

in specified gravity between the corundum and the waste minerals, but the finished product must be cleaner and of a more uniform standard than in any other branch of concentration. The obtaining of these results under the local conditions of Craigmont has called for the development of a method extreme in the direction of fool-proofness and in an organization designed principally to take care of and teach the new unskilled workmen. The hardness of the mineral to be saved and the habit of its fracture more than counterbalance the drawback of its low specific gravity. The absence of any differential surface tension action makes the cleaning of the slimes and finer sizes a difficult and wasteful process, but with all the coarser sizes the high grade of product is maintained without serious difficulty.

The problems of the selling department have also their intricate details; as an example, until very lately the publicity department has included in all its advertising literature the statement that the abrasive efficiency of emeries varies according to the percentage of corundum that they contain, and the inference has been made that because Craig mine corundum contains twice as much corundum as does a high grade emery it must be twice as good. This may be a partial truth, but has been a very serious fallacy, as it has not only emphasized the competition with emery but has largely governed (in the wrong direction) the selling price. In reality, though, both crystal corundum and emery owe their abrasive qualities to the corundum content, the percentage of corundum present has practically nothing to do with the relative efficiency. In the case of emery, most of the corundum is present as a delicate sponge-like skeleton filled in with iron oxide. When this iron oxide is dissolved out by acid this skeleton shows to be granular and easily crumbled. In work it is supported by the iron oxide, but its action is a fine scratching rather than a cutting. With crystal corundum the working edge is a firm, hard, sharp edge that cuts cleanly without a sign of rubbing or scratching. Emery and corundum should not be considered as being in the same class of abrasives. This difference in the texture or mechanical character of the individual particle also had much to do with the hindering of the progress of corundum in its early days. The success of an abrasive wheel or an abrasive paper depends as much on the bond as on the abrasive. Emery, on account of its rough, almost porous, surface, is easily held by any bond or glue; corundum, on the other hand, on account of its smooth, dense surface, is much more difficult to hold, and as it takes a much harder bite on the metal it needs much more careful holding. The result was that many of the early products were most unsatisfactory because of the rapidity with which the corundum was pulled away from its bond. The excellent work done by some of the wheel manufacturers of the States have completely overcome this difficulty in the manufactured wheel, but in the polishing trade, where the individual factory or probably the individual workmen attaches the abrasive with ordinary glue to a soft wheel, this particular trouble has often condemned the use of corundum in favor of emery.

The main efforts at Craigmont to-day are directed towards increasing the capacity of the mill, the elimination of hornblende and garnet from the products supplied to the vitrified wheel makers, and the collecting of a nucleus of steady contented workmen trained to the special character of the work. Good progress is being made in each case. Beyond the elimination of the hornblende, no effort is being made to increase the purity of the output. The standards which have been adopted,

and which are adhered to very closely, are accepted as being perfectly satisfactory by the most exacting wheel makers on the continent, and the reputation for uniformity of quality and steadiness of supply has been fully established. More than 300 men are now employed on the works.

THE PROFESSIONAL IDEALS OF THE TWENTIETH CENTURY

A PLEA FOR THE HIGHER CONCEPTION OF THE ENGINEER'S RELATION TO SOCIETY.

(Arthur Twining Hadley—Dedication of the United Engineering Societies' Building.

The great element of progress in the nineteenth century has been the recognition on the part of mankind in general, of the value of scientific generalizations in every department of human conduct. Our science has become sounder, our understanding of its applications clearer, and the public has recognized that scientific conduct of a business means the substitution of universal experience, learned with difficulty and applied with toil, for the narrower range of individual experience which was at the disposal of the so-called practical men of fifty or one hundred years ago. Of this change the engineer is the representative and the leader. He it is that makes physical science in its various lines applicable to the complex problems of construction and development. He it is who has paved the way for the recognition of the technologist and the expert in every line of human industry. He it is who has shown how mathematics, instead of being an abstract discipline, remote from everyday human affairs, may become the means of applying truths for a long time remote and undiscovered, to the everyday affairs of the world in which we live. Not the buildings that you have built; not the railroads that you have planned; not the machines that you have invented, represent your greatest achievement. Yours is the proud boast of having in one brief century established science as the arbiter of the material affairs of mankind, and of having enforced her worship upon a world once reluctant but now gloriously admiring.

Well, then, you will ask: is there anything which remains to be done comparable in importance to this? Yes, there is. An equally large part—perhaps in one sense a much larger part—of your professional duty yet remains to be accomplished. It is not enough to have technical training. It is not enough to know the special sciences on which the practice of a profession is based. A man ought to have clear conceptions of the public service which his profession can render, and the public duty which its members owe. Thus, and thus only, can the engineer, the lawyer, the physician, or a member of any other learned profession, rise to the full dignity of his calling.

For there are two quite distinct qualities which must be combined in order to secure the best professional services; two quite distinct tests which work must meet in order to be pronounced first-class. One of these is the technical standard; the other, for want of better word, may be called the ethical standard. The man who wishes to build a good railroad must not only lay it out according to the rules of the surveyor's art, with proper curves and grades, and bridges which will not fall, but he must also have intelligent regard to the needs of the population, the safety of travel, and the many other factors which determine whether a railroad shall be a