

ish, so that when the individual parts are finished they will fit accurately together and form one harmonious whole. When these drawings are completed, patterns must be made for the parts to be cast in iron or brass.

In making the patterns the amateur must have some knowledge of the moulder's trade in order to make the proper allowance for drawing the patterns out of the sand, for the contraction of the metals in cooling and for coring the hollow parts. The shapes of hollow parts cannot be made in ordinary sand, which would not stand up; but core boxes must be constructed in which are made the hard baked sand cores which are knocked out of the holes after the casting is done. The steel forgings are made directly from the drawings and do not as a rule call for patterns. To do this the amateur must be somewhat of a blacksmith.

After the castings and forgings, comes the machining of the parts, which falls to the lathe, sharper, or drill, as required. In addition to this there is a certain amount of bench work such as scraping, filing, tapping for screws and general fitting. It will be seen that in these manipulations the amateur has been in part a draughtsman, pattern-maker, moulder, blacksmith and machinist, and if he complete the engine and run it he will learn some of the duties of a fireman and an engineer. He will have acquired an increased respect for each of these arts and for the men who practice them well.

One of the chief benefits of the mechanical hobby to the individual is the training of the faculty of accuracy.

To work to definite measurements, to be able to perceive the relations of things in the material world, is just that kind of education which this age and in fact all preceding ages have lacked.

The perception of relations between things in the concrete is the only basis on which to train the mind to compare ideas in the abstract. The lack of this basis is responsible for much of the loose thinking of the present day.

If our truly heroic efforts in the line of education are to have any real results, we must begin upon a sound basis, and we may well rejoice at the adoption of manual training in our schools, for that is the very element best fitted to bring about the desired result.