In fact, I cannot, as a principle, recommend the practice of watering stock in the open air in winter, though in some cases the injury done by it may not be perceptible. At the Portage farm, our beasts are always watered in the house, where water is always before them. But I know that many of the best cattlemen on the Island of Montreal invariably water their beasts in the open air. Even if they do not treat their milch-cows so, they do their other beasts."

"I can understand that in your climate below Quebec, the turning out of cattle in winter cannot be done so often as in the district of Montreal, but, given a favourable temperature, the reasons for the practice are as good for the farmers below Quebec, as for those above that place."

M. Marsan's letter modifies considerably the purport of his speech at St. Hyacinthe as far as concerns the Eastern part of the province, where, except on very few days, in peculiar winters, it is always too cold to turn cattle out. Last winter, we had not one sufficiently mild day. But we go farther than he, and we assert that in no part of our province is it right to turn cattle out to exercise, and it is especially wrong to water them at a spring. It is true that M. Marsan did not intend, as we gather from his explanatory letter, to recommend the latter practice, but another farmer did, advising the watering of cattle at the months of drains. For this reason, we think it well to discuss the value of this proposition too.

Mr. Jenner Fust, of the *Journal of Agriculture*, appreciated our ideas on the matter, as he showed when, speaking of the question discussed at the meeting, he said: "M. J. C. Chapais declared himself to be entirely opposed to this practice. As for me, *distinguo*; milch-cows ought to be kept in from the 1st November to the 10th April, and their water should be of the same temperature as the cowhouse. From the above date, they ought to gradually *hardened off*, like hotbed plants, unless they are intended to be kept in the house all the summer on green-meat. Young stock will be none the worse for out-door exercise in a sheltered yard." Mr. Jenner Fust lives at Lachine, near Montreal.

The exposure to the external air in winter of milch-cows is, in reality, the most injurious form of this mode of treatment; as is that of watering them at springs, which are generally icy cold. But, for farmers in general, we contend that no animal, without exception, can be allowed to remain out of doors in winter without injury, unless it be for working purposes, and that the injury is two fold, affecting both the farmer's purse and the animals' health. To prove this statement, we will remind our readers of some of the principles that govern the feeding of cattle, and the effects that follow. In order to be well understood, we will give some extracts from a relatively recent publication on cattle-feeding, by M. Jules Crevat, which was honoured with the applause (*couronné*) of the French Agricultural Society in 1885, and the well-reasoned *data* of which it would, in my opinion, be hard to confute.

In order to understand the argument of M. Crevat, we must understand a term he frequently uses: *calorie*—(a modern scientific term, signifying, I presume, in English, *heat-unit*. A. R. J. F.) This term he explains as follws:

"For the unit of matter the weight of 1 *kilogramme* (=2.20 lbs.), and for the unit of work 1 *kilogrammètre*, have been assumed. The latter represents the force required to raise 1 kilogramme, vertically, 1 *mètre* (=39 37 inches) high, time being beside the question.

"The heat-unit is taken as one *calorie*, or the amount of required to raise 1 *kilogramme* of distilled water (=4¼5 of an imperial quart) by one degree of the centigrade thermometer.(1)

"By a number of most ingenious experiments, modern physicists have proved that it requires about 425 *kilogrammètres* of work to produce 1 heat unit—the greatest discovery of modern science.

"An animal being a living piece of mechanism, must be always in motion, for *motion is life*.

"By its anatomical construction, the animal machine can only do its work at a temperature more or less elevated, varying according to its kind and its environment, which demand a certain amount of heat.

Motion and heat being essentially diffusible, that is, having a tendency to act in every direction and through every space, it is clear that in the animal machine there will be a constant loss of heat and of motion. The animal, then, will exact a certain quantity of heat to maintain its temperature, and a certain quantity of work, in the mechanical sense of the term, to maintain its motion.

On the average, it may be calculated that a full grown bullock, weighing 1100 lbs., kept idle in a temperature of 12° C. (=53° F) will lose daily an amount of heat equal to 16,000 units (*calories*), of which about ⅔ represent the heat radiated from the surface of its body, ¼ the heat expended by the evaporation of sweat, whether through the skin or by the lungs, the remainder being employed in warming the drink and food, as well as the air it breathes."

Thus, one-twelfth of the heat obtained from its food is expended by the animal in warming its food and drink, and the air it inspires.

We say, the heat obtained from its food, for the author tells us afterward, "that one part of the elements of the food, in contact with the tissues, fixes itself, assimilates with the body, properly so called, for its support and increase, while another part undergoes, in contact with oxygen, a genuine (*eremacausis*) slow combustion, destined to produce the heat necessary for the proper working of the animal machine.

As we saw just now, the loss of heat by radiation from the body is very considerable—⅔ of the entire loss. If it be two-thirds in the case of a bullock kept idle in a cattle-house at a temperature of 53° F., what will it be with the same animal strolling about in the open air in winter? And, again, if the beast expend ½ of its heat in warming its food at an ordinary temperature, it must needs expend much more in warming ice-cold water! and, thus, the remedy this great waste of heat, the quantity of combustibles, that is, of food, must be increased. So much for the question as regards its economy.

Now as to the health part of the business: M. Crevat shall tell us what he thinks of cold water for stock: "The temperature of their drink should be about the same as the temperature of the bodies of our cattle, that no sudden change should be caused in the heat of their bodies, which would always injure the regular process of their functions. A temperature of from 50° F. to 100° F. is suited to those beasts that drink water unmixed with other things; if hotter, it would be less aerated, insipid, and indigestible; colder, it might arrest the digestion, produce colic, suppress perspiration, and cause serious complaints. Nine-tenths of the diseases prevalent among our stock come from the general or local suppression of cutaneous or pulmonary perspiration."

It is for this reason, we will add, that cows frequently abort from no other cause than the imbibition of *cold* water. And more; as a general rule, farmers who water their cattle at springs, have no means of watering them in their barns.

(1) The centigrade thermometer, the one used in France, starts from the point of melting ice, equal to 32° F., and makes one hundred divisions between that and boiling-point. Hence to convert Centigrade indications into those of Fahrenheit it is clear we must multiply by 1⅘ and add 32. Thus 40 degrees of. centigrade=⅘×9=7232+=104° Fahrenheit; and the boiling point of centigrade, multiplied by ⅘+32=212° the boiling point of Fahrenheit's scale. Celsius, the inventor of the centigrade, was a Swede. A. R. J. F.