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THE DEDICATION OF THE ENGINEERING BUILDING OF THE UNIVERSITY OF PENNSYLVANIA.

A COMPARISON OF UNIVERSITY AND INDUSTRIAL DISCIPLINE AND METHODS.

THE point from which I view college education is that of the employer, not that of the educator. I have had no experience with the difficult and complicated problem that faces the professors and the governing boards of our colleges. On the other hand, I have been engaged for years in organizing the shop, office and commercial management of quite a wide range of engineering and manufacturing establishments. This has brought me into intimate personal contact with a large number of college graduates, and I have become well acquainted with their strong points, which are many, and at the same time with a few of those points in which it would seem that as a class they might be improved. And in what I shall say I have principally in mind the preparation of young men for success in commercial engineering and industrial enterprises; in other words, enterprises outside of the four learned professions.

I despise the pessimist who sees nothing but the defects and blunders of mankind, and the scold, whose pleasure it is to complain of all things as they are.

Let me say at the start, that without question our college graduates as a class represent the finest body of men in the community. And as to the value of an engineering course for men in our profession, our fellow-townsmen, Mr. Jas. M.

Dodge, in his admirable paper on 'The Commercial Value of an Education,' has shown through carefully gathered statistics, that within a few years after graduation the college educated engineer far outstrips in position and salary his average competitor who comes up from the ranks.

It would be a much more congenial task to dwell upon this view of the profession, but something may possibly be gained by considering what has seemed to many of the friends of our young graduates to be the one defect which they practically all have in common.

For a period of from six months to two years after graduating they are, generally speaking, discontented and unhappy. They are apt to look upon their employers as unappreciative, unjust and tyrannical, and it is frequently only after changing employers once or twice and finding the same lack of appreciation in all of them that they finally start upon their real careers of usefulness.

On the other hand, the attitude of employers towards young graduates is fairly expressed by the following written instructions given for the selection of quite a large number of young men to fill positions which presented opportunities for rapid development and advancement. These instructions were to give the preference—first, to graduates of technical schools; second, to the graduates of the academic departments; but to employ no college boy who had not been out for more than two years.

Why is it, then, that these young men are discontented and of practically little use during the first year or two after graduating?

To a certain extent this is unquestionably due to the sudden and radical change from years spent as boys almost solely in absorbing and assimilating knowledge for their own benefit to their new occupation of

giving out and using what they have for the benefit of others. To a degree it is the sponge objecting to the pressure of the hand which uses it. To a greater degree, however, I believe this trouble to be due to the lack of discipline and to the lack of direct, earnest and logical purpose which accompanies, to a large extent, modern university life.

During the four years that these young men are at college they are under less discipline, and are given a greater liberty than they have ever had before or will ever have again.

As to college discipline, it can not be a good training for after life for a young man deliberately to be told by the university authorities that he can flagrantly neglect his duties sixty times in one term before any attention will be paid to it; while, if in business, the same young man would be discharged for being absent two or three times without permission.

And, as to the freedom offered by the modern university system, it is not true that boys from eighteen to twenty years old have the knowledge and experience necessary to select a logical and well-rounded course of studies, and even if they had this wisdom, the temptation to choose those studies which come easiest is so strong that it would be unwise to throw upon them so great a responsibility. Nor does it appear wise to leave each student free to study as little or as much as may suit him, at times doing practically no work for days, and at others greatly overworking, with no restraint or direction except the round-up which comes twice a year with examinations. At the least, it must be said that in commercial or industrial life this undirected liberty will never again be allowed them.

During the past thirty years two radical changes have occurred in educational meth-

ods. The kindergarten and its accompanying ideas have come for the children, and for the young men has come the change from the college, with its one or two courses carefully selected and rigidly prescribed by the faculty, to the university with as many different courses as there are young men, and in which, under the elective system, each student is given the choice of all of his studies.

The fundamental idea back of the change from college to university is excellent; namely, that of providing a far greater variety in the courses to suit the different tastes and abilities of the students, and to especially prepare them for their future occupations. Accompanying, however, this great step in advance, and yet, so far as I can see, in no way logically connected with it, has come the false step of giving our young men in many ways a greater liberty than is allowed, on the whole, to any other class of active workers; and of handing over to them the final decision in a subject most needing a master mind.

Commercial, manufacturing and other enterprises in which many men cooperate, are managed more and more by delegating all important decisions to a few men whose judgment has been trained through long experience, study and observation in those matters which they are called upon to decide. Yet many of our universities are managed by giving over to the young man, under the elective system, the final decision as to what studies will best fit him for his life's work, although he has, of necessity, but the vaguest idea of the nature of the subjects which lie before him. It is almost like asking him to lift himself up by his boot straps.

I can not but think that in changing country we have modeled largely after the English and German universities, which, as we know, are influenced in their management by traditions handed down through

several hundred years; and that in adopting the great university idea of a variety of courses, we have at the same time blindly accepted the foreign idea of the elective system accompanied by a lax discipline, both of which are better suited to medieval times when each man worked for himself than to the present day when the road to success lies through true cooperation.

In this change, also, too great stress has been laid upon those elements leading to knowledge or book learning on the part of the student and too little upon the development of his character.

The kindergarten also, which has proved so great a help in training the younger children, making them observant and giving them a certain control over themselves, has brought with it one idea which has wrought great harm, and yet this bad idea is in no way properly or logically connected with the underlying principles of the kindergarten.

Somehow the average kindergarten child gets a firm conviction that it is the duty of the teacher to make things interesting and amusing, and from this follows soon the notion that if he does not like his studies and fails to learn much, it is largely the teacher's fault. Now, whatever views the parents or the teachers themselves should hold upon the duties of teachers, there is no doubt that the boys should have firmly in their heads the good old-fashioned idea that it is their duty to learn, and not that it is the duty of the teacher to teach them.

Along with the kindergarten plan of interesting and amusing children, the idea has taken firm hold in a large portion of the educational world that the child and young man should be free to develop naturally, like a beautiful plant or flower. This may again be an excellent view for the older person to hold, but it is a distinctly bad one for the young man to act

upon. He promptly translates the idea of developing naturally into wishing to do only, or mainly, those things which he likes or which come easy to him.

Of all the habits and principles which make for success in a young man, the most useful is the *determination to do and to do right all of those things which come his way each day, whether they are agreeable or disagreeable*; and the ability to do this is best acquired through long practise in doggedly doing along with that which is agreeable a lot of things which are tiresome and monotonous, and which one does not like.

Now neither the kindergarten idea, the university elective system, nor the lax college discipline tend to develop this all important habit in young men.

True cooperation, cooperation upon the broadest scale, is that feature which distinguishes our present commercial and industrial development from that of one hundred years ago. Not the cooperation taught by too many among those of our trades unions which are misguided, and which resembles the cooperation of a train of freight cars; but rather that of a well-organized manufacturing establishment, which is typified by the cooperation of the various parts of a watch, each member of which performs and is supreme in its own function, and yet is controlled by and must work harmoniously with many other members.

It is a mistaken notion that character of this kind needed for successful cooperation is developed by the elective idea of allowing each boy to choose for himself those things which he will do. It requires far more character to do successfully those things which are laid out for one by a wiser man than to do only what one likes, and in modern cooperation, while the work of each man is modified and more or less controlled by that of others, there is ample scope left

for originality and individuality. We must remember that of all classes in the community, college boys are being trained to fill some day the position of leaders in the cooperative field. And there is no fact better established than that the man who has not learned promptly and fully to obey an order is not fit to give one.

An examination of the studies chosen by boys in the university academic departments will show that the logic and motive back of about one half of the students is that of obtaining an easy course, and even the better students show generally a lack of clear-cut logical purpose in their selection. In their case, the studies are chosen because the young man likes or is interested in the subjects, or because they come easy to him, rather than because they give a well-rounded and balanced course with a distinct logical purpose. The loose, flabby, purposeless courses chosen by fully one half of the students under the present system furnish but poor mental diet.

Why can not all of the good features of the elective system be better attained by permitting each young man to choose in general the object or purpose for which he wishes to educate himself, and then leaving the entire course of studies to the one or more professors in the faculty who are especially fitted to plan a complete and logical course in the chosen field? Let the young man say where he wishes to go, and let the faculty tell him the road he is to travel to get there.

As to the object of college life, some boys are sent to the university to learn how to mingle with men, and to form friendships which shall prove useful and agreeable in after life. Some go there to amuse themselves, and some to get the standing given by a college degree.

Something can be said for each of these objects. Is not the true object of all education, however, that of training boys to be

successful men? I mean men successful in the broadest sense, not merely successful money getters. Successful, first in developing their own characters, and second, in doing their full share of the world's work.

Young men should not come to college mainly to get book learning or a wide knowledge of facts. The successful men of our acquaintance are, generally speaking, neither learned nor men of great intellect. They are men, first of all possessed with an earnest purpose. They have a certain all-round poise or balance called common sense. They have acquired through long training those habits, both mental and physical, which make them masters over themselves; and at all times they have the firm determination to pay the price for success in hard work and self-denial.

It is singleness and earnestness of purpose that constitutes the great motive power back of most successful men, and it is a notable fact that the moment a young man becomes animated with such a purpose, that moment he ceases to believe in the elective system, and in the loose college discipline.

In all earnest enterprises which the students themselves manage, they throw the elective system to the winds and adopt methods and a discipline quite as rigid as those prevailing in the commercial and industrial world.

The boy who joins the foot-ball squad is given no sixty cuts a season, nor is he allowed to choose what he will do. He does just what some one else tells him to do, and does it at the time and in the manner he is told, and one or two lapses from training rules are sufficient cause for expulsion from the team or the crew.

I say in all seriousness that were it not for a certain trickiness and a low professional spirit which has come to be a part of the game, I should look upon foot-ball and the training received in athletics as

one of the most useful elements in a college course, for two reasons: First, because in it they are actuated by a truly serious purpose; and second, because they are there given, not the elective idea of doing what they want to, but cooperation, and cooperation of the same general character which they will be called upon to practise in after life.

Is not the greatest problem in university life, then, how to animate the students with an earnest, logical purpose?

In facing this question I would call attention to one class of young men who are almost universally imbued with such a purpose; namely, those who, through necessity or otherwise, have come into close contact and direct competition with men working for a living. These young men acquire a truly earnest purpose. They see the reality of life, they have a strong foretaste of the struggle ahead of them, and they come to the university with a determination to get something practical from the college training which they can use later in their competition with men.

They are in great demand after graduating, and as a class make themselves useful almost from the day that they start in to work.

Neither their earnestness of purpose, however, nor their immediate usefulness, comes from any technical knowledge which they have acquired while working outside of the university, but rather from having early brought home to them the nature of the great problem they must face after graduating. Nothing but contact with work and actual competition with men struggling for a living will teach them this. It can not be theorized over or lectured upon, or taught in the school-workshop or laboratory.

I look upon this actual work and competition with men working for a living as of such great value in developing earnest-

ness of purpose that it would seem to me time well spent for each student, say, at the end of the freshman year, to be handed over by the university for a period of six months to some commercial, engineering or manufacturing establishment; there to work as an employee at whatever job is given him, either manual or other work. He should have the same hours and be under the same discipline as all other employees, and should receive no favors. Moreover, he should be obliged to stay even a longer time than six months unless he has in the meantime given satisfaction to his employers.

I believe that there would be but little difficulty in obtaining the cooperation of our business and manufacturing establishments in carrying out this plan, and the University of Pennsylvania, situated as it is in the foremost manufacturing city in this country, would have an especially good opportunity to inaugurate it.

My belief in the benefits to be derived from doing practical every-day work early in the college course is not the result of a theory. It is founded upon close observation and study of young men who have had this experience, and also upon a vivid remembrance of breakfasting each morning at five-thirty, and starting to sweep the floor of a pattern shop as an apprentice some thirty-two years ago, after having spent several years in preparing for Harvard College. The contrast between the two occupations was great, but I look back upon the first six months of my apprenticeship as a patternmaker as, on the whole, the most valuable part of my education. Not that I gained much knowledge during that time, nor did I ever become a very good patternmaker; but the awakening as to the reality and seriousness of life was complete, and, I believe, of great value.

Unfortunately, laboratory or even shop work in the university, useful as they are,

do not serve at all the same purpose, since the young man is surrounded there by other students and professors, and lacks the actual competition of men working for a living. He does not learn at college that, on the whole, the ordinary mechanics, and even poorly educated workmen, are naturally about as smart as he is, and that his best way to rise above them lies in getting his mind more thoroughly trained than theirs, and in learning things they do not know. All of this should be taught him through six months' contact with working-men.

Let me repeat in conclusion that our college graduates are the best picked body of men in the community. Yet I believe that it is possible to so train young men that they will be useful to their employers almost from the day that they leave college; so that they will be reasonably satisfied with their new work instead of discontented; and to place them upon graduating one or two years nearer success than they now are; and that this can best be accomplished by giving them an earnest purpose through six months' contact early in their college life with men working for a living; by rigidly prescribing a course of studies carefully and logically selected, and with some definite object in view, and by subjecting them to a discipline comparable with that adopted by the rest of the world.

Philadelphia possesses and is proud of the most notable group of medical schools in this country, and among these that of the University of Pennsylvania unquestionably stands first.

The Philadelphia lawyer has been proverbial for his knowledge and shrewdness for more than a century, and this reputation can be traced largely to the fundamental training given in the law school of the University of Pennsylvania.

Philadelphia is the center of the largest and most diversified group of engineering

and manufacturing enterprises in this country. The Engineering-Schools of the University of Pennsylvania already stand high; but it seems to me that the opportunity lies open to them even more than to their famous medical and law schools to stand at the very top. This magnificent building, equipped as it is with the latest and best of everything, is the first and a great step towards this end. But, after all, your largest possibility and one which does not exist for, and can not be created by, any other American university, lies in the opportunity for bringing your students into close touch and personal contact with the men who are working in and managing the great industrial establishments of Philadelphia.

FREDERICK W. TAYLOR.

THE ENGINEER AS A CITIZEN.

I CONSIDER it no small honor to be included as one of the participants in to-day's program. But though I come on the invitation of those in authority, I hesitate to appear before this audience, gathered in sympathy with so notable a step in the development of one of the greatest of America's universities, a university presided over by a man eminent as an educator, an administrator, and a man of affairs, to express my opinions on questions of engineering education and citizenship and their correlation.

In spite of apprehensions as to my insufficiency for the duty I have accepted, I shall make no apology, but fall back upon the fact that, having been called to serve the university to which as an adopted son I proudly owe allegiance, it remained for me but to obey. I can only promise you that I shall not vaguely theorize, but I shall speak from my personal experiences in the fields of business, engineering and education.

In coming before you as the president of

Stevens Institute of Technology, I come as the successor of your own Henry Morton, a graduate of, and later a professor in, your university, secretary of the Franklin Institute, professor in the Philadelphia Dental College, brilliant lecturer, profound scientist, man of affairs, but above all a simple-minded seeker after the truth, too modest to recognize his own great qualities of mind, qualities combining the grasp of genius with the sanity of common sense.

It is peculiarly appropriate that the University of Pennsylvania should develop a thoroughly efficient department of engineering education in view of the important scientific work done by the many-sided Franklin, upon whose suggestion the original Philadelphia Academy was organized.

In view of what I have in mind to say to-day, I am particularly struck by the following words which appear in the original charter granted to the academy in 1753 by Thomas and Richard Penn:

The well-being of a society depends on the education of their youth, as well as, in great measure, the eternal welfare of every individual, by impressing on their tender minds principles of morality and religion, instructing them in the several duties they owe to the society in which they live, and one towards another, giving them the knowledge of languages, and other parts of useful learning necessary thereto, *in order to render them serviceable in the several public stations to which they may be called.*

It is interesting to note that the charter of 1755, creating the college, enlarged the scope of work to include 'Not only the learned languages, but the liberal arts and sciences.'

Since Franklin's day, tremendous strides have been made in the sciences and especially of late years in that branch in which he did pioneer work—electricity.

It is to the credit of this university that it has recognized its responsibility in connection with this advance, and has quietly progressed in the line of engineering edu-