THE COLLEGE OF THE CITY OF NEW YORK—THE TECHNICAL COURSE.

The tendency of modern educators is every day more directed in the way of manual training. The first steps in children's education by the kindergarten method of Froebel, and the followers and amplifiers of his system, consist in a training of the faculties of observation and manual accomplishment. It is claimed that by this system a child need only commence to learn to read when seven or eight years of age, and that, owing to his kindergarten training, he will pass by one who may have learned reading several years earlier, but who never had a regular course of object lessons. The object system being established as a foundation for educational training, the extension of the same system to the higher courses seems only logical. A strong movement to effect this has become prominent here and in other cities during the past year. In New York the project of establishing such classes in the public schools has been successfully carried out. Considerable notice has been taken of the attempts. The work of the students has been publicly exhibited, and commented on in the papers. While this has been going on in the grammar schools, and before this period, the College of the City of New York has unobtrusively, and without attracting any notice, carried out a similar advance. Manual and technical education is firmly established there. From blacksmithing and carpentry up to chemistry and physics, the leading branches of technical training have a place in the course.

The president of the college, General Alexander H. Webb, saw from an early period the necessity in a college course of making men think for themselves. Thus, to render the lectures in ancient art and history concrete, reference could be made by the professor to the college collection of pictures and models. If the Venus Victrix or Apollo Belvedere was spoken of, a picture or cast of the statue was at hand for illustration. Athens and its Acropolis became more than names when the views of the city and its buildings were presented to the student. The courses in chemistry and physics, from the beginning of the college, were profusely illustrated by the experiments of Professor Doremus, who, in his reputation of a demonstrator, is without rival in this country. Thus the eye has always been appealed to as well as the purely intellectual faculties, and this was the beginning of the advance. Within a few years the practical lessons of the laboratory, workshop, and drawing room have been added and made a part of the course. Some views of these are given in our illustrations.

The main college building is familiar to all residents of our city. It is situated on the southeast corner of Lexington Avenue and 23d Street. South of it a new building, devoted principally to the natural history department, was erected some years ago, and more recently a building devoted to the technical work of the students was erected to the east of the main building. These new departments are the ones illustrated in this issue.

Recognizing the practical, every-day importance of the microscope, the students are instructed in its use. The substances examined by it are principally commercial products. The obvious intention is to give the students a lesson that may be of service in business life, where these products are dealt in. The same is to be said for the blowpipe class, where mineralogy and examination of ores is studied. The construction of the blowpipe from a clay pipe, a cork, and a bit of glass tube will be familiar to some, but probably new to the greater number of our readers. These branches are in the charge of Prof. William Stratford.

For the study of practical and analytical chemistry a laboratory that in many respects is superior to any in the city is provided. The ceiling is very high, and rises in a series of parallel gables running east and west and glazed upon the north slope. These act as a series of skylights, admitting the north light only, and excluding all direct sun light. The effect is the most perfect illumination for work. The room is filled with laboratory tables, each table having its own set of reagent bottles, with name and symbol blown upon the glass of each. At the end of the room is an elevated platform, with lecture table and blackboard, for the use of the professor or instructor in charge of the laboratory. Various details about the desks are worthy of notice. No separate funnel or filtering stands are used, a series of sockets being provided that hold movable supports for the funnel. For every four desks a sink and water faucets are supplied, a distinct advance upon the old system of a single sink for a whole laboratory. Qualitative analysis is taught here; quantitative analysis as yet being given to but few of the students. Balances are, however, provided, so that the laboratory is equipped for both classes of work.

Physical science, as a rule more quickly appreciated by students than chemistry, is practically studied in laboratories devoted to it. Air pumps, gas analysis apparatus, electrical apparatus, gasometers, apparatus for illustration of heat and light, are here all used and handled by the students themselves. Radiant energy is worked at by sections of four or five students at a time with Melloni's classic apparatus. Those who have attended a good course of lectures in physics may form some idea of the work when it is stated that practically the students themselves repeat all the experiments incident to such a course.

Prof. Doremus, in whose charge these two departments are, lectures on the subjects of chemistry and physics, with all the illustrations the college's collections afford. His lecture room, as not appertaining to the students' personal work, is not shown. It is provided with every imaginable appliance, including the great air pump driven by steam.

The practical division, including the laboratories, is directed by Dr. Charles A. Doremus, together with Dr. L. H. Friedburg. The work of inspiring an army of students day in and day out with the magnetism necessary for their work is a most trying one, as any educator can testify. Upon the work of the laboratories, and upon this inspiration the success of the course depends.

The instruction in drawing on the blackboard, and on paper from relief models, and from memory, is a necessary feature of the programme. Besides relief models, natural history is made to supply subjects. On the boards the structure of mollusks and other types are drawn. In this way the art may be made the exponent of a branch of natural history, and by such reference acquire a new spirit of life and reality.

What we have thus far described is the work in the natural sciences. Practical and useful though the design is, a more striking, because on its face a lower and more every day, form of manual training is next to be considered. In an extensive workshop, wood and metal working are thoroughly taught. Some of the scenes are illustrated.

The treatment of iron begins with forging. The general principles of the art are given by the instructor, with blackboard illustrations. The students then don their aprons, light up their own fires, and in groups work at the assigned tasks. A number of portable forges with hand blowers keep all the students at work. On the occasion of our visit, all the class were occupied chain making. Another day, some other piece of forging would be executed. In this way a knowledge of this most artistic work is acquired. In no art can effects more characteristic of the pure work of the hand be produced. The achievements of the old time blacksmiths in decorative forgings can stand comparison with the work of any artificers.

The blacksmith shop is next to the lathe or turning shop. Here a large number of lathes for metal turning, both speed and engine lathes, are in daily use. Having learned how to forge his material, and acquired some idea of vise work, filing, etc., the final work of turning is taught. From our illustrations, owing to limited space, only an imperfect idea of the number of lathes and completeness of the equipment can be obtained. Between the lathe shop and blacksmith shop is an electric plant for supplying electricity for the general needs of the scientific department.

Next to the metal turning lathes come the wood lathes. There are about the same number of these. The students who have gone through the carpenter shop, and have learned joinery, are ready for wood turning. All the lathes are driven by power.

Finally, the carpenter shop is shown. A number of complete benches, with full outfit of tools, give every facility for good work. In this connection the subject of sharp tools is not lost sight of. The students receive special instruction in sharpening their saws, plane irons, etc. For the lessons in saw filing, strips of brass are supplied, which the student files into teeth for practice. This economizes material, and really affords, if anything, a better substance for a criterion of the student's work. The making of the different joints, such as mortise and tenon and dovetail, with other points in carpentry, are features of this course.

Thus it will be seen that the city of New York affords to the sons of her citizens a complete technical training free of all expense. With great judgment the students are not restricted to the regular hours for work in the shops. Late in the afternoon they may be seen bending over the lathes, or carpentering, or doing some other class of work. Yet we believe we risk little in saying that we are disclosing what is to many a new fact—the existence of such an opportunity for the poorest as well as the richest of the city's future citizens. The work of the college has been done so quietly and unostentatiously that less is known of it than should be.

The Shrinkage of Flannel.

To keep flannels as much as possible from shrinking and felting, the following is to be recommended: Dissolve one ounce of potash in a bucket of water, and leave the fabric in it for twelve hours. Next warm the water, with the fabric in it, and wash without rubbing, also draw through repeatedly. Next immerse the flannel in another liquid containing one spoonful of wheat flour to one bucket of water, and wash in a similar manner. Thus treated, the flannel becomes nice and clean, **has barely shrunk, and almost not at all felted.**

Correspondence.

The Army Comparison.

To the Editor of the Scientific American:

Your item copied from the *Sun*

French army, peace footing	523,000
German army, peace footing	445,000
United States Army of pensioners	400,000

conveys a false impression, which I believe you are willing to correct. The pensioner is only *partly* supported by the government. The pay and allowances of a soldier are several times as much as the average pension. For instance, a captain's pay and allowances are about $140 a month. His pension varies from $5 to $30, according to the degree of disability.

S. N. STEWART.

Philadelphia, Pa., February 26, 1887.

Experiments in the Cultivation of Beets.

Prof. D. G. Marck, of the University of Koenigsberg, has for several years been making an interesting series of studies upon the influence exerted by orientation in the cultivation of various plants, especially beets. He finds that, according as the lines are parallel with or at right angles to a north-south direction, the yield in quantity and weight show notable differences. We shall confine ourselves to a citation of the principal results as given in the very long and detailed report published by the performer of these interesting experiments.

If we suppose the weight of a beet deprived of leaves to be 16 ounces, and that of the collar and leaves to be eight, the difference in weight of the beets sown in the north-south direction, as compared with the east-west, amounts to +2·96 per cent for the weight of the roots and —8·44 per cent for that of the leaves.

Supposing a crop of 33,000 lb. of roots and 16,500 of leaves per acre, these differences are equivalent to +1,080 lb. of roots and —1,418 lb. of leaves and collars.

As regards polarization, the north-south lines always exhibit the highest figures, the surplus fluctuating between +0·16 and 1·33, and the average being 0·48 per cent.

It may be conceded that the north-south lines yield the most saccharine beets. As regards the quotient of purity, the greatest purity was, except in one case, obtained in the north-south lines, the quotient fluctuating between —1·20 and +4·33 per cent. It may be concluded, then, that the north-south lines furnish the purest beets. If, therefore, concludes Prof. Marck, two sowings of beets are cultivated under the same conditions, with the lines oriented in contrary directions—north-south and east-west—the north-south lines will yield a crop which is superior as regards weight of roots, saccharine richness, and purity, but will furnish a less quantity of leaves.

Prof. Marck explains these differences as due to the unequal action of the solar light and heat. They are more sensible where the beets are cultivated in ridges or shelving beds than they are where the culture is in even ground. When the lines run north and south, the surface looking toward the east receives the solar rays in the morning, while the one turned toward the west receives them in the afternoon, and the absorption of heat is greater than when the direction of the lines is parallel with the east-west direction.—*La Nature.*

The Ring-shaped Atoms.

August Bernthsen and Hugo Scweitzer.—Among the most interesting results of recent chemical investigation must rank our recognition of the fact that there exist certain so-called "ring-shaped" groups of atoms, like those of benzol, naphthaline, anthracene, and pyridine, which are widely distributed, and which are formed with exceptional readiness. Among these a peculiar interest attaches to that ring which exists in anthracene, and which is characterized by having two phenylen groups connected by two groups of atoms, which, in the benzol residues, take up the ortho position to each other, so that with the carbon atoms in question they form a third ring of six members.

Two compounds analogous to anthracene, acridine and thiodiphenylamine, have been investigated in the Heidelberg Laboratory. These compounds, like anthracene, produce beautiful coloring matters. Thus, chrysaniline is a diamido-phenylacridine, and thiodiphenylamine passes, by the intussusception of amido groups or hydroxyles, into the leuko compounds of coloring matters, of which methylene blue is the most prominent representative. Hence it seemed to the authors desirable to examine if other diorthodiphenylene derivatives are capable of existence, and if they also are chromogens. Such a body is phenazine. The authors prove that methylphenazine and phenazine are not merely chromogens, but actually give rise to coloring matters of importance. The safranines (which contain one phenyl group more than the coloring matters of the toluylene-red group) must be referred to a phenyl derivative of phenazine, or rather of hydrophenazine.