

as those prepared by special instrument-makers; for the successful performance of experiments, "Cheap Jack" substitutes are poor apologies indeed. Again, all teachers are not born mechanics; many a very useful and successful teacher is utterly unable to jump from his school to a tinsmith's or a carpenter's bench, or a blacksmith's forge, and hope to equal if not to rival, the efforts of skilled workmen. Even were such possible, it is hardly fair to expect spare time to be devoted to instrument-making, when so many other claims imperatively demand the teacher's attention. Remembering that what is worth doing at all is worth doing well, it is not too much to ask that at least six hundred dollars be devoted to the purchase of apparatus and of chemicals, and at least forty to fifty dollars per annum be devoted to paying for chemicals used during the year, breakages, etc. Large as this sum may seem, it is little enough for him who would teach chemistry with satisfactory results; especially if we remember that every student must, as far as possible, verify each experiment for himself.

Again, time is pre-eminently a necessary consideration in the teaching of chemistry. In the preparation of botanical specimens for classes, a few minutes will suffice; even for teaching physics, a short time will in general be enough for arrangement; but in chemistry, even the veriest tyro knows with how much trouble and time experiments are prepared; every one knows how many chances of failure there are to one of success; how unless every experiment be properly and carefully rehearsed, failure is almost certain. Yet in Ontario High Schools of two or of three masters, the science teacher has at least half a dozen other subjects assigned to him. He is expected to jump from class to class, leaving only too often his ap-

paratus unwashed and still set up; perhaps to be taken apart, cleaned and put away by some student, whose time can be ill spared for the purpose; more often to be left to be dealt with by the master himself at a more convenient season, whenever this may come. And he is expected to give full time to each subject, and yet to secure his full amount for rehearsal of experiments, for class-work in chemistry, and for subsequent cleaning up and putting neatly away the apparatus used.

But even allowing these difficulties to be removed, and everything to be so well arranged that each pupil may experiment for himself under the master's eye, as the High School regulations prescribe, even then all is not perfect; for proficiency on the part of the teacher by no means infers like proficiency on the part of the pupil. It may be the proud boast of the master that *he* never failed in any experiment; it certainly cannot be the boast of the pupil, especially if we consider the ever-varying conditions of age, sex, rank of life, disposition, represented by students in general. The pupil requires time and experience to learn chemical manipulation, but amidst the rustle, bustle, hurry and worry of school-life, where shall this time be found?

The pupil too, if successful, may rest on the results of experiments, without going on from experiment to principle; only too often if these experiments have been brilliant and showy. Only too often the brilliant revelations of experiment are realized merely as so many *aides-memoire* to that awful demon, "the examination." Never a word, never a thought, is given to the underlying law; never a word, never a thought, goes out to the Universe of God. And this, not because the teacher is unwilling or incapable, but because the pupil will not follow. Only too often does the unfortunate