

less. I frequently find that in factories where composite samples are kept for a week or twelve days, these samples set out in the sun, and globules of fat dried solid to the walls of the bottles, and the man is not yet born of a woman who can test those samples correctly and honestly.

#### Butter Scoring Contest

The Ontario Department of Agriculture and the dairymen's associations are co-operating in the holding of a butter scoring contest for "cream gathered creameries" during the months of July, August and Sep-

tember. Prizes will be given as follows: 1st, \$30; 2nd, \$25; 3rd, \$20; 4th, \$15; 5th, \$10; 6th, \$5. The whole milk creameries will not be allowed to compete, as the competition is intended only for makers, managers, or proprietors of "cream gathered creameries." The competition shall consist of a scoring contest on three packages of butter from each creamery, the butter to be sent to the Dairy Department, Agricultural College, Guelph, when called for in July, August and September. Applications must be in the hands of Geo. A. Putnam, Parliament Buildings, Toronto, before July 15th.

## Steam or Hot Water Heating in Farm Houses

Editor THE FARMING WORLD:

Would you be so kind as to give me an impartial answer to a few questions in reference to heating apparatus for a dwelling, for which I shall feel much obliged:

(1) Will a common upright boiler (steam), of say three horse-power, be sufficient to heat a house of 28 x 34, solid brick and two storeys in height, with hot water radiating from say 500 feet of one inch and a half iron pipe, arranged as radiators?

(2) Would water, move freely and free of noise if said boiler were placed on same floor as the main radiators if two-inch pipe were used for the outgoing and return feeders?

(3) Would such a boiler do as well as some of the hot water apparatus now on the market? Would it be as economical in the use of fuel? Would it burn hard coal without being a nuisance because of gas, dust, etc? Can hard coal be burnt on a straight bar grate such as is found in those boilers, to advantage?

(4) Which of the two kinds of heaters; that is, the steam boiler or the hot water apparatus, will absorb the most heat from a given quantity of fuel?

AMATEUR.

Peel Co., Ont.

Answered by Prof. J. B. Reynolds, Ontario Agricultural College, Guelph.

These questions to be dealt with authoritatively should be considered by an expert in house engineering. I may, however, be able to offer some general remarks that will be of use.

(1) It is estimated that a boiler built to develop one horse-power

should heat a radiating surface of 200 square feet when the water is the medium of heating, so that a three horse-power boiler, if used to advantage, should heat 600 square feet of radiating surface either in the form of pipes or radiators. It is further estimated that each square foot of radiating surface, when hot water is the medium of heating, should heat from 20 to 30 cubic feet of space, so that this boiler should heat from 12,000 to 18,000 cubic feet. The house in question, if each storey is estimated at nine feet in height, contains about 10,000 cubic feet of space. A three horse-power boiler should heat the whole house during the winter to a temperature of 60 degrees or over.

The amount of surface furnished by 500 feet of one and one-half inch pipe would not be sufficient to heat the whole house thoroughly. It would require about two and one-half feet in length to furnish one square foot of radiating surface. Even in the most favorable circumstances, that is when the pipes are single and some distance apart and at some distance from the wall, so that the whole circumference of pipe is allowed to radiate equally, the 500 feet of pipe would furnish 200 square feet of radiating surface, and there should be 500 square feet. According to the above estimate, to heat the whole house and to make full use of the power of the boiler would require about 1,250 feet of one and one-half inch pipe.

Steam boilers are sometimes used for heating, and if care is exercised in the fittings there is nothing to prevent their working well, although the large space in the boiler must make the heating slow.

(2) It is quite practicable to heat with the boiler on the same floor as the radiators. It would be necessary, however, to carry the distributing main straight up from the head of the boiler to the ceiling of the ground floor, and thence by branches to distribute the water down to the radiators on the ground floor, and upward to the radiators of the first floor. For the return pipes, they may without interfering with the flow of the water, be carried below the ground floor from the radiators, and thus placed out of the way.

(3) It is impossible to say as to the work of a steam boiler for heating the house by hot water. To consider the question on the face of it, we would say that a boiler specially built for heating should heat more economically than the power boiler, but the latter, if it is economical in the use of fuel when developing power, should be equally economical when used for heating, provided that the pipes are arranged to permit ready circulation.

As to burning hard coal, if the grates are designed for burning hard coal, there should be less dust, soot and gas than with soft coal. It would be advisable to secure a grade of hard coal of the right degree of coarseness to suit the grates. Beyond that, it is a question of draft.

(4) The relative economy of steam heating and hot water systems depends principally on the construction and the handling of a particular system. On the average there is little, if any, difference in economy between these two systems, so far as the consumption of fuel is concerned. If any difference has been noticed, it has been in favor of hot water, possibly because with hot water the escaping gases are not heated to such a high temperature as with steam, and, therefore, there is less heat lost. The first cost of steam heating is considerably less, because the radiating surface required for steam is less than for water. On the other hand, the temperature of the hot water is lower than that of the steam radiators, and, therefore, the heat may be described as more pleasant. With steam it is easier to regulate the flow and to distribute uniformly than with water. With water any difference in resistance offered by the pipes will cause the water to flow more readily in the direction of least resistance, and thus will rob another section of the system of its proper share of heat. On the whole, therefore, it may be seen that there is little to choose between these two systems, provided that they are equally well set up and equally well managed.

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