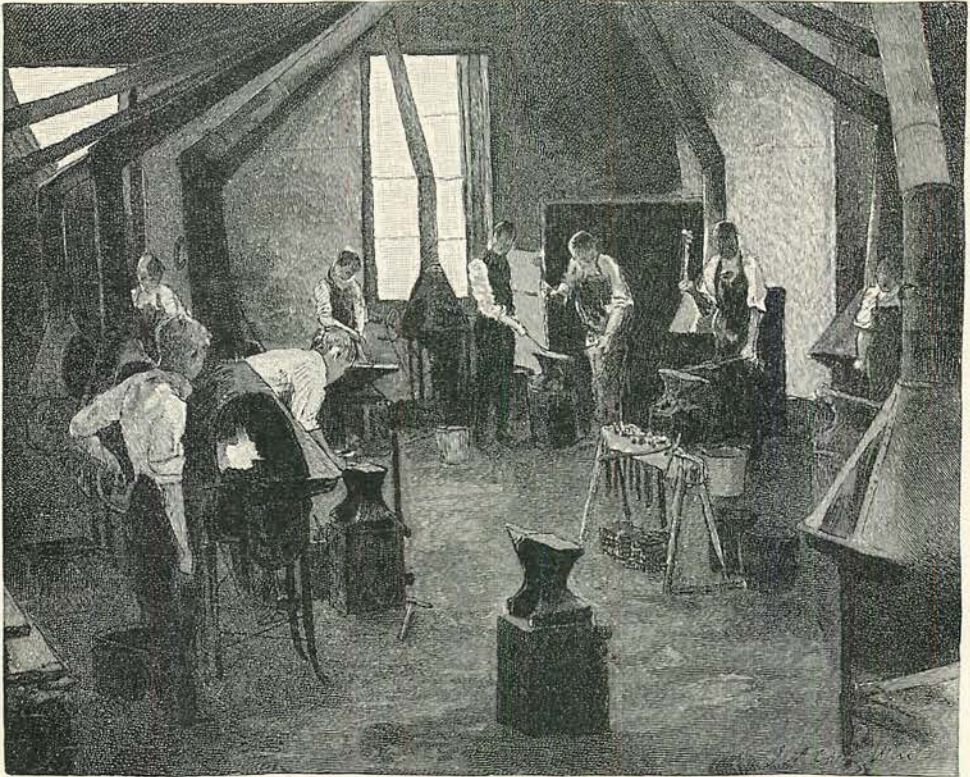


MANUAL TRAINING AS A FACTOR IN MODERN EDUCATION.

WITH ILLUSTRATIONS FROM THE PHILADELPHIA MANUAL-TRAINING SCHOOL.



IN THE SMITHY DEPARTMENT.

IN modern education the factors may be grouped as industrial, political, social, and moral, each of which is essential to the realization of an harmonious ethical training. An education which discovers the duties men owe to themselves and to society, growing out of their natural or acquired capacities and their position and prospects in life, which trains men to fulfill the ends and aims of their existence, or to know their rights and to perform their duties, is an harmonious ethical training. The results in manual-training schools have been somewhat loosely attributed to the industrial factor alone instead of attributing them to the harmonious cooperation of all the ethical elements involved. The ethics of the modern manual-training school may be expressed in Macaulay's epitome of the philosophy of Bacon — utility and progress.

Education is acquisition and training. The type in modern society which largely determines our civilization is the industrial man; education in the United States must be considered, primarily, in relation to the needs of the masses, and the masses are of the industrial type. Less than three per centum of the boys of this country can hope to make a living by the practice of the professions; the mass of American boys must succeed, if they succeed at all, in industrial occupations. A servile adherence to traditional class interests has forced all minds along a narrow public-school course, and by the exclusion of the industrial factor has kept the curriculum a fragment and has maintained a discrimination against the essential group of industrial rights, duties, and interests into which all men are born. More important than that which may be learned at school is the discipline which comes with the

acquisition and the training. To omit industrial discipline in education is to wage war against common sense. The manual-training school is the modern means of acquiring a knowledge of things and of men; its training is a discipline that may be described as having ethical proportions. The new movement is an embodied expostulation against the fatal narrowness of our schools, and there is reason to believe that by the harmonious ethical training realized in manual-training schools some evils now crowding upon society in this country will be remedied.

To the objections that the curriculum of the public schools is already crowded; that the introduction of the industrial factor will only add to present confusion; that the industrial training is technical training, and that the schools of the country are wholly unprepared in faculty or in equipment to add the industrial factor, the reply is the experience of the present manual-training schools: the results reveal that the new education differs from the old chiefly in the administration of educational powers. The time given to manual training might be given to training in language, or mathematics, or philosophy; the question of which training is one of values. Manual training does not mean no training in language, in mathematics, or in philosophy. Given the present condition of society, the capacities of boys and girls and their respective positions and prospects in life, the question is: Shall their education consist of acquisition and training in language, in mathematics, and in philosophy only, or in a sufficient amount of these three, and in industrial training? The question becomes a practical problem in economic administration of educational forces. In academies and in high schools the tendency is to imitate the college. The true function of the academy and of the high school is to help boys and girls prepare for life; too often these schools expend their energies in merely preparing students for college. The manual-training school has for its function the fitting of the young for careers in life appropriate to their characters, their position, and their prospects: it fits boys for college, but first, by its harmonious training, it teaches them to think and fits them for making an honorable living in the world. It is a world school.

Shall a boy know less of Latin, less of Greek, less of French, less of German, less of conic sections or quaternions, less of psychology, and in place thereof know the principles of industrial occupations, the use of tools, the construction of typical forms in the applied arts, and possess both the trained mind and the skilled hand? For the mass of American boys which training is best worth having? Provided that the course in the manual-training

school is, to use a current phrase, "sufficiently literary," could not every school introduce the industrial factor into its curriculum, and by harmoniously administering educational powers already possessed, with absolute certainty increase and intensify the benefits accruing to society from educational work?

A manual-training school is composed of several departments in co-relation: science, mathematics, literature, history, economics, engineering, drawing, and manual work. The harmony of the new education is the harmony of instruction and of construction, which may thus be outlined:

Instruction in mathematics, science, drawing	}	Construction in materials, as wood, metal, etc. Laboratory work; graphic presentations in botany, electricity, chemistry, physics, physiology, etc.; collections and investigations.
Literature, history, and economics, drawing ..	}	Graphic presentations of historic events; social science; language; biography; economics.
Engineering, drawing ..	}	Electrical and mechanical laboratories; models; working machines; designs; ornamentation.
Manual work, drawing,	}	Typical forms in wood and metal; clay modeling; casting; smithing; forging; tool constructions.
Morals	}	Conduct, daily association; industrial relations; social duties; record of personal qualities and powers; self-knowledge.

Experience in Philadelphia proves that drawing, mathematics, and language underlie all other departments.¹ Drawing is as important in the school as are tools in the arts. It in-

¹ *Course of Study, Philadelphia Manual-Training School.*

FIRST YEAR.	
<i>Studies.</i>	<i>Hours per week through year.</i>
Algebra	3
Botany	2
Carpentry and Joinery	5
Drawing, free-hand and mechanical	4

volves the knowledge of things and is the graphic language of facts, forms, and objects. It is a means to an expression of the beautiful and to its conception in science, in literature, and in economics. As the ends of the school are not solely industrial, drawing becomes the means for a graphic presentation of political, industrial, and moral conditions of society. The construction of mechanical units is, educationally, only a method of discipline, and drawing becomes the medium for a logical process. In a working drawing are embodied the facts of form, the appearance of an object to the eye, and the ornamentation incorporating elements of design, beauty, and utility. The results in drawing are: the ability to make out and to interpret working drawings, *e. g.*, machine or house drawings; to produce from drawings the indicated forms in plastic material; the understanding of the phraseology of artistic constructions; and the power to elaborate a proposition. The elaborative faculty has constant use in the school in the construction of machine drawings, tracings, blue-prints, sketches, specifications, drawings to scale, and in the applications of drawing in the work of the various departments. In architectural drawing details from private and from public buildings, plans, elevations, constructions, and graphic problems, such as the combination of use and ornament in a construction, sufficiently test the practical value of the training. In free-hand the boy is fitted to delineate rapidly and accurately the apparent form of objects, models,

tools, applications of typical forms in daily life, and to understand the use of light and shade, both natural and artificial. He learns also the properties and the elementary use of colors. He can distinguish between good and bad design, recognize the historical styles of ornament, and analyze or conventionalize plant forms in artistic applications.

Were the applications of drawing and of the principles of art to go no further, the training in the school would differ but slightly from that given in schools of art. Drawing has not been in American schools long, and the greater part of it has been mere school copy work leading to no practical applications. The manual-training school applies drawing in every department. Exercises in wood, metal, smithing, or molding are first drawn to scale, to which the rough material must be reduced according to the blue-print specifications. The first lesson in the metal shop requires the reduction of a block of cast iron, rough from the foundry, to the proportions $4'' \times 2'' \times 1''$. The groove is cut across the rough face with a cope chisel; the whole surface is chipped off with a flat chisel and filed perfectly smooth. Each face is tested mechanically and is reduced to mathematical proportions, according to the blue-print. Successive lessons increase in difficulty as typical forms are composed, and the completion of the last lesson is the embodiment of all preceding lessons. At the completion of the course in the metal shop alone boys are fitted to enter establishments

<i>Studies.</i>	<i>Hours per week through year.</i>
English Language, Rhetoric, with classic authors . . .	3
Geology	2
Geometry	2
Metal work (chipping, filing, fitting)	5
Physiology	1

SECOND YEAR.

American History	2
Social and Industrial Drawing, mechanical and free-hand	4
English Literature, classic authors	3
Geometry	3
German	2
Metal work, smithing (iron, tin, brazing, molding, casting)	5
Mechanics	1
Physics	3
Pattern-making, turning	5

THIRD YEAR.

General History	3
American History, civil and political	2
Chemistry	3
Clay-modeling	1
Drawing, machine, architectural, designing	2
Engineering, electrical and mechanical	3
English Literature	3
German	2
Political Economy	2
Trigonometry	2

<i>Studies.</i>	<i>Hours per week through year.</i>
Wood-carving	2
Mechanical Constructions	6

THIRD YEAR: Individual work (constructions) in chemical laboratory, electricity, wood-working, ethical studies, depending upon the character of the student.

FOURTH YEAR: Individual work with special professors preparatory for further studies or for practical work.

Distribution of Subjects.

	<i>Years.</i>	<i>Hours.</i>
Mathematics, 400 hours	1	200
	2	120
	3	80
Science, 600 hours	1	200
	2	160
	3	240
Language, History, Economics, 880 hours	1	120
	2	280
	3	480
Drawing, 400 hours	1	160
	2	160
	3	80
Manual works, applications, and constructions, 1160 hours	1	400
	2	400
	3	360
Total		3440

In the fourth year, special work in various departments; hours, voluntary.

employing skilled workmen and earn fair wages. In a few instances, such boys have been able to earn wages enough to support themselves.

In the process of transforming rough material into typical forms possessing artistic proportions a boy applies mechanical principles, produces material changes visible to himself and capable of undoubted tests; he acquires the discipline shown in muscular accuracy, perfection of sight and of judgment in the exercise involved. Industrial discipline forms habits of inestimable worth. The finished manual lesson, the construction of a typical form in metal, is an unprejudiced record of the industrial boy. In wood-working, or in forging, the same methods obtain as in the metal shop—the drawing, the instruction, the use of raw material, the reduction to required form. The boy proceeds by various exercises, graded in difficulty, in sawing, planing, squaring, chiseling, mortising, mitring, dove-tailing, and in combinations of these, and learns, during his course, the design, the structure, the use, and the care of tools.

Parallel with the work in wood and in cold metal is a course in the manipulation of hot iron. The boy learns the economy of heat and of material. He draws the design, bends, splits, upsets, punches, shapes, and tempers the iron in the construction of rings, squares, hooks, tongs, and machine tools, each of which is a typical lesson in the art of smithing. The necessity for quick work in forging and the impossibility of testing the accuracy of the strokes while the iron is hot compel a mental concentration peculiarly valuable in any system of education. The smithery is as popular with the boys as any department of the school. All courses in drawing, metal-working, wood-working, forging, tin-smithing, pattern-making, molding, and casting, together with the acquisition and the training from the other departments of the school, prepare for the culmination of the industrial training in a construction. By a construction is meant the making of a mechanical unit, such as a steam-engine, an electric dynamo, a bridge, a turn-table, or some other unit involving the composition of forces and of principles with which the previous training has made the boy familiar. These constructions are models in wood or metal, or in both, and are accompanied by complete drawings.¹

Were the instruction in the school to end

¹ The training provided in the school may be outlined as follows: Drawing, free-hand, mechanical, architectural, design; wood-working, pattern-making, carving, turning, joinery; metal-working, chipping, filing, fitting; smithing, iron, tin, brazing, molding, casting; mechanical constructions in wood, metal; electrical and mechanical engineering, motor powers,

here it might, perhaps, be called a trade-school. The training thus far outlined has been in mechanical principles and their applications, but the course has ethical proportions and it does not merely fit a boy for a special trade. Exercises in manual work alternate with exercises in other departments. The industrial factor in education is but one element in the recognition and the interpretation of types in the world of worths and of forms. Mechanical units can be classified, and the just administration of educational affairs provides for the training, the industrial discipline which comes by the construction of a mechanical unit after an adequate study, in a practical way, of mechanical principles. But the construction takes a far higher significance when it is made by a boy equally well trained in language, in mathematics, and in philosophy.

The more complex the construction the greater familiarity with ethical principles is demanded. All the factors in education are inseparably involved in the manual-training school. The new movement is endangered if manual work alone be made the essential characteristic of the school. Then the school becomes a shop, and the ethical completeness of the education promised by the school is lost. It is difficult to make plain the harmony of mental and manual work realized in the school to those to whom the proposition is new, or who have not examined the school personally. As far as possible, each department of the school is a laboratory. In manual work, in drawing, in chemistry and physics, and in engineering, laboratory methods have been long in use. But in conjunction with the methods of the German "seminar," manual skill has worked a revolution in the study of literature, history, and economics. It is on the so-called "literary side" that manual training displays the power of the new education. Mechanical skill acquired by industrial training in free-hand, machine, and architectural drawing; in tool constructions; in working accurately to specifications; in the composition of constructions; in the power which the boy gains to apply his various acquisitions and training to the solution of a given proposition, is a new factor in ethical training for which there is no substitute and which cannot be eliminated from modern education without defeating the primary purposes of education itself. The new education liberates hand power as brain power and the boy is enabled to express his compre-

illumination; modeling and carving; mathematics, arithmetic, geometry, trigonometry, algebra; physics, the study of matter; economic botany; chemistry; physiology and hygiene; the English language and literature (German, French, or Latin); history, general and (specially) American; social science, government, political economy; morals.

hension of men and of things not only in the traditional manner known to schools, but by a graphic language of sketch, of chart, of diagram, and of illustration which remove the last doubt of his mental obscurity. Practical school men appreciate the worth of a trusty measure of a boy's understanding. If he can give the traditional tests of recitation, examination, and thesis, and, in addition, give a graphic presentation of his own understanding of the problem under investigation, he has attained a condition long sought in the schools and he possesses powers of recognized value among men. The manual-training school teaches a boy to think and trains him how to do; it enables him to understand his own powers.

As the school is unfettered by traditions it may incorporate all known best educational methods, and in so far as the incorporation is reasonable, the results will be the same as those already realized wherever those methods obtain. But the peculiar feature of the school — the harmonious coöperation of all the factors present — is an educational discovery. Especially has skill of hand supplemented the understanding in the study of history, economics, and literature. Such subjects as rent, taxation, public debts, banking, labor, have, by graphic presentation by the boy, become intelligible to him. Had he pursued these, or kindred topics, in an ordinary high school, he would have probably satisfied conditions by memorizing the pages of a book. By graphic illustration¹ the life and growth of language, the position of literary men, the tendency of historic periods, the co-relation of historic epochs, the distribution of social conditions, the economic status of nations or of communities, the movements of population, and the political condition of men under differing forms of government, are raised from the dead surface of mere verbal description into comparative reality. Graphic methods are not unknown in our best schools, but industrial training alone can impart the manual skill, the mathematical accuracy, and the mental grasp to understand and to elaborate the visible proofs that the boy understands the subject before him so thoroughly as to be able to construct, as it were, a photograph of the impression it has made upon his mind. Not from manual training alone can this power come; the boy must be trained ethically; the whole boy must be put to school.

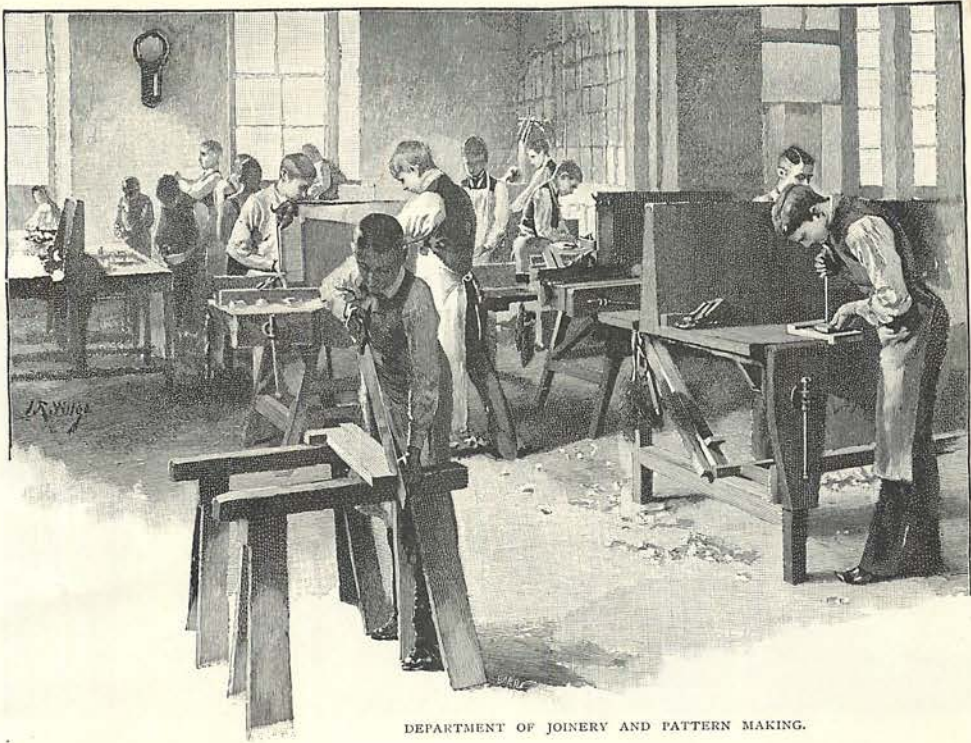
As the school is an embodiment of the educational tendencies of the present, in addition to other departments which train boys for modern society a department of electrical

engineering was organized. Electrical science has become the world's property, and it was thought wise to provide a practical knowledge of a force which, as a motor and as a means for illumination, has become essential to the comfort of man. The study of electricity is put side by side with the study of mechanics, of literature, and of chemistry.

American boys usually leave school before they are fourteen years old. Our public schools, in the higher grades, are chiefly attended by girls. Boys find the utilities lacking in the schools, and they are tempted to leave them as soon as they are able to understand the dominant conditions in society. Less than twenty per cent. of American boys enter high schools and less than half of those who enter complete the course. Those who never enter the high school, or who leave before the completion of the course, outnumber those who graduate more than twenty-fold. The wholesome interest taken by boys in industrial training suggests a remedy for many of the evils which have so long prevailed in the higher public schools. Experience in St. Louis, in Chicago, and in Philadelphia leads to the reasonable belief that by the incorporation of manual training in public schools boys will remain longer in school, and at that critical time, from the fourteenth to the eighteenth year, when the character of subsequent life is so largely determined. Experience at Philadelphia further shows the beneficial effects of the new education in the general condition of school interests. In the manual-training school a boy's growth is wholesome because harmonious. He acquires strength of body and of mind. The healthfulness of manual training is of itself a sufficient reason for its introduction into our schools. Subject to the discipline of a harmonious training boys develop a moral power which carries them over the temptations which too often overcome the school-boy. The discipline of the school is that of an industrious and reasonable household. The reason for so healthful moral condition lies in the nature of the school: it touches life at every point; it deals with realities; the boy sees his world not by means of books alone, but also with the aid of daily wrestling with practical problems. By the addition of the industrial factor the chasm between the subjective and the objective world is practically bridged, and the boy finds a way into the meaning of his daily life. The building of this educational bridge is the departure in modern education; it is still in process of construction, but so near completion that many have already traveled safely across.

In the details of the purposes and methods of the new education those engaged in direct-

¹ The illustrations for this paper, taken from work done *in cursu* by boys in the Philadelphia Manual Training School, show, to some extent, the harmony of mind training and hand training.



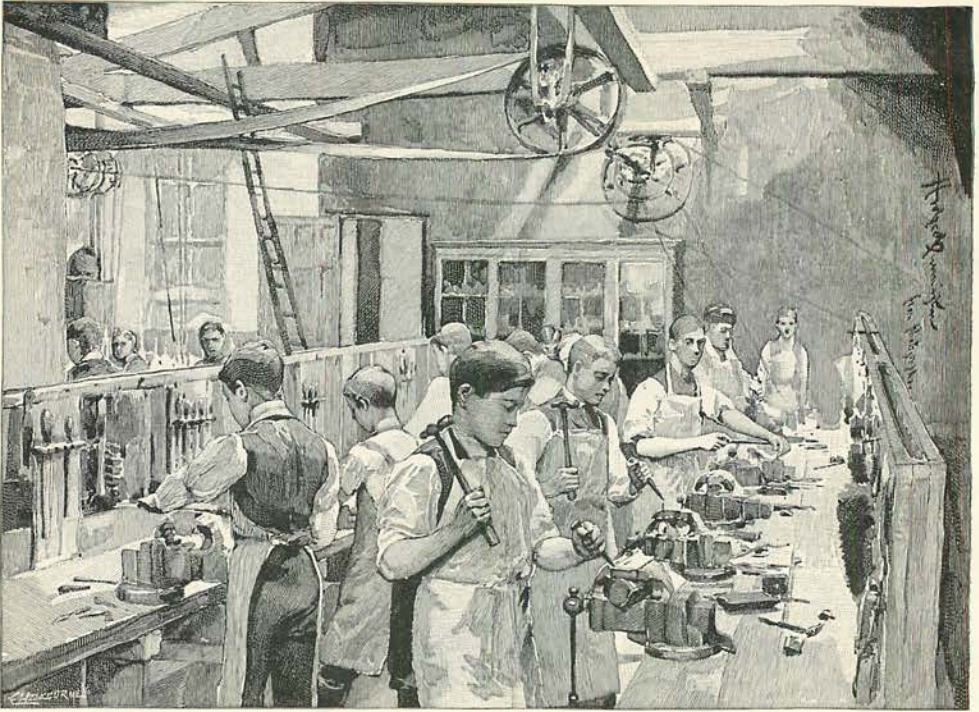
DEPARTMENT OF JOINERY AND PATTERN MAKING.

ing it are not agreed. They agree, however, that all the ethical factors, industrial, political, social, and moral, must harmoniously dominate the movement. They agree that it provides the fittest education for boys.

It is as a public-school problem that manual training has its chief interest. In organizing these schools, whether special schools of high grade as a part of the public system, as in Philadelphia, or with manual training in each grade of school, as in New York, the faculty must consist of trained specialists. The men in charge of the mechanical departments, wood-working, metal shop, forging, constructions, etc., must be men trained for the work by long experience in great industrial establishments, or possess mechanical skill of high order, acquired in special technical training. A man may be a fine mechanic, yet the school cannot use him unless he is also a real teacher. A man may be a real teacher, yet the school cannot use him unless he is also a fine mechanic. The men in charge of drawing, of mathematics, of electrical and of mechanical engineering, of literature, of history, and of economics must be practical teachers, trained at the university, or possessing an equivalent preparation. There is danger that in the haste to equip these schools the men fitted to direct them may be ignored. The success of the new movement demands as a primary condition

the coöperation of skilled mechanics, practical educators, and the ablest graduates of scientific and polytechnic schools. Unless qualified men direct these schools, they will be mere shops. In the end the requirements of the new education will be a powerful factor beneficial to the teaching profession, as that profession is more likely hereafter to attract men of the highest type of mind when the possibilities in ethical training are made possible in the schools. Not only must the school be directed by high-minded men, it must also be equipped with adequate material and laboratory facilities.

With the training of the new education boys leave school fitted to pursue occupations to which they are adapted. It is a mistake to suppose that those who have completed the courses of the school are found only in shops or factories. As a rule, boys who have been obliged to leave before completing the courses have entered industrial establishments where their already acquired skill has enabled them to earn higher wages than boys who never received such training. The graduates of the school are found in all professions and in many industries. Some are still pursuing higher courses at the universities; some are teachers; others are artisans, architects, engineers, foremen, farmers, business men, and manufacturers. Experience in after life enables them to attest the value of that discipline begun in the school.



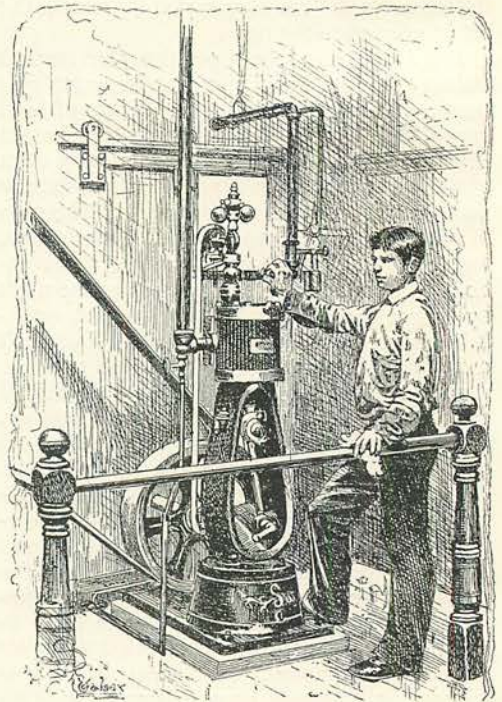
IN THE WORKSHOP.

As one happily expressed himself, "I am able to get on in life."

Popular appreciation of the school is well illustrated in Philadelphia. When the manual-training school opened, it was with doubt and hesitation that parents entered their sons. In 1887 there were 130 applicants; in 1888, 250. Of the 58 graduates in 1888, 25 were offered desirable positions before Commencement Day; 20 of whom took scholarships in the University of Pennsylvania, entered college, and before the summer had passed, the remaining boys were at work in various industrial occupations. The average age of the class of 1888 was 18 years.

Manual training is likely to increase both the cost and the efficiency of the public schools, but in a ratio immensely in favor of efficiency. A manual-training school trains boys in actual practice to become familiar with elementary notions, and to acquire a substantial knowledge of the nature of things, and of the rights and duties of men. The limits upon its provision for education can be set only by the actual wants of society as expressed in applications of all knowledge. It is a training needed both by boys and by girls, and is capable of modification suited to the wants of each. The school is a school of things, of principles, of human affairs, opened for the purpose of educating the young naturally, harmoniously, ethically, in order to fit them to enter upon their work in

the world without loss of time, without error in choice of activity, and with constant recognition of the gain both to society and to the



AT THE ENGINE.

individual: a manual-training school is, in the wisest sense, a fitting-school for life and for living. Our public schools upon a philosophic basis will quicken the life of society and aid, as they have never yet aided, in the solution of the industrial problems before the country. In conclusion it may be said that the industrial factor in modern education is a permanent factor; that its early effects are already a revelation to educators of the hitherto unknown powers of boyhood, and that the manual-training school

is the nearest approach to the world of experience into which American boys have yet come. Whether in city or in country, boys need an education that is ethical in character. Experience will correct the early errors in the new movement, and the twentieth century may be well on its way before manual training is as characteristic of an academic course as literature or mathematics now are; but the economic forces in American society will work out a harmonious system of popular education.

Francis Newton Thorpe.

THE DEMOCRATIC IDEAL IN EDUCATION.

WITH AN ILLUSTRATION FROM THE WORKINGMAN'S SCHOOL AND FREE KINDERGARTEN, NEW YORK.



EDUCATION is a means to an end; the value of means is entirely dependent on the end in view. Therefore, before discussing the relative merits of educational systems it is imperative to inquire into the nature of

the end towards which education is proposed as a means. Much of the confusion which characterizes the current controversies on educational topics is due to the neglect of this preliminary inquiry. The contending parties are like a company of travelers who dispute as to the relative advantage of different roads. In the course of the discussion it appears that they are bound for different destinations: no wonder that they could not agree as to the road.

But when we ask what ought to be the aim of education we enter into deep waters. What the Germans call "Weltanschauung," the ideal of life, the conception of the universe and man's place in it, determines the scope and direction of educational systems. The history of these systems is a running commentary on the transformations through which the ideal of life has passed in various periods of history and among various peoples. The Greek education, with the prominence it assigned to the exercises of the palestra, to dietetics, music, etc., reflects the Greek ideal of the *Kαλὸν Κἀγαθόν*. The medieval education was controlled by the transcendental ideal of the Church, which regarded the present life solely as a preparation for the next. To come at once to what is nearest, the common-school system of the United States is the outgrowth of democratic tendencies and democratic ideals. What strikes

every one on considering the American common school is its inclusiveness. The multitude pour through its portals; all citizens are alike invited to share its benefits; it is plainly the fruit of institutions based on the assumption that all men are equally entitled to life, liberty, and the pursuit of happiness.

We are concerned in this paper with the democratic ideal and the inferences to be drawn from it respecting the true aim, the matter and method, of elementary education. But at the start it is necessary to distinguish between the lower and the higher democracy. The lower democracy is materialistic. It regards political liberty chiefly as a means of securing to the individual larger opportunities of material well-being. It interprets the "pursuit of happiness" to mean barely more than the pursuit of riches. The public school on this standpoint ought to give its pupils such an education as will enable them to earn a living, also to read the newspapers and to vote with a due appreciation of their private interests on the political issues of the day. As the avenues of commerce are at present overcrowded, and as it is maintained that the public schools are fitting their pupils to become clerks and book-keepers, and have no outlet in the direction of the industries and mechanic arts, the cry has lately been raised that the schools should include some form of manual training in their curriculum. But this demand is still urged from the same materialistic point of view: it is assumed that the business of the school is to educate its pupils to earn a living. If they cannot earn their living as clerks and book-keepers, the school should offer them an industrial training, so that thus they may be