and training the mind to consider a given piece of work not as a "job" or whole, but rather as a result —a series of solutions of problems long ago learned, or to be solved. During all this time there may be a "commercial note" made of the quantity of or bulk of material proper to be removed by various tools and at various cutting-speeds; so that when the learner is put upon "jobs," he may estimate the amount of time required to complete each stage—so many hours for ripping, cutting, roughing, &c.

Having learned that with various grades of wood, and working them in various directions, he must employ cutting-edges of various degrees of acuteness applied, the learner will be quite ready to consider the subject of metal-cutting. He will find the fibrous wrought-iron and the granular cast-iron, the various kinds of steel and alloys, requiring special treatment, just as the various kinds of wood did; and his analysis will dictate that he employ less acute tools, at a less acute angle; that the cutting-speed and the feed be slower, &c. His bench work may be conducted just as with wood; sawing, chipping, filling, &c., coming before lathe work. The lathe and its tools having been studied, the planing, slotting and shaping machine will be more readily comprehended—the action of the tools being governed by precisely the same general principles; the idiosyncracies of each machine, and the amount of work per hour, requiring special study.

If, during this time, the learner has been taught something of the laws of stress and strain, he may apply them to the use of the materials with whose nature and strength he has familiarised himself, and will be prepared to analyse and criticise structures, and eventually to design and construct them.

Such a system, as hastily and roughly sketched out, will be ten-fold more effective than the shop and apprentice system, in producing, not machine tenders (able to make, with a full shop and kit to aid them, what they have found out by failures how to make), but reasoning *mechanics*, competent to make good things, and to turn out good work with inferior appliances, in emergencies.

We are indebted to an excellent article in the *Polytechnic* for many of the practical ideas herein suggested.

CANADIAN BUTTER.

In March number we inserted an article and some illustrations from that excellent work, the *American Agriculturist*—a work which we heartily wish was in the hands of all our Canadian farmers. These articles treated on—THE CHEESE FACTORY, CHEESE MAKING, AND BUTTER WORKING INSTRUMENTS. We now give a page from the same work showing the construction of an AMERICAN DAIRY, a model of which was exhibited at the late Centennial Exhibition.

The quantity of inferior butter manufactured in Canada is simply a disgrace to our farmers and a national loss to the country. Every pound of bad butter made is so much money lost to it.

The number of tubs of butter offered for sale in Montreal at the present time, selling at prices as low as 12 cents per pound, and only fit for axle grease at that, is something extraordinary, and shows a great lack of knowledge in its manufacture, or a total disregard of cleanliness in the dairy. It is roughly calculated that the loss to the farmers of Canada, by manufacturing such an inferior quality of butter, is, at a low calculation, not less than $500,000 per annum. Why should this be? Why should we not make as good an article as is made in the New England States and the State of New York, where a pound of bad butter is hardly ever seen? There is no reason why we should not do so —except that arising from carelessness and ignorance— and the sooner Canadian farmers look to the matter the better for themselves.

(See page 123 for model of a Dairy Farm).

THE HOUSE FURNISHER.

THE leading article of the first number for the year of this useful journal, informs us that it has entered upon a new field of usefulness and wider importance than that which it hitherto occupied, and that its principal mission will be to lay before dealers in every branch of the house furnishing business full and accurate information in regard to all matters pertaining to their trade, and especially as to the state of the wholesale market of their wares. To this end it will contain a monthly revised and carefully compiled list of all staple goods as well as all such novelties as may from time to time be introduced. All the different articles of house-furnishing are illustrated and alphabetically arranged, which is most convenient to dealers who may wish to order goods or to check off the prices of those they have ordered. It is a work which should be in the hands of all dealers in house-furnishing, for it not only gives correct information as to prices and where the goods are to be bought, but it contains some excellent illustrations of such novelties as may seem most deserving of conspicuous notice, and also some excellent illustrations of handicraft in tinware, &c., of great service to mechanics.

The work is published by Tuft & Howard, 12 Murray St., 15 Park Place, New York.

SIMPLE WAY OF LEVELLING AND GRADING.

(See page 111.)

The simplest instrument for the purpose of establishing levels and grades, consists of two glass tubes, A and A, each tied to a stick C and D, and placed vertically; the tubes are opened at both ends and connected at their lower parts by a large piece of India-rubber tubing E F. If now water is poured in one of the two glass tubes A, it will pass through the rubber hose E F, reach the other glass tube B, and stop there just as high as in the first, no matter how uneven the ground in which the sticks are placed. If the ground is very uneven, it is well to have the glass tubes long enough. If now poles G H are driven to the height of the water in the tubes, their tops will all indicate one level, and the depression of the soil can be measured on the poles; and if a grade is required, it can be measured above or below the thus established level.

This arrangement is similar to the Japanese level represented on page 74 of our April number for 1876, with the advantage that it is more correct in proportion to the length of the rubber tube, while a special advantage is that it is even possible in this way to make levels between places around corners where from one point the other is invisible, or at both sides of an intervening object, as a rock K, a wall, tree, &c., as represented in our engraving, in which we wish to correct the impression which the engraver unfortunately conveys by making the hill like a section in which the tube passes through a hole. It is intended to represent the exterior of a hill, around which the tube is conducted, lying everywhere on the upper surface of the ground. As rubber tubes may be had in lengths of 24 feet, and are easily joined together, the levels may be easily determined in this way at distances of 100 feet or more.—*Scientific.*