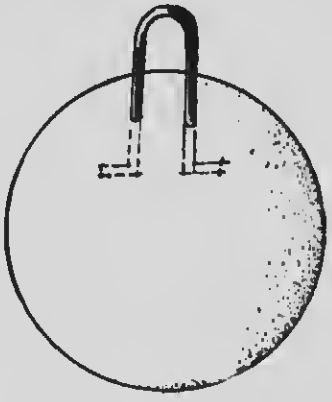
Mix concrete (1 part cement and 2 parts sand), and mould it in a tin can of the diameter you wish the weight to measure. Anything round may be stuck in the centre of the wet concrete, to form the hole for the cord, by which the weight is to be attached to the cloth cap. Set aside for two days, to dry and harden, and then remove the weight from the can.

Depending on the size of the cloth cap and the force of the wind, these weights are made in sizes to weigh from 4 to 6 ounces each.

To hold down tarpaulins covering grain or hay stacks, concrete anchors of heavier weight are used. These are made in the same way, only in larger cans.

Some farmers simply fill drain tile or old tin cans with concrete and use them for weights. Both serve the purpose well; but the tile mould is somewhat expensive, considering the purpose, and the tin cans are not pleasing in appearance.

Another simple method is to fashion a mass of concrete into any desired shape or size with the hands, inserting a wire staple as cord fastener.



Advantages of Concrete for Hay Cap Weights

Ten concrete weights can easily be made at a cost of one cent—the iron washer nut, usually used for the same purpose, costs one cent *each.* Thus the weights for an entire cap, if made of concrete, cost less than one single weight of iron.

The slight expense involved makes it possible for any farmer to take the precaution of keeping his hay covered —for it must be remembered that, even if the weather remains fine, the hay cured in shock under caps, is much superior in nutritive value to hay left unprotected from air, wind and rain. Concrete weights will last forever.

Survey Monuments and Corner Stones are Easily Made of Concrete

Ordinary "survey monuments' or corner stones often cannot be distinguished from the surrounding rocks. As a consequence, these important marks of property lines are frequently in doubt or entirely lost. Wooden stakes and monuments rot out. Expensive re-surveys or legal fights can be saved by making such monuments of concrete.

Concrete corner marks stand out distinct and last forever.

Consult or write the proper public official (usually the county engineer or surveyor) in regard to placing corner stones. To preserve the exact location of the original stake or stone, drive four stakes in the ground on opposite sides of the old mark so that strings stretched between opposite stakes will cross each other, (intersect) directly over the original monument.

Remove the original monument, and, with a post auger, bore a hole 3 feet deep, under the point where the strings cross when stretched.

Fill the hole with concrete mixed 1:2:4; and, with the hands, round the top so that it will extend above the ground level.

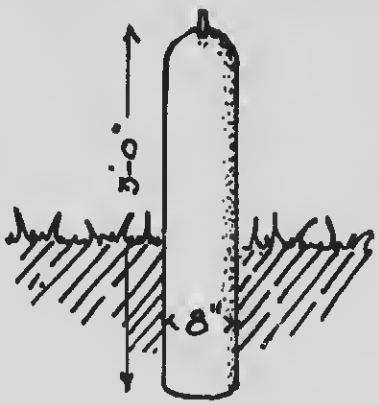
While placing the last foot of concrete imbed a harrow tooth, an iron bolt, or a gas pipe, so that it will barely show above the concrete at a point directly under the intersection of the strings.

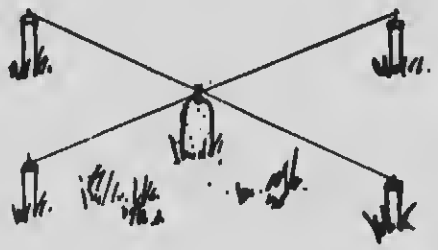
It is in such small utilities as the survey monument or corner post that the average farmer first learns the ease with which concrete can be used—and the excellent service it renders.

From the small article, he progresses to something bigger and more important.

Finding that in it, too, concrete best serves his purpose, he finally tries his hand at something larger still, such as a tank, or a barn foundation, or a stairway.

Thus it is that prominence is given in this book to the smaller farm requirements. It is by first trying concrete in the making of little things that the farmer learns to realize its truly wonderful qualities.





Concrete Survey Monuments do away with Boundary Disputes

The advantages of concrete survey monuments are many.

They are easily distinguishable.

They are permanent.

They are not readily mistaken for, or confused with, other marks or objects.

They render re-surveys unnecessary.

Because their evidence is unassailable, they obviate expensive legal battles.

How Concrete May be Used to Repair Trees

An important use of cement is in connection with "Tree Surgery," or, as it is sometimes called, "Tree Dentistry."

A realization of the value of trees about a house or farm, must carry with it an appreciation of any method whereby the life of a tree may be prolonged. Concrete offers the only adequate cure for decaying trees.

Picture to yourself, a fine old shade tree into which insects have bored, causing decay. Larger and larger becomes the hole, and unless prompt measures be taken, the weakened condition of the trunk will permit of the first heavy wind storm striking the tree to earth—a fallen monarch that cannot be replaced in less than a lifetime.

Thanks to concrete, it is now possible to save trees that appear to be almost beyond help. Many famous old trees have indeed been spared, by the simple process here described. Open up the cavity with a hand-axe, and with a mallet and chisel cut out every last bit of the decayed wood. This leaves an outer shell of living sap wood and bark.

Now comes an important operation—the cutting of "water sheds," so as to prevent the entrance of moisture into the wound after it has been closed up. This water shed consists of a deep incision or groove which should be made about an inch back from the outer edge of the cut, and which should open out at the foot of the cut, so as to lead the water outward and downward to the ground below. The cement being packed tightly into these grooves, will form a channel down which the water flows, to be led out at the base.

Before filling the cavity, paint it with hot coal tar or liquid asphalt to stop the flow of sap. Otherwise a small air space may be formed around the filling and the decay may continue.

In the case of a small cavity, reinforcement may be arranged by means of nails, as shown in the first photograph on this page. If it is a larger cavity, it will need to be reinforced throughout with ordinary fence wire, the wire being attached to nails driven into the wood. After

LARGE CAVITY, WITH DECAY REMOVED.

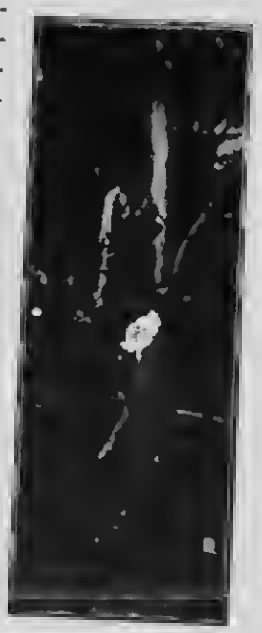
A CAVITY REINFORCED WITH RODS.

reinforcement has been arranged, carefully fill every crevice of the hole with a 1:3 cement sand mortar.

By slightly trimming the edges of the bark around the filling once or twice a season, the bark may be induced to grow entirely over the concrete. The large filling, shown in illustrations on page 123a, contains over a ton of concrete. One day when there was no wind blowing, to endanger the temporarily weakened tree, the cavity was opened up and treated as described above, both nails and wire rods being used for reinforcing. The rods were placed lengthwise in the hollow, and within one inch of its walls and the outside of the concrete. These rods were held in place by wires twisted upon firmly-driven nails. Two men completed the work in one-half day.

In the case of exceptionally large cavities, the opening is covered by large strips of zinc. Cement is then forced down into every crevice and allowed to set, after which the zinc is removed, and a coat of fine finishing cement put on and painted the color of the bark. By this method the Tree Surgeon is enabled to build out trees in which fully one-half the wood has been destroyed by lightning or from some other cause.

The treatment above described serves as a fine example of the healing powers of nature. It is truly remarkable how quickly these wounds in trees will heal when protected from moisture and further decay, by the use of concrete.



"THE SURGEON" AT WORK.

The above photo shows a one-piece Concrete Silo.

Concrete and the Silo

A Silo is a tank for the preservation of fodder in its green state, for feeding stock at times when a natural feeding pasture is not available—in other words, in winter and in the hot, dry months of summer. By the use of silos the fodder is canned very much as a housewife cans fruit, preserves and vegetables.

The silo originated in France, was then imported into Germany, and during the past few years has been tried out with much success in Canada. Our more progressive farmers have been experimenting with the use of forage stored in this way and their success has resulted in the building of quite a number of silos throughout the country. The fact that all farmers who have tried the silo are unanimous in its praise would seem to form the best possible recommendation for its use.

The Use of Silos.

At first the canned fodder (called silage) was only fed to milch cows, but it has been found that silage may be economically fed to horses, hogs, sheep and chickens as a partial feed. By using a silo, fodder in a green state can be fed during winter when there is no natural pasture, also during the dry summer months when the pastures have been eaten off.

Advantages of Silage

1. The value of a crop preserved by the use of a silo is increased about 40 per cent. over that of a crop harvested in the usual way.

2. At a conservative estimate, two cows can be kept by feeding silage at the cost of one cow from the same acreage, fed on hay or other roughage.

3. The moderate cost of husbanding into silos compared to the cost of making hay, husking corn, or shredding fodder:

Actual cost of filling 100-ton silo in 1903:

5 men loading silage in field, at	...$1.50	$7.50
5 men and teams hauling silage from fields, at..	3.00	15.00
1 man in silo, at	1.50	4.50
1 man at table, at	1.50	1.50
Machine, 10 hours, at	1.25	12.50
Fuel		5.00
Cutting 6⅔ acres corn, at	.75	5.00
Twine		2.12
Total		$54.62

Or, a cost of $0.546 per ton.

4. Convenience in feeding and economy of storage room. Ten tons of silage can be stored in the same space as one ton of hay.

5. When fed with the proper rations, silage is a greater milk-producer and fattener than any known feed.

6. Ensilage-fed stock, as a rule, are in a healthier state than when other feeds are used.

7. When properly taken care of, there is absolutely no waste of any part of the corn crop.

8. By providing a succulent forage, winter dairying is made profitable and no reduction of stock is caused by a dry season.

9. The acreage needed for pasture is greatly reduced and, consequently, more land can be brought under cultivation.

10. It is the cheapest feed that can be produced, as well as the best.

11. It is a certain supply, notwithstanding the drought, the flood or the snows.

12. Inclemency of weather does not hinder its harvesting.

In conclusion, we may say that a silo is the cheapest method of handling the crop, of storing it, and, finally, the best method of saving and realizing the fullest value of the crop as feed.

Why Concrete is best for Silos.

Silos are not built *round* just by chance or by custom. That form is really best for two reasons:

1st. The amount of building material required to construct a silo of a given capacity is less for a cylindrical shape than for any other form.

2nd. The crop is best preserved in a round silo, as this form renders packing easy.

Concrete Silos are Air Tight

Just as a preserve can must be air-tight to prevent the fruit from working, so must the silo be air-tight to prevent the silage molding. A certain amount of air is necessarily confined in the packing, and this causes the silage to ferment, and if no additional air gets in, the silage keeps perfectly. On the other hand, if the silo is constructed of a material which allows more air to get in, mold forms and the cattle will not eat the silage.

No other material can be made as air-tight as concrete. This is recognized by builders of other kinds of silos, who recommend a coating of cement on the inside.

As a general rule a silo is used for about six months, namely, during winter, and for the remainder of the year is empty. Now a wooden silo is just like a wooden bucket. When allowed to stand empty, it will shrink, the joints open and the silo leaks. The coating on the inside with cement prevents this for about one year, but at the end of that time the shrinking process again takes place, with the result that the cement lining cracks and again the silo becomes a sieve. Thus, it will be seen, to keep a wooden silo in condition, the cement coating has to be replaced every year.

A concrete silo, besides being free from this tendency to shrink in hot, dry weather, will not swell up, as a wooden one will, in damp weather. Likewise when filled with the juicy ensilage it does not swell up and burst.

Concrete Silos are Water Tight

Another feature of a concrete silo is that it is water-tight. This is important, as the moisture which goes in with the silage should be kept in, thus preventing the process known as "dry firing."

To build a Concrete Silo such as this, consult the book "Concrete Silos" mentioned on page 159.

Concrete Silos are Smooth on the Inside

It must, also, he taken into consideration that a silo should be perfectly smooth on the inside, and this can only be attained by the use of concrete. The silage settles after being packed and even a slight roughness is liable to catch the cornstalks and prevent their settling evenly. The silage around the air-places formed in this way becomes moldy and must be thrown away.

Concrete Preserves Temperature

In view of the importance of an even temperature in keeping silage, concrete further recommends itself, being one of the best non-conductors of heat and cold. Let the outside temperature vary as it will, a concrete silo will more nearly preserve the temperature of the silage at the time it is packed than a silo built of any other known kind of material.

Concrete Silos Do Not Rot

The acids formed by the slight fermentation in the silage rot out wood silos and eat away metal ones. Also, the alternate wetting and drying which every silo receives rots the wood and rusts the iron. All this has no effect whatever on concrete. A concrete silo is the most durable you could have.

Concrete Silos are Vermin Proof

What farmer does not know the annoyance and danger experienced from rats? Nothing that is built of wood is rat-proof, and a wooden silo makes a fine nesting place. Once the rats get in, air is also admitted by reason of the rat-holes. Even companies that sell wooden silos recommend a concrete floor to keep out the rats. Why not go further and make sure of a vermin-proof silo by having it built entirely of concrete?

Concrete Silos Need No Repair

When built of concrete the silo cannot be blown over, and if properly constructed it will last for ever. It cannot spring a leak and no complicated rods are necessary to pull the sides together in summer when the wooden sides dry out, or to allow for swelling when the silo is filled again in the fall.

Concrete Silos are Fire-Proof

Concrete being fire-proof, a silo built of this material cannot burn down, nor can the feed stored in it be injured or destroyed. This is most important. In the case of a building burning, a temporary structure may be erected to replace it, but the *crops* cannot be replaced except at great expense.

Concrete Silos are Economical

The only objection ever made to a concrete silo is its cost. Now, this varies, owing to the price of the materials of which the concrete is made. In many places concrete silos are cheaper than any other kind; few farmers are without a gravel pit suitable to furnish both gravel and stone of the proper quality for making a good concrete. Portland Cement is being manufactured to-day at so many points in Canada as to bring it within easy reach of well nigh every farmer, and it can therefore be obtained in most localities at a reasonable cost. Under these conditions, a concrete silo is really cheaper than any other kind. But original cost is not the only thing to think about. Remember that, when it comes to the building of an article like a silo, the best is the cheapest, no matter what it costs. A silo which never leaks, will not blow over, is always ready to be filled without first repairing, requires no repairs, cannot burn down and is vermin-proof—such a silo is certainly the best and cheapest.

The Proper Size of a Silo

The size of your silo will depend upon the number of your cattle to be fed, and the number of days they are feeding continuously. It does not pay to build a silo for less than ten head.

The diameter (inside measurement) should not be more than one-half the height, and in practice it is not found advisable to make it over 20 feet.

For convenience, we present the following table, showing the size silo it will take to feed any number of cattle for a given time.

TABLE A.

This table gives the number of cows in herd and tonnage of silage for both 180 and 240 days of feeding of 40 pounds of silage per cow, also acreage of corn estimated to fill the silo and the dimensions of the silo itself. The diameters given are such that at least 2 inches in depth of silage will be taken off daily.

Number of Cows in Herd	Fed for 180 Days				Fed for 240 Days			
	Estimated Tonnage of Silage Consumed	Size of Silo		Corn Acreage Required at 15 Tons to Acre	Estimated Tonnage of Silage Consumed	Size of Silo		Corn Acreage Required at 15 Tons to Acre
		Diameter	Height			Diameter	Height	
	Tons	Feet	Feet	Acres	Tons	Feet	Feet	Acres
10	36	10	25	2½	48	10	31	3½
12	43	10	28	3	57	10	35	4
15	54	11	29	4	72	11	36	5
20	72	12	32	5	96	12	39	6½
25	90	13	33	6	120	13	40	8
30	108	14	34	7½	144	15	37	10
35	126	15	34	8½	168	16	38	11
40	144	16	35	10	192	17	39	13
45	162	16	37	11	216	18	39	14½
50	180	17	37	12	240	19	39	16
60	216	18	39	14½	288	20	40	19
70	252	19	40	17	336	..	..	..

As stated before, the number of animals to be fed should determine the diameter of the silo, and the length of time silage is wanted should determine the height of the silo. The amount of silage to be fed per cow must be determined first. Decide whether each cow is to have 20, 30, 40, or 60 pounds per day. Then having decided this point, make the diameter of the silo such that by feeding the cows so much per day the silage can be fed down at least 2 inches per day, as this will prevent molding of silage. If a silo is made too large in diameter—and this is the most frequent error—one of two things will happen: *First*, the silage will be moldy all the time, owing to the inability to feed it down rapidly enough, or, *second*, the cows will be fed more than they should have in an attempt to keep ahead of the molding.

About fifty cows seem to be the most that can be fed with advantage from one silo. In general, 40 pounds of silage is figured as the average daily feed of a cow.

For further convenience in figuring in connection with the size and capacity of silos, we present Table B:

TABLE B.—THE APPROXIMATE CAPACITY IN TONS OF ROUND SILOS.

(The diameter is shown at the top of the columns and depth at the left.)

Height of Silo	Inside Diameter of Silo in Feet and the Capacity in Tons (2,000 lbs.)										
	10 ft.	11 ft.	12 ft.	13 ft.	14 ft.	15 ft.	16 ft.	17 ft.	18 ft.	19 ft.	20 ft.
Feet	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
20	26										
21	28										
22	30	36									
23	32	39									
24	34	41	49								
25	36	43	52								
26	38	46	55	64							
27	40	49	58	68							
28	42	51	61	71	83						
29	44	54	64	75	87						
30	47	56	67	79	91	105					
31	49	59	70	83	96	110					
32	51	62	74	86	100	115	131				
33	53	65	77	90	105	121	138				
34	56	68	80	94	109	126	143	162			
35	58	70	84	98	114	132	149	169			
36	61	73	87	102	118	136	155	176	196		
37	63	76	90	106	123	142	161	183	204		
38	66	79	94	110	128	148	167	191	212	237	
39	68	82	97	115	133	154	174	198	221	247	
40	70	85	101	119	138	160	180	205	229	256	280

Showing two Concrete Silos with a Chute between them.

Where large cows are kept and it is expected to feed 40 or 60 pounds per cow daily, it frequently happens that it is desirable to cut down the silage ration. It is well to have the diameter of the silo small enough so that the ration can be cut down one-third or even one-half and still be able to feed down the silage 1 to 1½ inches daily.

In the older dairy sections, where silos have been longest in use and dairymen have used up their first wood silo and are building the second time, they build two small ones in place of the one large one. They also build smaller in diameter and higher.

In the dairy sections many farmers consider this point so important that they are building two small silos instead of one large one, so that they can feed a light ration and still feed down the silage rapidly enough to prevent molding.

Construction of Various Forms of Concrete Silos

There are three types of concrete silo:

1st. Monolithic (or solid wall).

2nd. Hollow wall monolithic concrete silos.

3rd. Concrete block silos.

All three are good, and in choosing between them, the cost—which is fixed by local conditions—should be the deciding feature. It must be taken into consideration, however, that in cold climates it is necessary to take precaution against the possible freezing of the silage, and to prevent this the hollow monolithic or hollow block wall silo is the best.

First decide the kind of a concrete silo best adapted to the locality where it is to be built. Cost usually decides the class of concrete silo, except where extreme cold weather makes a hollow wall necessary.

All concrete silos preserve silage equally well. The effect of freezing silage should be considered in some sections of Canada, and the form of construction best adapted to prevent it is known as the hollow wall silo.

Solid Wall Concrete Silos

The solid wall concrete silo is cheap, easily built, and fulfils all the requirements of a perfect silo. This type has been extensively used

These were first built with very thick walls ,and without steel reinforcement. By using steel reinforcement (¼ to ½-inch bars, expanded metal, or wire mesh imbedded in the concrete) a greater strength can be obtained with a much thinner wall. This saves in the quantity of concrete used, and also in the cost of material and labor.

For solid wall concrete silos therefore thin reinforced walls are recommended rather than thick walls, without reinforcement.

Showing how Concrete Silos look at a distance, and their usual height as compared to the barns which they adjoin.

Hollow Wall Monolithic Concrete Silo

The hollow wall monolithic concrete silo is constructed much the same as the solid wall, except that two walls are built instead of one, with a hollow air-space of about 4 inches between them. The inner wall is reinforced in the same way as in a single solid wall silo. The only reason for the outer wall is to form the air-space between the walls. This keeps the silage from freezing.

While it takes a long period of low temperature to cause any serious freezing of silage, it is of decided advantage in handling the silage, in localities subjected to such severe cold weather, to be able to feed it to the stock without the added labor of thawing it out.

Agricultural authorities are still debating the effect of feeding frozen silage, but all agree that if it is thawed out before feeding, there is no harm in it.

The labor and time lost in thawing out the silage is saved by the use of a hollow wall silo. This is quite an item in districts where the silage would remain frozen for two months or longer.

The cost of the hollow wall silo is about one-fourth greater than the solid wall silo. Except to prevent freezing, it has no advantage over the single, solid wall silo. With both types of silos, any kind of doors, roof, chute, etc., desired, may be constructed with equal ease.

Cement Block Silo

The cement block or concrete block silo is built of circular, hollow blocks, laid in cement mortar, and reinforced with steel hoops, which fit in between every second or third course, according to the size and depth of silo and size of hoop. When finished, the silo is usually painted both inside and outside with a cement mortar to insure air-tightness. The block silo, like the hollow wall silo, has a dead air-space in the walls which tends to prevent freezing, although the block wall is not quite as effective in this respect as the hollow wall, since the air-space is not continuous.

If the farmer lives in a district where cement block, hollow wall, or solid wall silos are constructed, he should get prices from the various concerns in the business, and compare these with an estimate of what it would cost him to do this work himself, before deciding what kind of a silo to build.

If the price submitted by a concern doing this kind of work is lower than the amount the farmer estimates he can build the silo for himself, he should, of course, have them do the work.

Location of Silo

In selecting a proper location for a silo the following conditions must be met: (1) The silo must be convenient for feeding. (2) Must be located on solid ground. (3) No odors from the silage should enter the barn.

1. CONVENIENT FOR FEEDING.

The silo should be as near as possible to the feeding stalls, preferably at the end of the feedway. Silage is a heavy feed, and some must be handled each day, and by locating the silo in this way, much labor is saved.

2. MUST BE BUILT ON SOLID GROUND.

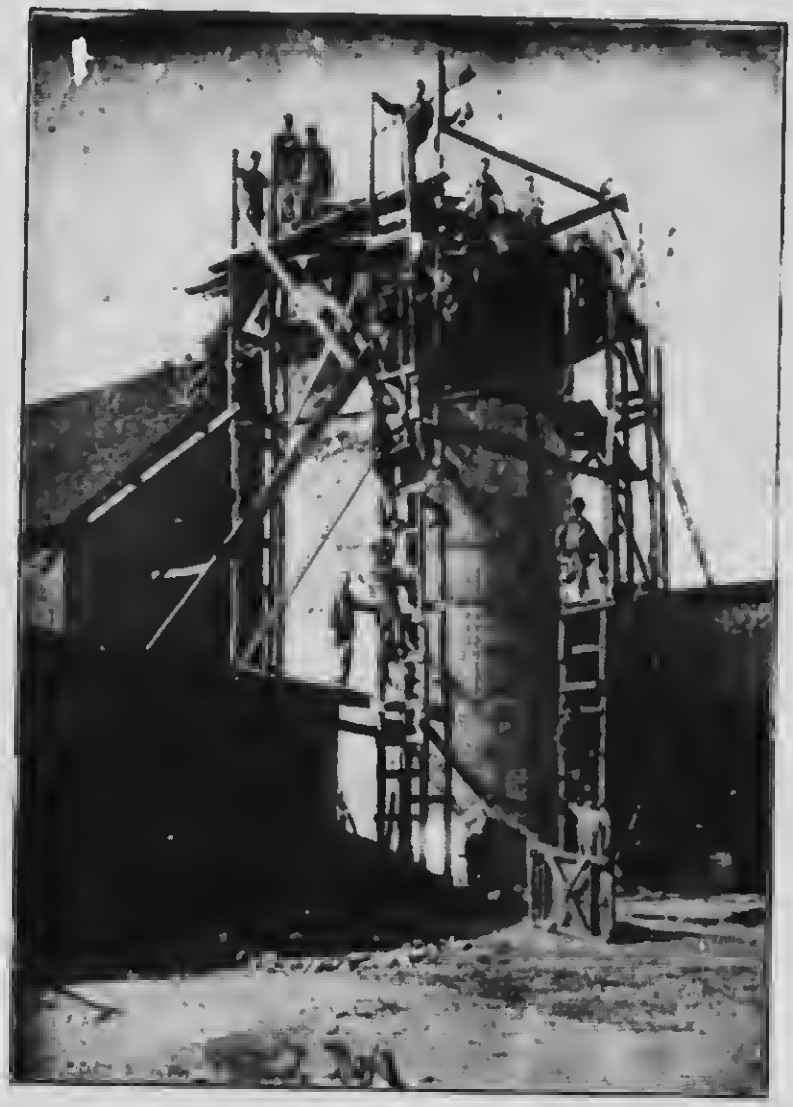
The weight of the silo and its contents is very great. The foundation must, therefore, be placed on solid ground, so there will be no settlement.

3. NO ODORS IN THE BARN.

Milk readily absorbs odors, and if the odor from the silage is allowed in the barn during milking-time, it can be noticed in the taste of the milk. This taste disappears when the milk is made into butter or cheese, and in no way affects the keeping qualities of the milk.

As has been explained, a silo is nothing more than a round tank, and the Forms are very much like a round tank form. They may be made of wood by the farmer, a combination of wood and metal, or they may be entirely made of metal.

Space does not permit us to go into the details of construction of Forms, or of the silo. For this information, you are referred to Bulletin No. 2.



An Actual Fact That Has Proved the Superiority of Concrete

One of the principal arguments in favor of Concrete is its fire-resisting qualities, as was illustrated recently at the Boys' Farm and Training School, Shawbridge, Quebec. This institution had just completed a circular concrete silo, when a fire wiped out all of their farm buildings with the exception of the concrete silo, which had been built with "Canada" Brand cement.

Photographs are reproduced herewith, showing the silo just before it was completed, and also showing it after the fire. Careful

examination reveals the fact that this silo is to-day as good as when built. There were found in some places slight fire cracks, but these were only on the surface. In a few places the heat has peeled off the surface concrete to a depth of from one-fourth to one-half inch, but in no place has the damage extended beyond that. Experts aver that the strength of the concrete has not been in the last impaired, nor has it become in the slightest degree more porous. One expert gives it as his opinion that a plastering coat would make it a perfect silo in every respect.

Spectators who witnessed the fire say that the concrete walls were heated to such a degree that after the fire was extinguished the silo stood aglow against the dense background of the night and that it was visible for miles around the country.

As may be seen, by reference to the photographs, the silo stands within a few feet of what were very large buildings. These buildings furnished an abundance of excellent fuel, and in addition to these the scaffolding that had been in use during the building of the silo was still in position at the time of the fire, which brought the flames closer to the silo than would ordinarily be the case.

This whole incident demonstrates, in a manner seldom equalled, the value of concrete as a fire-resisting medium.

A corroboration of these facts may be obtained from Mr. G. W. O. Matthews, Superintendent of the Boys' Farm and Training School, at Shawbridge.

A Silo Built of Cement Blocks.

What is "Concrete"?

Concrete—a manufactured stone—is made by mixing together cement, sand and stone (or gravel). Various proportions of each are used, depending upon the use to which the concrete is put. About half an hour after mixing these materials together, the mass begins to stiffen—until, in from half-a-day to a day, it becomes so hard that you cannot dent it with the hand. By a month the mass is hard like stone—indeed harder than most stones.

That mixture in which all the spaces (called "voids") between the stone or gravel are filled with sand, and all the spaces between the sand are filled with cement, is the ideal mixture. This mixture is rarely attained, as the voids in each load of gravel and sand vary slightly, and in order to be absolutely safe, it is well to use a little more cement than will just fill the voids.

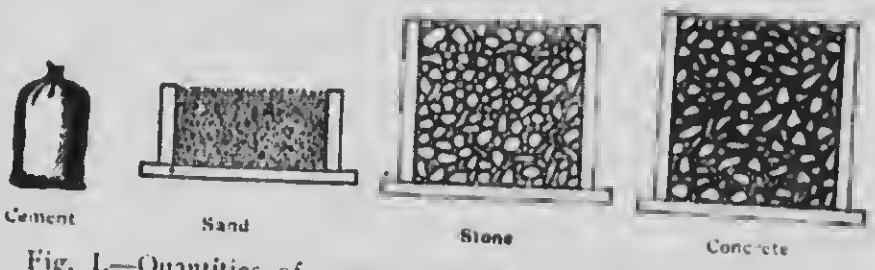


Fig. 1.—Quantities of cement, sand, and gravel in 1:2:4 concrete mixture and the resulting quantity of concrete, which is only slightly greater in size than the gravel; the sand and cement filling the voids in the gravel.

TABLE I.

SHOWING THE QUANTITIES OF MATERIALS AND THE RESULTING AMOUNT OF CONCRETE FOR TWO-BAG BATCH.

KIND OF CONCRETE MIXTURE.	PROPORTIONS BY PARTS.			TWO-BAG BATCH.						
				Materials.				Size of Measuring Boxes. Inside Measurements.		
	Cement.	Sand.	Stone or Gravel.	Cement.	Sand.	Stone or Gravel.	Concrete.	Sand.	Stone or Gravel.	Water* in Gal. lons for Medium Wet Mixture.
				Bags	Cu. ft.	Cu. ft.	Cu. ft.			
1 : 2 : 4 Concrete....	1	2	4	2	3½	7	8	1'9" x 2' 11½"	2' x 3'6" 11½"	9
1 : 2½ : 3 Concrete....	1	2½	3	2	4½	8½	10	2' x 2'3½" 11½"	2'3½" x 4' 11½"	12

*See Note on Water, page 138.

As above explained, concrete is composed of a certain amount of cement, a larger amount of sand and a still larger amount of stone (or gravel). To determine how much of each of these materials to use, we must first consider the type of work we wish to undertake. For ordinary work about the farm (silos, tanks, cisterns, fence posts, well curbs, etc., etc.) use twice as much stone as sand, and twice as much sand as cement. This is called a 1:2:4 mixture—meaning that there are in that mixture:

1 part of cement,
2 parts of sand,
4 parts of stone or gravel.

For sidewalks, gutters, etc., a "weaker" mixture is sometimes used, consisting of

1 part of cement,
2½ parts of sand,
5 parts of stone or gravel.

The proportions should always be measured by volume, and the best way to do the measuring is by the use of a home-made "measuring box," of any kind of rough board having straight sides, but with no top or bottom.

The size of these measuring boxes is determined by the proportion desired for your mixture. For instance, for a 1:2:4 mixture, you require a box measuring, on the inside, 2 ft. x 3 ft. 6 in. x 11½ inches.

For such a box you need the following sized lumber:—

2 pieces 1 in. x 11½ in. x 1 ft. 9 in. rough.
2 pieces 1 in. x 11½ in. x 4 ft. rough.
2 pieces 1 in. x 11½ in. x 2 ft. rough.
2 pieces 1 in. x 11½ in. x 5 ft. 6 in. rough.

Note:—The 2 pieces 4 ft. long and the 2 pieces 5 ft. 6 in. long have an extra foot in length at each end to be made into a handle, as shown in Fig. 3.

For a 1:2½:5 mixture, you require a measuring box 2 ft. 3½ in. x 4 ft. x 11½ inches, and will require the following sized lumber:—

2 pieces 1 in. x 11½ in. x 2 ft.
2 pieces 1 in. x 11½ in. x 4 ft. 3½ in.
2 pieces 1 in. x 11½ in. x 2 ft. 3½ in.
2 pieces 1 in. x 11½ in. x 6 ft.

Note:—The 2 pieces 4 ft. 3½ in. long and the 2 pieces 6 ft. long have an extra foot in length at each end to be made into a handle, as shown in Fig. 3.

Now, to illustrate the use of the measuring box, let us once more assume that a 1:2:4 mixture is required, and that the amount of finished concrete needed is 8 cubic feet. By referring to table, on page 136 it will be noted that two bags of cement are required, also 3½ cubic feet of sand and 7 cubic feet of stone or gravel.

Under "size of measuring box" it is found that the sand should just fill a box 1 ft. 9 in. x 2 ft. x 11½ in., and that the stone should fill a box 2 ft. x 3 ft. 6 in. x 11½ in. Then, having made a box of the larger size (2 ft. x 3 ft. 6 in. x 11½ in.), as described above, lay this box, or frame, on the mixing platform and fill it exactly one-half full of sand (up to a mark previously drawn around it to indicate the half measure). Next level off the sand, to be certain that it just half fills the frame or box. Then raise the box.

Empty two bags of cement on the sand and mix it as described under "Mixing," see page 148. Even off the mixture thus obtained with your shovel, place the measuring box back on top of the mixture and again fill it, but this time with stone—and this time you fill it full, right up to a level with the top.

Raise the measuring box—and you have the correct amount of stone all ready to be mixed with the cement and sand.

It is important to measure both the sand and stone *loose* in the box —never "pack" them.

For purposes of explanation, size of mixture will be referred to as a "*batch*" of so many bags of cement. Thus, a "2 bag batch of concrete" would mean one requiring 2 bags of cement, with the sand and stone proportioned accordingly, as shown above.

For a "4 bag batch of concrete' it would be necessary to multiply the amount of stone and gravel by 2, also multiplying the cubic contents of the measuring box by 2, and using 4 bags of cement instead of 2.

The table previously referred to, also shows the amount of water for different sized batches, but it is to be noted that the quantity of this ingredient is only approximated. Use the amount indicated in the table for the first batch, and if it proves too wet for the use desired, reduce the amount of water; if too dry, increase the amount of water. Always use a bucket in measuring the amount of water, as this secures uniform results.

Natural Mixture of Bank Sand and Gravel

Naturally mixed bank sand and gravel are sometimes found in the right proportions for making concrete. Generally, however, there is far too much sand for the gravel, and great care should be exercised in using this class of material. Unless the mixture runs very even throughout the bank, and is found to be made up of one part sand to two parts gravel, it is better to screen the sand out of the gravel and prepare the materials in the usual way.

Herewith is a table showing the quantities for a natural mixture of bank sand and gravel. The quantities can be found in the same way as in Table 1, on page 136.

TABLE II.

SHOWING THE QUANTITIES OF MATERIALS AND THE RESULTING AMOUNTS OF CONCRETE FOR TWO-BAG BATCH, USING NATURAL MIXTURE OF BANK SAND AND GRAVEL.

KIND OF CONCRETE MIXTURE	PROPORTIONS BY PARTS.		TWO-BAG BATCH FOR NATURAL MIXTURE OF BANK SAND AND GRAVEL.				
			Materials			Size of Measuring Boxes	
	Cement	Natural Mixture of Sand and Gravel	Cement	Natural Mixture of Sand and Gravel	Concrete	Mixture of Sand and Gravel	Water in Gallons for Medium Wet Mixture.
			Bags	Cu. ft.	Cu. ft.		
1 : 2 : 4 Concrete	1	4	2	7	8	2′ x 3′6″ x 11½″	9
1 : 2½ : 5 Concrete	1	5	2	8¾	10	2′ 3½″ x 4′ x 11½″	12

There are three kinds of mixture in general, on concrete work:—

1st.—*Very Wet Mixture.*—Concrete wet enough to be mushy and run off the shovel when handling, used for thin walls or for thin sections, etc.

2nd.—*Medium Mixture.*—Concrete just wet enough to make it jelly-like, used for foundations, floors, etc. To better describe this mixture it may be said that a man should sink ankle deep if he were to step on top of the pile.

3rd.—*Dry Mixture.*—Concrete like damp earth, used for foundations, etc., where it is important to have the concrete "set" up as quickly as possible.

The difference between the mixtures is, that the dryer the mixture the quicker will the concrete "set up"—but in the long run, when carefully mixed and "placed," the results from any of the above mixtures will be identical. It may be said, however, that a dry mixture is the harder to handle, must be protected with greater care from the sun or from drying too quickly; and lastly, is likely—unless used by most experienced hands—to show voids or stone pockets in the face of the work when the "Forms" are removed. The less the voids in the stone or gravel, the greater will be the volume of the concrete. In general, the amount of concrete will be greater in each instance than is shown in the table—especially when gravel is used.

Materials

Before attempting to describe the actual processes of mixing and placing concrete, it will be well for us to have a pretty clear understanding as to the nature of the materials with which we are to work, and how best these may be selected.

Portland Cement

Portland Cement comes in paper bags, cloth sacks or wooden barrels—but the best way to handle it for the average user, is in cloth sacks. Manufacturers of cement charge more for this kind of package, but allow a rebate for the return of the empty bags. These bags must be kept dry and untorn and shipped back by freight to the manufacturer.

Paper bags tear easily, while barrels are too bulky to handle readily, and are not returned to the manufacturer—thereby necessitating a loss, as compared with cement in bags, of about 45 cents to each barrel.

The weight of the shipping units of cement varies slightly, but in general, the paper or cloth bag contains 87½ lbs. of cement, and four such bags make a barrel of 350 lbs.

It is important that your stock of cement be kept in a dry place. Once wet, it becomes hard and lumpy, and in such condition, is useless. If, however, the lumps are caused by pressure in the store house, the cement may be used with safety. Lumps thus formed can be easily broken by a blow from the back of a shovel.

In storing cement, throw wooden blocks on the floor. Place boards over them and pile the cement on the boards, covering the pile with a canvas or a piece of roofing paper. Never, under any circumstance, keep cement on the bare ground, or touching or against the sides of buildings.

Sand

Do not use very fine sand. By this is meant that a large proportion of the grains should measure 1-32 to 1-8 of an inch in diameter, and should the grains run up to ¼ in., the strength of the concrete is in-

creased. If there is a large quantity of fine sand handy, obtain a coarse sand and mix the two sands together in equal parts; this mixture is as good as coarse sand alone.

Sometimes fine sand *must* be used, because no other can be obtained; but in such an event an additional amount of cement must be used—sometimes as much as double the amount ordinarily required. For example, in such a case, instead of using a concrete 1 part of cement, 2 parts sand, and 4 parts stone, use a concrete 1 part cement, 1 part sand, to 2 parts stone.

Besides being coarse, the sand should be clean, i.e., free from loam, clay and vegetable matter. "But," you say, "how shall I tell whether the sand is what you call clean?" Here is a simple test—pick up a double handful of moist sand from the bank, open the hands, holding them with the thumbs up, and rub the sand lightly between the hands, keeping them about ½ inch apart allowing the sand to slip quickly between them. Repeat this operation five or six times, then rub the hands lightly together, so as to remove the fine grains of sand which adhere to them, and examine to see whether or not a thin film of sticky matter adheres to the fingers; if so, do not use the sand, for it contains loam.

A further test is to scrape some of this matter from the fingers on the end of a penknife and take a little of it between the teeth. If it does not feel gritty or sharp, it indicates vegetable loam, which is bad. Do not use this sand, or if no other can be obtained, test it further to make sure that there is not sufficient loam present to prevent the cement from getting thoroughly hard.

The sand for the test given above must be moist, just as it comes from the bank. When dry, the dirt will not stick to the fingers, hence this test cannot be used. Some idea can be obtained, however, by the appearance of the sand, even if it is dry. If it looks "dead" (an appearance which is caused by the particles of dirt sticking in little lumps to the grains of sand, sometimes also making the grains of sand stick together in little bunches when picked up), it is almost a sure sign of vegetable matter, and the sand should not be used. Fine roots in a sand will also indicate the presence of vegetable matter.

Having discovered that the sand you contemplate using is not clean, and provided you cannot readily obtain any that *is* clean, you may use what you have, provided you wash it in the following manner:—

Build a loose board platform from ten to fifteen feet long, with one end a foot higher than the other. On the lower end and on the sides, nail a board 2 in. x 6 in. on edge, to hold the sand. Spread the sand over this platform in a layer three or four inches thick, and wash it

Fig. 3.—Concrete Mixing Plant, Showing Concrete Board, Tools, etc., Necessary for Mixing Concrete by Hand.

with a hose. The washing should be started at the high end, and the water allowed to run through the sand and over the 2 in. x 6 in. piece at the bottom. A *small* quantity of clay or loam does not injure the sand, but any amount over 5 per cent. does.

Stone or Gravel

This, known as the "coarse aggregate" of concrete, must be free from loam, clay or vegeable matter. Great care should be used in its selection. The pebbles should be closely inspected to see that there is no clay on their surface. A layer of such clay prevents the "binding" of the cement. If necessary stone or gravel may be washed in the same way as above described for sand. Indeed, it is more easily done than sand, as the water flows through the larger voids in the gravel more readily than through the voids in the sand. Dust may be left in the crushed stone without fear of its interfering with the strength of the cement, but care should be taken to see that such dust is distributed evenly through the whole mass, and when dust is found in stone, slightly less sand should be used than ordinarily.

As to the size of stone or gravel, this must be determined by the form of construction contemplated. For foundations or any large thick structure, use anything from ½ to 2½ in. in diameter. For thin walls use ¼ in. to 1 in. stone.

Best results are obtained by the use of a mixture of sizes graded from small to large. By this means the spaces or voids between the stones or pebbles are reduced and a more compact concrete is obtained. Moreover, this method makes it possible to get along with less sand and less cement.

Pure Water Necessary in Mixing

Water for concrete should be clean and free from strong acids and alkalies. It may be readily stored in a barrel beside the mixing board and placed on the concrete with a bucket. If you are at all in doubt about the purity of the water that you contemplate using, it would be well to make up a block of concrete as a test, and see whether the cement "sets" properly.

Tools

One great advantage of concrete, so far as the farmer is concerned, lies in the fact that, generally speaking, it necessitates no outlay for tools, for it so happens that the tools needed for most forms of concrete construction, are the very ones every farmer uses—

Shovels—One for each man on the job.

Wheelbarrows—At least two, preferably those with sheet iron body.

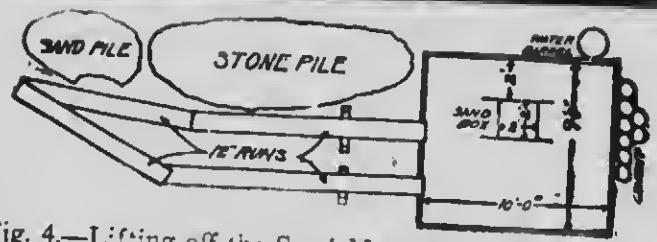


Fig. 4.—Lifting off the Sand Measuring Box and Getting Cement Ready.

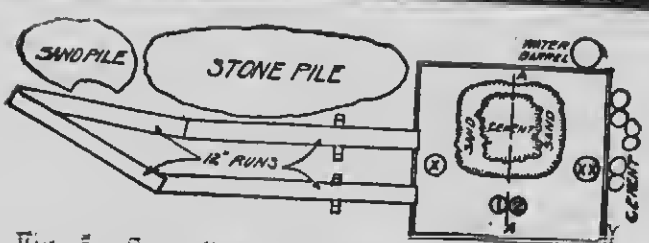


Fig. 5.—Spreading the Cement Over the Sand.

Rake.

Water barrel.

Several Water Buckets.

A Tamper or Rammer—This is made of wood with handles nailed to it, as shown in Fig. 3. The measurement is 4 in. x 2 in. x 2 ft. 6 in.

A Garden Spade.

A Sand Screen, made by nailing a piece of ¼ inch mesh wire screen, 2½ ft. x 5 ft., in size, to a frame made of 2 in. x 4 in. scantling.

In addition to the above tools you will require a Mixing Board. This is simply a water-tight platform. It should be (for a 2 batch mixture and for two men to work on) about 10 ft. square. Make it out of 1 in. boards 10 ft. long, surfaced on one side, using five cleats to hold the boards together. The cleats should measure 2 in. x 4 in. x 9 ft. If 1 in. x 6 in. tongue and groove roofers can be obtained, these will answer very nicely, provided they are fairly free from knots. The object of having surfaced boards is to make the shoveling or turning easy. The boards should be so laid as to enable the shoveling to be done with and not against the cracks between the boards. The boards must be drawn up close in nailing, so that no cement "grout" will run through while mixing.

For a larger job, a slightly larger mixing board will be needed.

In setting up your mixing board, choose a place giving plenty of room near the storage piles of sand and stone. Block up your concrete board level, so that the cement grout will not run off on one side, and so that the board will not sag in the middle under the weight on the concrete.

Wheelbarrow "Runs"

You will also have to make wheelbarrow "runs" leading from your mixing board to the spot where the concrete is to be erected. Do not use, for these runs, any old boards that are handy. Make a good run —smooth, and, if much above the ground, at least 20 in. wide. This one feature will lighten and quicken the work to a remarkable extent.

How to Mix Concrete

Having selected the proper materials and arranged the mixing board and runs the next step is the actual process of mixing.

The proportions of materials and the nature of same for various types of work have already been described on pages 136-142. In following the mixing instructions here given, considerable assistance will be obtained by referring to the illustrations with which instructions are interspersed.

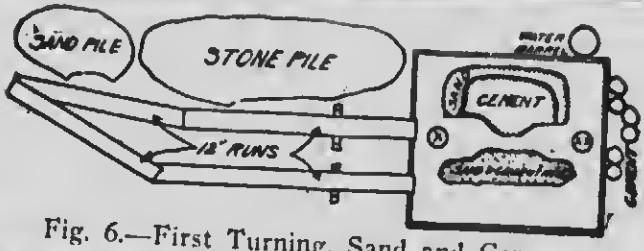


Fig. 6.—First Turning, Sand and Cement.

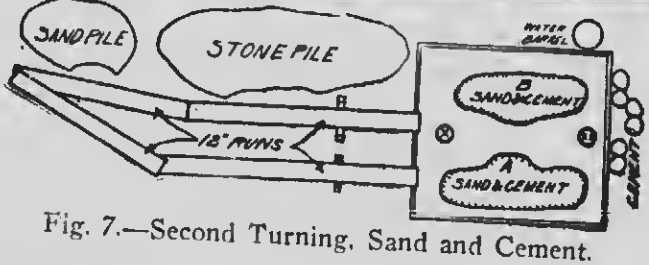


Fig. 7.—Second Turning, Sand and Cement.

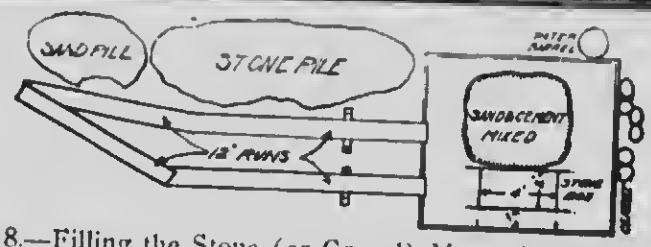


Fig. 8.—Filling the Stone (or Gravel) Measuring Box—First Method.

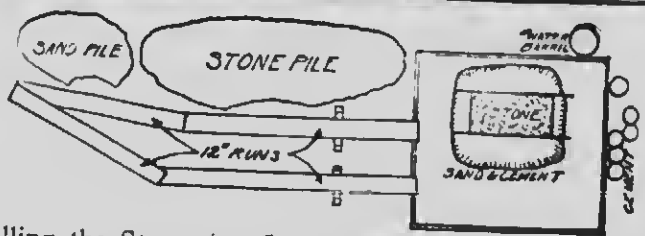


Fig. 9.—Filling the Stone (or Gravel) Measuring Box When on Top of Mixed Sand and Cement—Second Method.

The Hand Mixing Method

There are many ways of "hand mixing," all having the same good results. The way described here we believe to be the one best calculated to obtain good results with a minimum of labor. In this description and the accompanying illustrations, we have taken as a basis a "Two-Bag Batch" of 1:2:4 concrete.

First load your sand in wheelbarrows from the sand pile, wheel on to the "Board," and fill the sand-measuring box, which is placed about two feet from one of the 10-foot sides of the board, as shown by the diagram in Fig. 4. When the sand box is filled, lift it off and spread the sand over the board in a layer 3 inches or 4 inches thick, as shown in Fig. 5. Take the two bags of cement and place the contents as evenly as possible. With some experience, equally good results can be obmarked "x" and "xx" on the sketch below Fig. 5, start mixing the sand and cement, each man turning over the half on his side of the line AA. Starting at his feet and shoveling away from him, each man takes a full shovel-load, turning the shovel over at the points marked 1 and 2 respectively in Fig. 5. In turning the shovel, do not simply dump the sand and cement at the points marked 1 and 2 in the diagram under the cut, but shake the materials off the end and sides of the shovel, so that the sand and cement are mixed as they fall. This is a great assistance in mixing these materials. In this way the material is shoveled from one side of the board to the other, as shown in Figs. 6 and 7; Fig. 6 shows the first turning, and Fig. 7 the second turning.

The sand and cement should now be well mixed and ready for the stone and water. After the last turning, spread the sand and cement out carefully, place the gravel or stone measuring box beside it as shown in Fig. 8, and fill from the gravel pile. Lift off the box and shovel the gravel on top of the sand and cement, spreading it as evenly as possible. With some experience, equally good results can be obtained by placing the gravel measuring box on top of the carefully leveled sand and cement mixture, and filling it, thus placing the gravel on top without an extra shoveling. This method is shown in Fig. 9. Add about three-fourths the required amount of water, using a bucket and dashing the water over the gravel on top of the pile as evenly as possible. (See Fig. 10.) Be careful not to let too much water get near the edges of the pile, as it will run off, taking some cement with it. This caution, however, does not apply to a properly constructed mixing board, as the cement and water cannot get away. Starting the same as with the sand and cement, turn the materials over in much the same way, except that instead of shaking the materials off the end of the shovel, the whole shovel load is dumped as at points 1 or 2 in the

Fig. 10.—Placing the Water on the Stone (or Gravel) which is on Top of the Mixed Sand and Cement.

diagram under Fig. 5 and dragged back toward the mixer with the square point of the shovel. This mixes the gravel with the sand and cement, the wet gravel picking up the sand and cement as it rolls over when dragged back by the shovel. (See Fig. 11.) Add water to the dry spots as the mixing goes on until all the required water has been used. Turn the mass back again, as was done with the sand and cement. With experienced laborers, the concrete would be well mixed after three such turnings; but if it shows streaky or dry spots, it must be turned again. After the final turning, shovel into a compact pile. The concrete is now ready for placing.

Fig. 11.—Mixing the Stone (or Gravel) with the Sand and Cement.

Mixing Natural Mixture of Bank Sand and Gravel

Spread out the mixture of sand and gravel as much as the board will readily permit, add enough water to wet the gravel and sand thoroughly, spread the cement evenly in a thin layer over the sand and gravel, and turn over, as described previously, at least three times, adding the rest of the water necessary to get the required consistency while the materials are being turned. It requires some experience to work up a natural mixture of bank sand and gravel, and if at all doubtful about the concrete made from it, first screen the sand from the gravel as shown in Fig. 14, and then mix in the regular way. (See Sand Screen, p. 12, for size of screen.)

Number of Men

For the above operation only two men are required, although more can be used to advantage. If three men are available, let two of them mix as described above and the third man supply the water, help mix the concrete by raking over the dry or unmixed spots as the two mixers turn the concrete, help load the wheelbarrows with sand and stone or gravel, etc. Fig. 6 shows a third man on the board. In this illustration, he is helping mix the sand and cement by raking it— a most effective practice.

If four men are available, it is best to increase the size of the batch mixed to a four-bag batch, doubling the quantities of all materials used. The cement board should also be increased to 10 feet by 12 feet as shown under "Tools." In this case start the mixing in the middle of the board, and each pair of men mixing exactly as if for a two-bag batch, except that the concrete is shoveled into one big mass each time it is turned back on to the centre of the board. When more than four men are available, the rest may place the concrete, make new runs, load wheelbarrows, etc., taking the concrete away from the board as fast as it is mixed. In this case another small concrete board should be placed next to the big "board," so that in the last turning the batch can be shoveled over on to the small board for placing, making room on the big board to mix the next batch. The small platform need be only just big enough to hold the pile of mixed concrete.

Measuring By Wheelbarrow

With a little practice, the sand and stone or gravel can be measured by the number of wheelbarrow loads about as accurately as by the measuring boxes.

How to Determine Quantities of Materials Needed

First figure the number of cubic feet of concrete that will be required for the work in question. Then by multiplying this number by the number under the proper column and required mixture shown in Table III., the amounts of cement, sand, and stone or gravel can be found.

TABLE III.

Mixture	Quantities of Material in 1 Cu. Ft. of Concrete		
	Cement, Barrel	Sand, Cu. Yard	Stone or Gravel, Cu. Yard
1 : 2 : 4 Concrete	.058	.0163	.0326
1 : 3 : 6 Concrete	.041	.0174	.0348

Example

Suppose the work consists of a concrete silo requiring in all 935 cu. ft. of concrete, of which 750 cu. ft. is to be 1:2:4 concrete, and 185 cu. ft. is to be 1:3:6 concrete. Also enough sand and cement is needed to paint the silo inside and outside, in all 400 sq. yds. of surface, with a 1:1 mixture of sand and cement. One cu. ft. of 1:1 mortar will paint about 15 sq. yds. of surface and requires 0.1856 barrel of cement and 0.0263 cu. yd. of sand.

Solution, Etc.

Thus the necessary quantities of materials are:—

56 bbls. of Portland cement.
16¼ cu. yds. of sand.
31 cu. yds. of stone or gravel.

It is always wise to order two or three extra barrels of cement, if the dealer is at considerable distance, as this avoids any possible trouble that a shortage might cause. Besides, any cement left over always comes in handy for repair work around the house or barn.

How to Place Concrete

No time should elapse between the "mixing" and the "placing." Directions for placing must of necessity be general, and the farmer must use his own judgment as to how to handle this part of the concrete work, in connection with whatever particular job he has on hand. The important thing to remember is, that the materials should not separate in placing.

You may shovel the concrete off the board directly into the work; you may shovel it into wheelbarrows, wheel it to position and dump, or you may carry it to the proper place by buckets and hoisting apparatus.

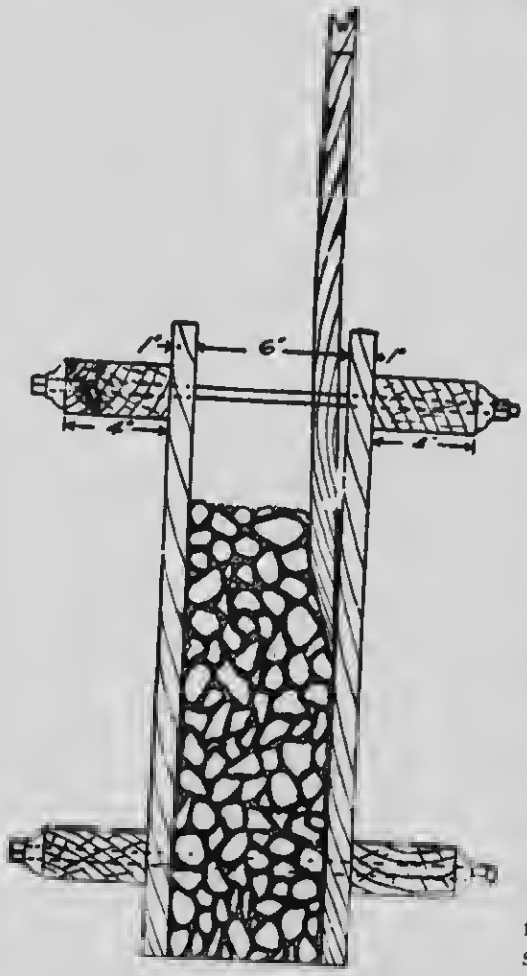
Directions for Placing

Ordinarily speaking, concrete should be deposited in layers about 6 inches thick.

After placing concrete in the Form, it should be "tamped" *lightly* with a wooden or iron tamper (or rammer) until the water shows on the top and no stones are left uncovered with mortar.

In order to obtain a smooth face on the concrete, the mixture should

be carefully "spaded" immediately after "placing"—on the side next to the Form where the finished concrete will be exposed to view. By "spading" is meant the working of a spade or beveled board between the concrete and the side of the Form, moving it to and fro, and up and down. This forces the large stones away from the boarding, or Form, and brings a coating of mortar next thereto, thus making the face of the work present an even, smooth appearance.



The Necessary Tools

On certain jobs—as, for instance, in the case of a 6 in. silo wall—you cannot very well use a spade, on account of the narrowness of the concrete section. In this event, use for your surfacing, a thin wooden paddle, made from a board 1 in. x 4 in., and gradually sharpened to a chisel edge at the end. The sharpening should be on one side only, and in using this paddle place the flat side against the Form, as shown in illustration. (See Fig. 12).

When the mixture is a *dry* one, great care must be used in this 'spading' or surfacing, in order to obtain uniform results, but in the case of a *wet* mixture, spading is only required as an added precaution against the possibility of voids in the face of the work, and in many cases it is not necessary at all.

Protection of Concrete after Placing

Green concrete should not be exposed to the sun until after it has been allowed to set for five or six days. Each day during that period the concrete should be wet down by sprinkling water on it, both in the morning and afternoon. This is done so that the concrete on the outside will not dry out much faster than the concrete in the centre of the mass, and should be carried out carefully, especially during the hot summer months. Old canvas, sheeting, burlap, etc., placed so as to hang an inch or so away from the face of the concrete will do very well as a protection. Wet this, as well as the concrete. Often the concrete Forms can be left in place a week or ten days; this protects the concrete during the setting-up period and the above precautions are then unnecessary.

Points to Remember

It may be well, in summing up, to emphasize the following points:—

1st.—The materials must be perfectly clean.

2nd.—The mixing must be in proportions carefully determined.

3rd.—The ingredients must be used while absolutely fresh.

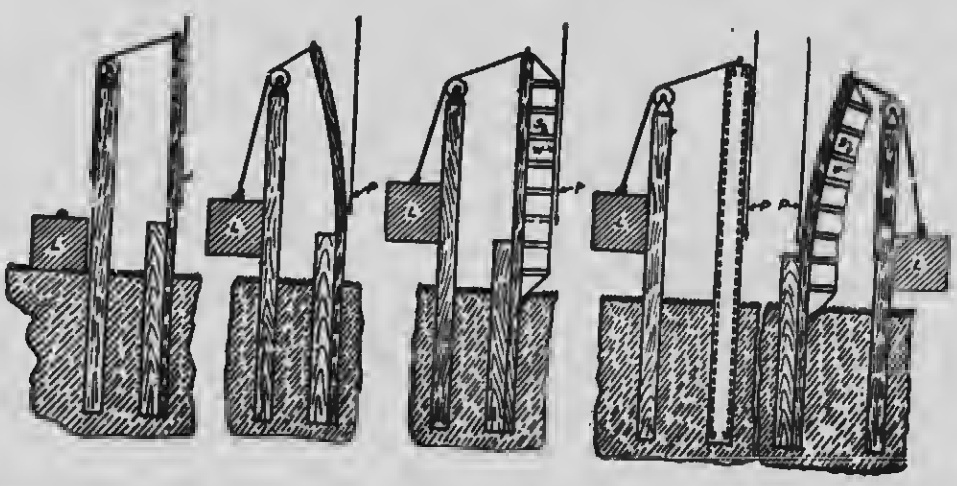
Good results cannot he obtained unless you use a good cement, nor will the work be at its best unless care is taken in the selection of clean sand and clean stone.

Amongst the uninitiated, there is an all too prevalent idea that anything is good enough for the making of concrete. Some will tell you that sawdust, shavings, mud, clay, , will do to complete the mixture, but the absurdity of this notion will very soon become evident to anyone who neglects the precautions which have been above pointed out.

Reinforcement

Principles Involved.

Concrete and steel render valuable assistance to each other in the support of heavy burdens. On a solid foundation, loaded from above and thus under direct pressure, a concrete column will withstand the strain of an enormous load. A much smaller load so placed as to cause stretching or bending toward one side of the same column may cause it to snap off, for concrete is strong, but brittle. On the other hand, steel is tough and elastic. In the form of rods or wire, steel withstands massive loads that tend to stretch it, and thus displays a kind of strength directly opposite to that of the plain concrete column. In modern construction these two valuable properties of concrete and steel are utilized by combining them in what is called reinforced concrete. With steel properly buried in the concrete, the column withstands not only the load which might otherwise snap it, but one many times larger and even though it is applied at any place along its length.



Reinforcement, therefore, is steel in the form of rods, bars or wires, buried in concrete to take up and to withstand the strains which tend to stretch or to bend the concrete. A concrete fence post is merely a small concrete column. Reinforced, it easily stands the strain from usage in a fence line.

The value of reinforcing concrete posts properly may readily be seen from figure 13. If a load (L) is raised so that its weight is supported on one side by a wooden post, the post will bend. The fibre in the wood on the side away from the load may be tough and elastic enough to prevent the post from breaking, and when released the post will spring back into its former position. In the third figure a No. 9 wire (W) is fastened securely to the wooden post at the top and the ground surface, and is supported along its length by the struts (S). If the same load is applied, the post will not bend, because the wire takes up the bending or stretching strain. This is precisely the case with the reinforcement in a concrete post. Supported along its length by the concrete, the wire (W) or steel in other shapes takes up the bending or stretching strains. Since the load which causes bending or stretching may come from any direction, concrete posts are reinforced on every side; otherwise they might break in a manner somewhat similar to that in which the wooden post bends when the reinforcement is not on the proper side of the post.

In the effort to be safe it is a common fault to insert more reinforcement than is absolutely necessary. This adds needlessly to the cost, for concrete becomes stronger as it grows older.

Kinds of Reinforcement

With regard to the roughness of the outside, metallic reinforcing materials are divided into two classes, smooth and corrugated or deformed. The general result of the many tests carried on in testing laboratories seems to indicate that in strength of bond, if the concrete is sufficiently rich and well mixed, smooth surfaces give satisfactory results. Two kinds of reinforcement are much used—bars and wire.

Bars—Round bars three-sixteenths or one-fourth of an inch in diameter are the size and kind most used on the farm. The stock on hand at blacksmith shops and hardware stores is generally from steel that stretches too easily and therefore is not the best for reinforcement. Companies which make a specialty of reinforcing materials can furnish both rods and bars which stretch only under very large loads.

Wire—The development of the wire fence has produced a material well suited for reinforcing purposes. Of equal size, such wire will produce a stronger reinforcement than the material above described. In order to obtain straight wire of the necessary length, the coils ordinarily placed on the market should not be straightened out. Straight wire can be obtained from dealers in the same manner as baling wire; that is, either single or twisted into two or three ply cables, and of the length desired. The plain, ungalvanized fencing wire is the proper kind, for galvanization adds nothing to the strength, and the metal will not rust when incased in the concrete.

Forms for Concrete

Concrete is a plastic material and before hardening, takes the form of anything against which or in which it is placed.

Naturally, the building of the Form is a most important item in the success of the work.

These Forms hold the concrete in place, support it until it has hardened and give it its shape, as well as its original surface finish.

Kinds of Forms

Almost any material which will hold the concrete in place will do for a Form. Concrete foundations for farm buildings require shallow trenches, and usually the earth walls are firm enough to act as a Form.

Moulds of wet sand are used for ornamental work. Frequently colored sands are used for this purpose, providing both the finished surface and color to the concrete ornament.

Cast, wrought or galvanized iron are used, where an extremely smooth finish is desired, without further treatment upon the removal of the Forms. Forms made of iron are more easily cleaned, and can be used a greater number of times than those of wood. Rusty iron, however, should not be used.

By far the greatest number of Forms are made of wood, owing to the fact that lumber in small quantities can always be obtained.

Requirements of a Good Form

Plan your Forms so there will be no difficult measurements to understand. Make as few pieces of lumber do the work as you can, and do not drive the Forms full of nails. If you do the Forms will be difficult to take apart without splitting.

Forms must be strong enough to hold the weight of the concrete without bulging out of shape. When they bulge, cracks open between the planks and the water in the concrete, with some cement and sand, will leak out. This weakens the concrete, and causes hollows in the surface which look badly after the Forms are removed.

Forms which lose their shape after being used once can hardly be used a second time. A part of the erection cost of Forms is saved if the Forms are built in as large a section as is convenient to handle. This saving applies to their removal, as well as their setting. Consequently, the lightest Forms possible, with the largest surface area, are the most economical.

How to Plan Forms

The first consideration in planning Forms is the use to which they are to be put. Neglect of this point means waste of money and time. If they are for work afterward to be covered with a veneer coat, the finish of the surface is of small consideration, while the alignment of the Form is all important.

If a tank or retaining wall is to be built, the fact that the Forms are not in exact alignment will hardly be noticed.

In planning Forms for large structures, the oftener each section is used, the less the cost. You save money if they are rigid in alignment, and well surfaced. In other words, if you count on using your Forms over and over again, the more nearly perfect they are, the more often they c n be used, and the cheaper they become.

If Forms are only to be used once, as is generally the case on the farm, they should not be nailed so securely as to prevent their being readily taken apart, and the lumber used for something else. It often pays to put them together with screws. If nails are used, do not drive them home.

Care Needed in Selecting Lumber for Forms

The selection of lumber is of importance. If the Forms are to be used over many times, surfaced lumber, matched, tongued, and grooved stuff, free from loose knots, is an economy. If, however, they are only to be used once, almost any old plank will do. By nailing a board on the outside of the cracks or over the bad knot, and filling with a little clay, the Form is made tight.

Green lumber is preferable to kiln-dried or seasoned stuff. Seasoned stuff, when wet (either by throwing water on the form before placing the concrete or by absorbing the water from the concrete), warps, and the shape and tightness of the Form is damaged.

Originally only surfaced lumber was used for Forms, dependence being placed on it for giving a finish to the work. While to-day other than smooth surfaces for concrete are the fashion, surfaced lumber has some advantages. The Forms fit together better and are easier to erect. They are more easily cleaned. They are easier to remove. All these items reduce the cost of the work. The saving effected will of

course depend on the difference in local price between finished and rough lumber.

How to Clean

Particles of concrete stick to the Forms. In order to prevent this, give the surface next the concrete a coat of oil or soft soap. Linseed, black or cylinder oil may be used. Never use kerosine.

Before erecting, paint the Forms with the oil or soap. Then carefully protect them from dust or dirt until erected. Upon removal, immediately clean off all the particles of concrete sticking to the surface. A short handled hoe will take off the worst, while a wire brush is most effective for finishing. Be careful not to gouge the wood in cleaning, as it will spoil the surface of your next section of concrete. It will not be found necessary to repaint after each time of use. Watch the surface and repaint if it appears dry in spots.

If chips or blocks of wood fall inside the Forms while erecting, carefully remove them. The space inside the Forms is intended for the concrete; and care should be taken to see that only concrete is placed there.

The necessity of Forms presents a problem, calling for the use of that ingenuity for which the farmer is justly famed. Forms can be economically placed in so many ways that only one example will be given. A foundation Form in place is shown in the photo. Note the simple and easy method of bracing. Also note how lumber is saved from cutting by allowing the sides to project, as well as the studding.

For this building 18 by 24 ft., trench 18 inches wide and two feet deep—total cost of setting forms $4.00. The lumber was all on hand and can be used again.

"Canada" Portland Cement

The Kind that Insures Success

Do not lose sight of the fact that the result of any concrete work you may undertake, will depend very largely upon the quality of the sand, gravel and cement.

Directions have already been furnished, as to how to select the first two ingredients.

To be sure of the last mentioned and most important—cement—there is but one way:

Insist on "Canada" Brand

"Canada" Cement is manufactured by tried and true methods. Up-to-date machinery, careful selection of materials, and painstaking care, are employed to make it as nearly perfect for the purpose it is intended to fulfill as human skill and ingenuity can accomplish.

All our Cement is manufactured under the supervision of a General Superintendent and a General Chemist. They require all cement produced in each of our ten mills to meet Standard Specifications, thus insuring absolute uniformity of product.

Our mills are located at Calgary, Alta.; Port Colborne, Ont.; Shallow Lake, Ont.; Belleville, Ont.; Marlbank, Ont.; Lakefield, Ont.; Hull, Que., and Montreal, Que.

Thus the entire Dominion is served with "Canada" Cement. The big output of this Company, our enormous storage bins, the location of our mills near large centres of population, where abundant labor may be had and where car supplies are available, places us in a position to make, at all times, the best possible deliveries at minimum prices.

"Canada" Cement, in spite of its superiority, is no more expensive than any other cement.

"Canada" Portland Cement

Is sold by all dealers. There's a man in your town who will be glad to supply it. If you don't know him, write us and we will tell you his name.

Any other information about cement and its uses cheerfully furnished to anyone who writes us.

Publications issued by the Canada Cement Company:

No. 1—"What the Farmer Can Do With Concrete."
No. 2—"Mixing and Placing Concrete by Hand."
No. 3—"Concrete Silos."
No. 4—"Tanks and Watering Troughs."
No. 5—"Cement Stucco."
No. 6—"Concrete Blocks."
No. 7—"Artistic House Building."
No. 8—"Concrete Chimneys."
No. 9—"Telegraph and Telephone Poles."
No. 10—"Concrete Surface Finishing."
No. 11—"Portland Cement Sidewalk Construction."
No. 12—"Concrete Fence Posts."

CANADA CEMENT COMPANY, LIMITED

MONTREAL

The estimated cost of constructing the various buildings and farm utilities pictured and described in this book, is in each instance calculated with the following figures as a basis of cost for the raw materials:—

Cement	$1.75 per bbl.
Sand	1.00 per yd.
Stone	1.00 per yd.
Labor	1.50 per day.

It will be understood that prices for these raw materials vary. The market price of cement fluctuates, and the other items depend upon locality.

The farmer taking the above-mentioned figures as his basis, and knowing the present cost of the various materials, in his own neighborhood—can easily arrive at a definite idea of what will be the cost of concrete construction for any buildings or articles such as those herein described.

"The Canadian Standard"


CANADA CEMENT COMPANY LIMITED
PORTLAND
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