

Farm Buildings.
Graduating Thesis.
Kansas State Agricultural
College.
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Building is one of the great events that comes far apart, and it is a very important undertaking in that the result is to be the farmer's home. Unfortunately, too little forethought and planning is given to the undertaking and often the result is far from satisfactory. After mistakes are once made in a structure they cannot be readily or cheaply corrected.

Seldom does the farmer conduct any great building movement at one time. Often his abilities will not permit or his aim is not clear so that he must begin, or prefers to begin modestly and add to what he has as there is demand for enlargement. This plan is preferable, for if extensive building is done at one time there will likely be a greater tendency to be too elaborate and the result may not only be expensive, but may not serve for the constant need of the farmer. Hence, it is desirable that the planning should be so as to facilitate subsequent enlargement, for money can be saved and convenience increased, and the enlargement of the home may be made so as to be in keeping with the steady growth of the farmer's enterprise and his surroundings. And, too, a steady growth permits that the structures may be more substantially put up, so they will be more permanent. Americans will probably never erect great castles and palaces that stand for centuries, as have many of the English, yet they are coming to realize, as have many of the European people, the necessity of suitable and substantial buildings for the country homes. Already, the eastern section of our country has made great progress in the erection of spacious and permanent buildings. True, that portion of our country is older, has more wealth, yet since the central and western parts of our country are so universally engaged in agricultural pursuits, there is great necessity that they should amply provide to conserve what they have produced, as well as furnish themselves

with all the conveniences and comforts that may come to the country life.

A first consideration in the construction of buildings is the location and the general arrangement. No requisite deserves more attention than that the site afford sanitary conditions. For this a dry well drained soil, a good circulation of air and plenty of sunlight are essential. It is preferable that the site be on slightly elevated ground, as this affords quick drainage and a good exposure. An abundant supply of pure water is also a primary requisite. Too often buildings must be placed in undesirable places just to be near the water supply. A lay of the ground that will afford an artificial drainage system for the disposal of refuse matter is very desirable, in order to prevent contamination of the water supply and to maintain a high degree of cleanliness about the buildings.

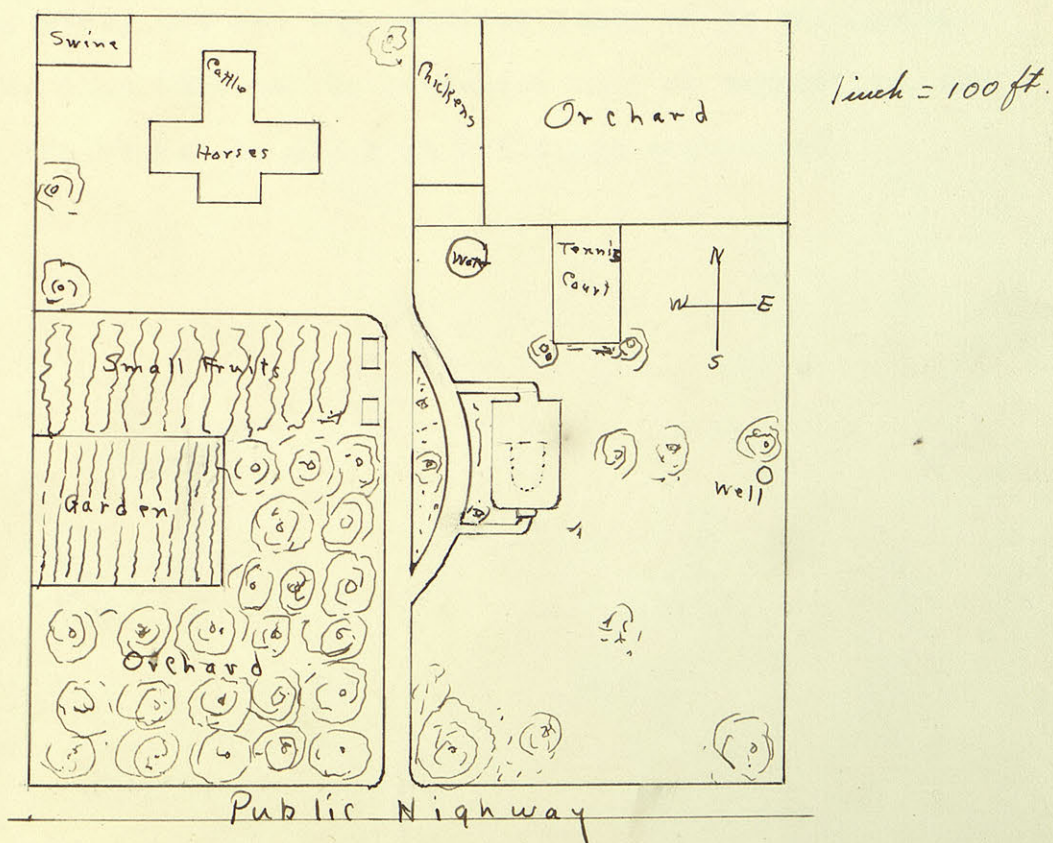
A location with any natural protection, either as hills or bluffs or timber, is to be favored as this will add much to the enjoyment of the people and also much comfort to animals. The temperature near a belt of timber is more even throughout the year.

Proximity to a public highway is to be favored, though this may be sacrificed for other desirable features. The relation of the house and barns and other out buildings is not merely a matter of appearance, but it is also a matter of convenience and health to the people. The barns, etc. should be set in the rear, or to one side and the rear of the house, and they should not be so close as to appear a part of each other, nor so far apart as to cause unnecessary steps in passing from one to another. In Kansas it is preferable to have the barns, etc. either, north, west, or northwest of the house, as the prevailing winds are usually from the opposite directions and that arrangement will carry the stable odors away from the house.

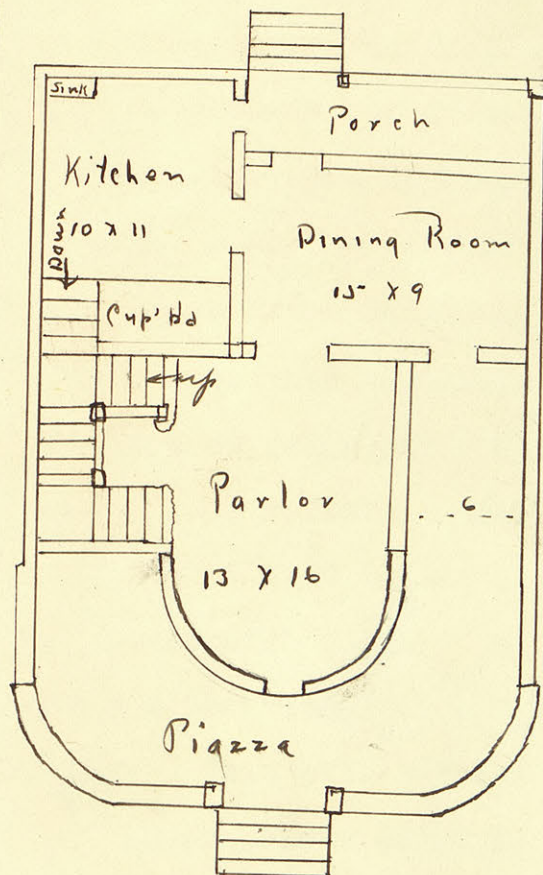
Drainage should be from the house towards the barns, if possible, at least, never from the barns toward the house. If the former is the arrangement the surroundings may be kept much more clean, and besides one sewage system will serve for all the buildings.

Beauty has a value, and perhaps we pay more for ornament and beauty than for utility. The farmer is too practical to accept this idea, but he certainly ought to not neglect the matter of making the home beautiful, not only the buildings themselves but the surroundings. Features of the natural landscape, a grove of trees, a beautiful lawn, shrubbery, adjacent fields of growing crops, hills and woods, all add character to the place and consequently value.

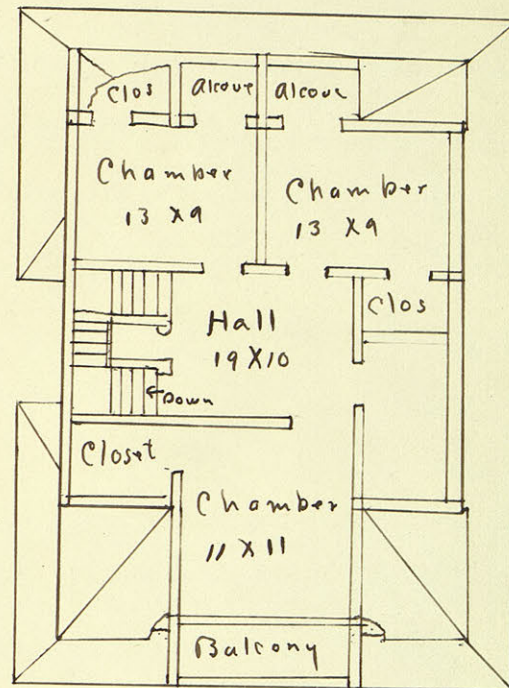
The following example will set forth many of the foregoing points that have been mentioned:



The plans, drawings, and specifications are intended to embrace everything necessary for the full and entire completion of the work. The plan of the structure cannot receive too much attention, and when once conceived it should be accurately drawn on paper. When the working plans, specifications and bill of materials are made up they may be submitted to the builder and serve as the general guide during the construction of the structure. The idea of constructing so as to make subsequent enlargement has been dwelt upon. But in house building it is preferable to erect the entire and complete structure at one time, for the house is not only to be the best built and most permanent of the buildings but it is needed most for the health and comfort of the residents. The following plan is presented as a type that will well serve the purpose of the ordinary family, and one that can be erected at moderate expense. Of course, in the construction of a building every one has his peculiar taste as to arrangement, size, etc., so that this can be presented only as suggestive, and points which are common to all such buildings emphasized.



First Floor



Second Floor

This is a six-room cottage, 27 feet in width and 36 feet in depth, containing a circular porch, reception hall, dining room, and kitchen, the latter being provided with cupboards, drawers, etc. A cellar is intended under the kitchen and dining room. Three good sized chambers and a bath room are on the second floor. A wide stairway is arranged to lead from parlor, and beneath this stairway is another leading from the kitchen to cellar. The height of the first story is intended as 9 feet, the second 8 1/2 feet.

The foundation and cellar are so closely interlinked that they may be considered together. It is quite essential that the foundation be built very substantial. Either stone or brick is best as they will last longer than most other materials, and will provide walls for the cellar. Walling up the cellar will make the foundation more durable, too. These materials may be so closely fitted as to

prevent circulation of air under the floors, which is very desirable in winter to prevent cold floors. The wall should extend three or four feet above the ground, as this will not only tend to keep the cellar drier, but it will afford better light and ventilation when needed. Both an outside and an inside door should lead to the cellar.

Since frame buildings are so universally built, this discussion will be confined to the subject in its relation to frame structures. The type of frame for a house consists of sill, studding, plates, joists, and rafters. For the size of house under consideration a sill from 6 to 8 inches is sufficient for vertical depth and 6 inches for horizontal width. On the inner side of the sill may be spiked a 2 X 4 scantling, on which may rest the tenons of the joist for the floor. This will prevent having to cut mortises or gains in the sill.

Floor joists ought to be at least 2 X 8 and cross-bridged every 8 or 10 ft., and oftener if the span is longer than that.

For studding 2 X 4's are most commonly used. If 4 X 4's or two 2 X 4's were spiked together it would make the building much more durable. At least 4 X 4's should be used on the corners with 2 X 4's spiked to both of the inner sides. This affords a more solid corner and allows for an end fastening of the lath.

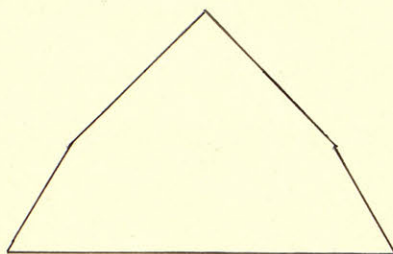
Plates are well to be made of 2 X 4's spiked double and then securely nailed to each studding.

Rafters are usually 2 X 4's but 2 X 6's are preferable, as they are twice as strong and contain only one^{-half} more material.

A double floor is often preferable as it is thought to be warmer, but if the best material is secured and tightly and smoothly laid the single will answer. The second floor joists may rest on 1 X 6 bearers which are let into the studding at the proper height.

Many mistakes are made when it comes to the roof, due to

excessive attempts at gable ornament, railing, brackets, and the like. They are to be discouraged, as they soon fall to decay and are a constant item of repair. It is much better to construct a plain roof, with a pitch of one-half, as this is less apt to leak than a greater pitch and appears better than either a greater or less pitch. A combination of two pitches is quite satisfactory, especially in a region of great snowfall, as the combination type is stronger than the straight pitch. Thus:



Shingles and slate are used exclusively on the roof. The board shingles are cheaper, while the slate is more durable. In either they should be laid 4 or 5 inches to the weather, joints broken and nailed to strips about 1 by 3 which have been nailed to rafters. The strips should not be more than 1 or 1-1/2 inches apart. Metal roofs are to be discouraged, as they are not only expensive but they are apt to rot out.

Gutters are to be preferred to eave troughs, as they appear better and are more durable. But the gutter should be placed below the outside of the walls, that in case of a leak the wall will not be affected. From the gutters the water may be readily conveyed away by pipes. Eaves that are long enough to protrude well not only look better but protect the walls better than shorter ones.

A common practice in sheathing is simply to put on the weatherboarding. A house so constructed will not only be cold in winter

but warm in summer. Much preferable is it to first cover with some cheap lumber, placed diagonally is better, as it will brace, then a covering with paper, and finally with the weather boarding. This makes a wall stronger and impervious.

In the plan submitted a spacious veranda has been provided for, as they are very desirable for any home. Considerable extra care will be necessary in the construction as the parts are so much exposed. The flooring should be of the best material and kept well painted as well as should the ceiling.

Matters concerning size, and style, of windows must be left much to the taste of the individual, but in general large ones are to be preferred.

The painting is a matter of taste as to the style, color, etc., but it is extremely important that the operation should not be neglected whenever the building needs it, as it has much to do with the durability of a structure.

A general farm barn is the only type that will well serve the purpose of the ordinary farmer, because his work and his products are so diversified. It is not even practical for the specialist to confine the construction of his buildings to a specific purpose, for nearly any one enterprise in which he may engage will require the raising of general products; hence the necessity of a general farm barn. It is more economical to build one large structure than to build a number of smaller ones that would answer the same purpose. The building will be more permanent and it will be much more likely to be well cared for. Convenience is also a desirable feature. In the care and management of the live stock they are kept close together and less time is wasted in passing from one to the other.

Products for all purposes are stored together and may be handled on a large scale. If the size of the farm and barn will afford an engine, the feed, sheller, grinder, cutter, crusher, fanning mill, elevator, and pump may all be operated by the same power.

One ventilating system would suffice for the entire structure. In fact, all modern conveniences would be available for their maximum use.

The manure from all sources may be gathered together and sheltered, and consequently much may be returned to the soil that would otherwise be lost. One sewage system would answer for the entire building.

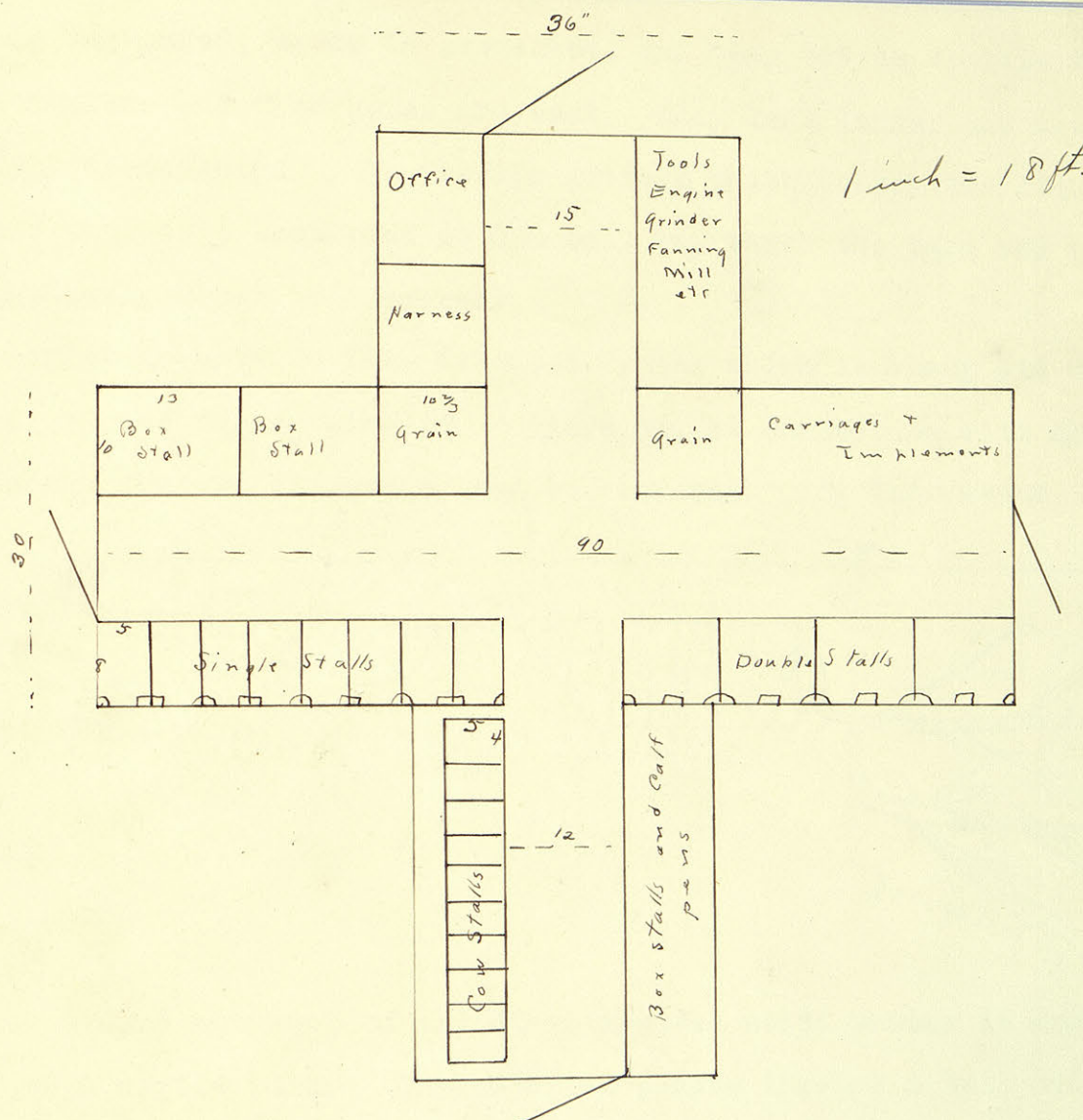
However, everything about the place is not to be stored or cared for in the general barn. Machinery may be more cheaply sheltered elsewhere. To house sheep or swine in the general farm barn would not be advisable on account of the peculiar characteristic odor of each, that would be objectionable to other animals and which would more or less permeate all feeds and hay.

The danger of fire is of the greatest risk in such a structure. Contagious diseases would be more readily spread where all animals are housed near together, but if affected animals are speedily isolated and the quarters immediately disinfected, such an outbreak may be quickly checked.

The plan to build so as to favor subsequent enlargement has been mentioned, and with the matter of erecting barns and outbuildings the farmer may add to such as he grows into his business. In general, a location that affords good light, especially sunlight is very desirable as it is a great purifier as well as a disinfectant. A large hay mow provides good shelter for an abundance of provender and saves double handling of much of the hay.

Much that has been said as to the detailed construction of the house applies relatively well to the barn. The material is coarser and the workmanship not so precise as to finish. The foundation, sills, studding, plates, joists, etc., all must be heavy. The roof needs to be well supported by braces and the plan of a combination pitch is especially desirable for a barn roof, as it makes it so much stronger. Siding is usually placed vertically and the cracks strip-ped. Flooring may be left dirt or cemented. The more windows the more light and health, and they are just as cheap as other building material. Doors are more convenient and durable if put on rollers rather than on hinges. Water is needed in the barn and to keep the building clean and healthful the sewage is to be conducted to a septic tank.

The following plan is proposed as complying with the principles that have been advocated:

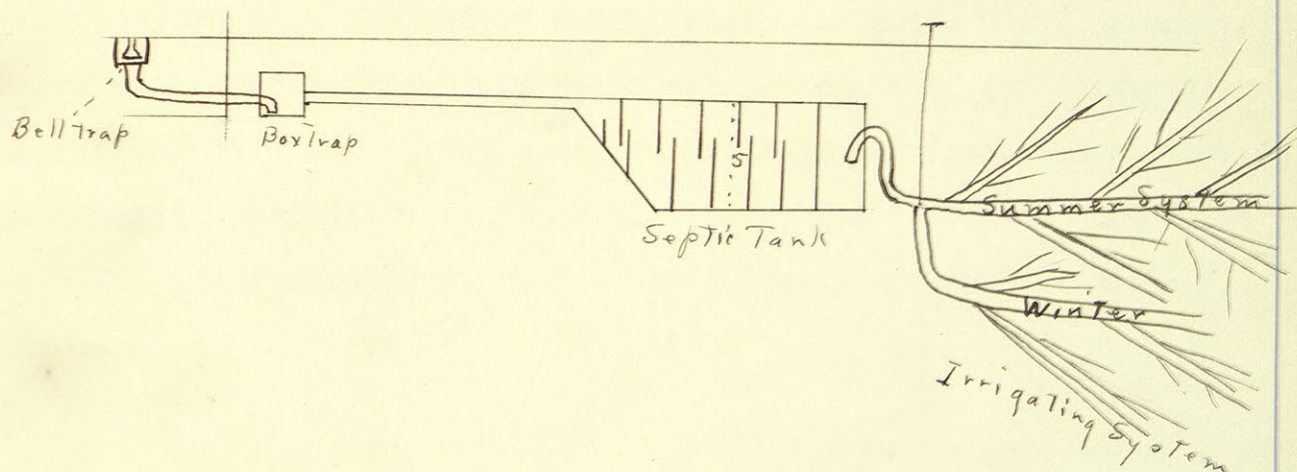


This plan will readily permit subsequent enlargement. The main part of the building, which is 90 by 30 feet, may be built first, and the two wings added as they are needed. Moreover, this scheme will afford the erection of a large centralized plant, if the farmer engages in extensive agriculture. Other than the dimensions indicated it is intended that the first story be 16 feet and 14 feet from the second floor to rafters. Roof is to be half pitch, hay mow over the entire structure.

In the stable fittings it is most modern to have hay shutes extending from the top of the mow to the various mangers. They are preferable to other means of feeding roughage, as the amount can be

easily regulated, waste is prevented, and they act as ventilators. Iron mangers and feed boxes are best. They last longer and are readily disinfected. To provide gutters which convey the liquid manure away to a cess-pool is the only way which the barn may be kept scrupulously clean and sanitary.

Below is shown a farm drainage system which is cheap and can be put in by the farmer himself. There may be connection with all buildings from which sewage need be conveyed. By this means



liquid manure and much of the disintegrated solid matter is drained away to a septic tank. The material passes through a bell and a box trap, which prevents the return of the sewage gases, thence to the tank where putrefaction takes place, the bacteria devouring all solid matter, changing it into a liquid form. In the tank are arranged a number of partitions that prevent the rush of liquid, so that the germs have better action. The tank should be air tight as this favors the bacterial growth and hinders gas formation. In the lower end of the tank is the reservoir which may be divided into many parts, so that any may be filled or emptied when it is desired. In looking down upon the tank it appears thus:



From the tank the material is conveyed into an irrigating system, and a small plot, as a garden, fertilized by the constituents of the refuse matter. The tile system should have a capacity equal to that of the tank, and two systems are preferable to one, a winter and a summer, so that the material may be drained into the deeper one and thus prevent freezing. If the sewage is not run into such a system it may be run into a cess-pool and allowed to seep away.

The principles of construction for the general barn will apply relatively well to the purely dairy, sheep, or swine barn, or poultry house, with special attention to an arrangement that is adapted to the purpose of each. But every farmer will not erect these other buildings in proportion to those that have been discussed, and since the house and general barn he must have, they need the greatest attention.