VIRGINIA

Agricultural and Mechanical

COLLEGE.

ITS HISTORY AND ORGANIZATION.

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ITS HISTORY.

The Congressional land scrip was disposed of by act of General Assembly, approved March 19th, 1872, one-third thereof being bestowed on the Hampton Normal and Agricultural School, and two-thirds set apart for the establishment of a separate institution, to be called the Virginia Agricultural and Mechanical College, and to be located at Blacksburg, Montgomery county; provided the real estate belonging to Preston and Olin Institute be transferred without cost to the Visitors of the new college; and provided also the county of Montgomery should vote the sum of $20,000 as an addition to the funds of the college.

It was required in this and subsequent acts, that a Board of Visitors should be created, consisting of nine persons to be appointed by the Governor, the President of the Virginia Agricultural Society, and the members of the Board of Education; and still further, that the Board of Education, acting conjointly with the Principal of the Hampton school, and the Rector of the new college should make sale of the land scrip, and invest the proceeds in stocks bearing not less than five per cent. interest.

The Governor appointed as members of the Board of Visitors, Messrs. D. C. DeJarnette, John Goode, Jr., J. R. Anderson, W. T. Sutherlin, Robert Beverly, Joseph Cloyd, W. A. Stuart, J. T. Cowan and Harvey Black. The first meeting of the Board was held at the Exchange Hotel, Richmond, on the 25th day of March, 1872, and continued in session for two days. The members present were Messrs. D. C. De Jarnette, John Goode, Jr., J. R. Anderson, W. T. Sutherlin, Robert Beverly, W. A. Stuart, J. T. Cowan, Harvey Black, W. H. Ruffner and J. C. Taylor. Dr. Black was chosen Rector, and W. H. Ruffner, Secretary.

A committee, consisting of Messrs. Ruffner, Anderson and Sutherlin, was appointed to report a plan of organization and instruction for the new college, to the next meeting of the Board.

Messrs. Black, Cowan and Cloyd were appointed a committee to see whether a suitable farm for the use of the college could be purchased, and on what terms, and report at the next meeting.

The Board adjourned on the 26th of March, to meet at the Montgomery White Sulphur Springs on the 18th of July, at which time and place the trustees of Preston and Olin Institute were requested to meet the Board prepared to execute all proper conveyances of that property, provided the county of Montgomery should have complied with the provisions of the act.

In pursuance of the resolution adopted at the session in Richmond, the Board convened at the Montgomery White Sulphur Springs on the 18th of July, and continued in laborious session for three days. All the members were present, to wit: Messrs. Black (Rector), Governor G. C. Walker, W. H. Ruffner, Superintendent of Public Instruction, J. C. Taylor, Attorney-General, Lewis E. Harvie, President of the Virginia Agricultural Society, D. C. DeJarnette, John Goode, Jr., J. R. Anderson, W. T. Sutherlin, Robert Beverly, Joseph Cloyd, W. A. Stuart and J. T. Cowan.

At an early stage of the proceedings, the report of the Committee on Organization, which is hereafter given in full, was called for and read.

The Executive Committee of the Virginia Agricultural Society, and the trustees of Preston and Olin Institute, who were on the ground, were invited to be present during the reading of this report.

Mr. A. Phlegar, of Christiansburg, appeared as the representative of the Board of Supervisors of Montgomery county, and furnished evidence that the county had complied with the conditions required by the act of Assembly approved March 21, 1872, entitled "An act to authorize subscriptions in aid of the Virginia Agricultural and Mechanical College at Blacksburg," by voting the requisite $20,000 by a large majority, and that said subscription would be paid in eight equal annual installments, falling due on the 1st day of each January, with accrued interest, beginning with January, 1873, bearing interest from July 1, 1872, and secured by coupon bonds. Mr. Phlegar having made a formal tender of this subscription to the Board, on motion of Mr. Goode, the subscription thus made and tendered was unanimously accepted as a full compliance with the conditions required by law.

A deed of conveyance of the property of Preston and Olin Institute was made in due form.

Governor Walker, as President of the Board of Education, made a statement concerning the sale of land scrip, and the investment of the proceeds thereof, the price obtained being ninety-five cents per acre, the

largest price obtained by any State. So much of the proceeds of the sale as had been realized were invested in Virginia State bonds.

The 19th of July was spent by the Board at Blacksburg, viewing the property of the Preston and Ohio Institute and such lands as were offered for sale to the college.

There are five acres of land belonging to the institute, with a substantial three story brick building, 100 feet by 40, containing three recitation rooms, a chapel, and twenty-four lodging rooms.

Blacksburg is a small town, occupying a plateau of high table land; it is seven miles from the Atlantic, Mississippi and Ohio railroad, and within a few miles are the Montgomery White Sulphur Springs, the Alleghany Springs, the Yellow Sulphur Springs and New River Springs, and a number of natural objects of great interest. The scenery is picturesque, the soil of fine quality limestone land, and the climate very healthful at all seasons. The country around Blacksburg really belongs to the great Valley of Virginia, a region of the State possessed of boundless resources. Veins of coal of superior quality, and large bodies of timber, lie within easy reach.

Before the adjournment of the Board, a contract was made with Colonel Robert T. Preston for the purchase of a portion of his home estate, known as "Solitude," including the mansion and principal farm buildings, and all that part of the farm lying west thereof, supposed to contain two hundred and fifty acres. The tract of land thus purchased is one of great beauty and fertility, lying within one-fourth of a mile of the Institute building. The price to be paid is eighty-five dollars per acre, and full possession will be given October 1st, 1872. A mill stream passes through the farm; there is water in every field, and limestone and sulphur springs are convenient to the mansion.

During the meeting of the Board, it was resolved to apply one-tenth of the proceeds of the land scrip to the purchase of this farm.

It was determined to elect annually a Treasurer, who should act also as Secretary of the Faculty and Board of Visitors, Librarian, and Proctor, giving bond in the penalty of $10,000, and to receive a salary of $1,000 per annum. Mr. V. E. Shepherd was elected to fill these offices.

The Board resolved to take all needful steps to put the college in operation on the 1st of October, 1872. Instruction for the first year was committed to the following corps of officers:

1. A President, who, with the concurrence of the Executive Committee, may appoint an Instructor, if deemed necessary.
2. A Professor of Chemistry and Natural Philosophy.
3. A Professor of Mathematics and Modern Languages.

4. A Professor of Technical Agriculture and Mechanics.

Military Tactics to be assigned to some one of the Professors, as may be agreed upon.

The salary of the President was fixed at $2,000, and that of each Professor at $1,500; the tuition fees to be divided equally among the members of the Faculty, provided the addition to the income of any member thereof shall not exceed $500.

The Board resolved to meet on the 14th of August at the Yellow Sulphur Springs, for the purpose of electing Professors. The Rector was instructed to give notice of the fact in the Richmond and Christiansburg papers, and to state that changes might be made in the assignment of branches of instruction to suit the wishes of the Professors who may be elected.

The charges to each student not exempted by law were fixed at thirty dollars for tuition, and ten dollars for college fees. The act of assembly requires that the college shall give instruction free of all fees to as many students as there are members of the House of Delegates, to be selected by the school authorities of the several counties.

A standing committee of three members, to be called the Executive Committee, was appointed, whose duty it should be to have general charge and oversight of the college between the sessions of the Board, and to see that the regulations and orders of the Board be duly carried out. *Committee*—Messrs. Black, Stuart and Cloyd.

This committee was instructed to make inquiries concerning board and lodging for students, and report at the next meeting.

On motion of Mr. De Jarnette, it was unanimously resolved that the report of the Committee on Organization be adopted, and that two thousand copies thereof be published in pamphlet form, together with an abstract of the proceedings of this Board from its first meeting to the close of the session to be held on the 14th of August; and the same committee was instructed to attend to the publication.

PLAN OF ORGANIZATION.

(REPORT OF COMMITTEE.)

All schools may be divided into three classes:

1. Elementary.
2. Liberal.
3. Technical.

1. By Elementary, are meant schools for teaching those studies which form the introduction to all other studies, and which are now adjudged to be indispensable to every civilized man.

2. In Liberal schools are taught studies designed primarily to liberalize and strengthen the mind. The old-fashioned college curriculum was intended to embrace the most important of these branches in such proportion as to produce the highest result in developing the powers of the student. This curriculum has not generally been retained in modern American colleges in its integrity, but the studies composing it are still retained, and they still have the weight of opinion in their favor.

Educators have different views as to the relative value of the various branches of study, but all agree as to the disciplinary value of a liberal education.

3. Technical schools are designed to qualify the student for some particular vocation. They are now very numerous, and may in time become as diversified as are human employments. They are all based upon the doctrine, that there is pertaining to every pursuit a theory and a practice worth learning, and better learned in schools than in active life.

Schools of Law, Medicine and Theology, have long been in vogue. Normal Schools are becoming general. Polytechnic Schools are starting up everywhere, either as separate institutions, or as outgrowths from colleges and universities; and there will soon be schools without number for commercial, manufacturing, mining, agricultural and mechanical pursuits.

The amount of general knowledge required to profit by these special schools varies not only with the leading subject taught in the schools, but with the manner of teaching it.

What is called a common college course, is usually regarded as an indispensable preparation for the schools of law, medicine and theology, on account of its knowledge and its gymnastic power. It is contended, with great force, that every man is the better for this liberal college

education, whatever may be his subsequent pursuit. But it has been found impossible to hold the world up to this doctrine. Simpler and more direct methods of education have been demanded. The establishment of the Polytechnic School, by the French government in 1794, marks the first great divergence from the established course of education. The name originally given to it, indicates the want it was designed to supply; it was called "The Central School of Public Works," and was meant to supply engineers, both civil and military.

The style of education known as polytechnic discards, or at least passes lightly over the "humanities," in the general sense, viz: language, rhetoric, literature, history, social and political science, psychology and ethics; and gives prominence to mathematics, physics, analytical mechanics, geodesy, descriptive geometry, drawing, and modern languages. The general training of the mental powers forms no part of its purpose, but its advocates contend that its studies have as fine a gymnastic effect as those of the curriculum.

The great characteristic of all forms of polytechnic education is that it has an objective purpose, one external to the student himself, and external to man as man. Its foundations are in the objective sciences; its eye is upon nature, whose powers are studied that they may be utilized.

This may not be the broadest and highest style of education, and yet it is one of great value to society, and one which has produced men of immortal fame. Its influence in developing the riches, and applying the forces of nature for the use of man has been, and is, incalculable. There is an inherent reason too why a polytechnic course must be thoroughly mastered by the pupil: its results in practice must be exact, or they are worthless. Hence the rigid drills of these schools.

Men who are or will be educated in polytechnic schools may be divided into two grand divisions, viz: *those who handle instruments*, and *those who handle tools;* or, *those who plan*, and *those who execute.*

The former class may be made to include men of capital who own farms and factories, but who do no manual labor; it includes also professional chemists, who are employed by manufacturers in testing and compounding medicines, chemicals used in the arts, and manures, natural and artificial, in analyzing soils, food, &c., and perhaps in conducting systematic experiments in medical, agricultural and mechanical practice; but this grade of polytechnic students mostly become engineers.

SCIENTIFIC ENGINEERING.

Engineering has been defined by Webster, "The science and the art of utilizing the forces and materials of nature." This definition is not exact, because under it might be included the chemist, the architect, and the scientific farmer and mechanic. The radical idea of engineering is contrivance—scheming to use the forces and materials of nature to accomplish a purpose. If it be contrivance to subserve military ends, it is military engineering; if it be for civil purposes, it is civil engineering. But engineering has been sub-divided into a great number of special branches. A beautiful distinction is made between civil and mechanical engineering. The work of the *civil engineer* belongs to the department of *statics*; that of the *mechanical engineer* to *dynamics*. The work of the former is fixed, that of the latter is moved by power. The former makes roads, and the latter machines: and of these we have other sub-divisions—mining, topographical, agricultural, hydraulic, steam, gas engineering, &c., &c..

All these varieties of engineering are *learned professions*, requiring almost as many years of laborious study as any of the other professions. And hence engineering in all its branches belongs properly to institutions of high grade. Whether this profession should be provided for by separate schools of high grade, is a question which may well engage the thoughts of both educators and statesmen. As a fact, however, colleges and universities are very generally incorporating departments of engineering in their courses of instruction. And the young men who pursue the engineering course are of the same class as have usually attended college.

Those who pass successfully through the engineer's course do not become practical mechanics, except a small proportion of those who study mechanical engineering. A few of these go into the workshops, and rise to fine positions as master workmen. This number may increase. Whilst the scholarly training of these engineers will incline them to the departments of mere designing and general superintendence of construction, the increasingly high wages now given to accomplished workmen may incline men of polytechnic education to exchange the pencil for the chisel. Should this tendency increase, independent polytechnic schools of high grade will become a necessity; not only because literary institutions cannot be expected to provide the necessary machinery for practice, but because there would then be a growing incompatibility between the dominant ideas belonging to the two forms of education.

The enforced conjunction of incongruous systems of education

must end in the destruction of the weaker. Every successful school must have an idiosyncracy—a life of its own—into which everything about it is absorbed.

But as long as the engineer handles instruments, and not tools, his education may be made to harmonize with that of the other learned professions; and hence be successfully pursued in colleges and universities. It is, howevever an education for the few and not for the many. A very small corps of engineers will keep busy at work an army of contractors, master workmen, miners, journeymen and common laborers. The engineer will plan the iron bridge, but he will not toil in the ore bank, the furnace, the foundry, or the machine shop. The mining engineer will survey the mineral land, test the quality of the mineral, indicate the place for drifts and shafts, provide for drainage and pure air; but the whole work of developing the mine is done by other hands than his.

Now it is easy to perceive that if the engineer needs to be an accomplished scholar, the man who stands next below him ought not to be an ignoramus. If the man who makes the picture of a bridge needs an education, the man who makes the bridge itself needs an education also. The builder may not need so much learning as the planner, but he does need some of the same sort of learning in order to execute the work intelligently. He has his plans and calculations to make; he needs to understand the nature of the materials he is to work up, and the principles on which they are to be built together. And through all the processes of working up the various crude materials into their final shape there is needed a skill and an intelligence beyond what can be learned in the shop.

The want of some special provision for the practical classes first found expression about the middle of the last century in the Real Schools of Germany, and from that time to this the idea has been gaining, and has been embodied in a variety of forms, that special schools are needed for mechanics, farmers, and traders for the same reason that they are needed for lawyers, doctors and engineers. Hence, besides the high grade schools, there are in Europe schools suited to the special wants of almost every class of people. The effect of these special schools in promoting national prosperity is prodigious.

MECHANICAL SCHOOLS.

Hoyt, in his valuable Report on Education in Europe, states that nothing could be more evident at the Paris Exposition in 1867, than

the fact that those countries which had established special schools for the mechanic arts excelled all others in the mechanical products resulting from such special training.

As early as the latter part of the last century, artisan schools began to spring up in many parts of France and Belgium, and in some other countries—schools for instruction in the arts of engraving, coloring, dyeing, of the making of astronomical instruments, stone-cutting and glass-making, of the working of metals into every variety of form—schools likewise of various grades for instruction in the principles and practice of the more complex and comprehensive arts of mining, engineering, agriculture, &c.—and to-day it is undeniable that in nearly all the branches of industry named, (in every one, Hoyt affirms,) those countries are the acknowledged leaders of all others. Similar schools have sprung up by the thousand in Prussia, Switzerland, Holland, and all the German States, and are exhibiting results similar to those of France and Belgium.

These results can be spoken of with confidence, inasmuch as they were thoroughly tested at the different World's Fairs which have been held, and particularly at the Paris Exposition of 1867. These results have been studied by intelligent practical men, and are shown to be directly connected as cause and effect with the general intelligence and special training of the workmen who produced the fabrics. This whole matter was the subject of one of the most remarkable investigations of modern times—one made by order of the Parliament of England. The results of this investigation are noticed at some length in the annual report of the Superintendent of Public Instruction for 1871; but it is proper in this connection to repeat a few of the leading facts and quotations there presented, with some not therein adduced. In 1851, England had surpassed all competitors at the World's Fair held in London in nearly every department. Sixteen years later, superiority was adjudged to her in only ten of a hundred of the departments; in other words, she was beaten in ninety out of every hundred of articles exhibited. As the result of this terrible defeat, the kingdom was convulsed, and this investigating commission was appointed. The testimonies were almost unanimous to the effect that the superiority of the continental workmen was owing to their general and special training.

J. Scott Russell, F. R. S., says:

"As a juror in the Paris Exposition, I have come to the conclusion that the higher class of education given in each of those countries to the workmen in its skilled trades, as well as the superior professional education given to the higher

classes of men employed in technical professions, is everywhere visible in the works exhibited by those countries, and I attribute the surprising strides those countries have been making in the last ten years in many of the great staple branches of mechanical construction and manufacture to the admirable scientific and practical training which the governments of those countries provide for their working classes."

A. J. Mundella, managing partner in a hosiery firm employing five thousand operatives, says:

"While I believe the English workman is possessed of greater natural capacity than any of his foreign competitors, I am of opinion that he is gradually losing the race through the superior intelligence which foreign governments are carefully developing in their artisans."

James Young, Esq. (Chemical Works) says:

"The reason for this increased rate of progress is the excellent system of technical education given to the masters of work-shops, sub managers, foremen, and even workmen."

Mr. Scott Russell adds:

"We find that some nations have gone so far as to have established in every considerable town technical schools for the purpose of teaching to the youth to be craftsmen, those branches of science which relate most nearly to their future craft.

"Workers in metal are taught the nature of the mechanical powers with which they will have to work, and the mechanical properties of the materials they will have to operate upon; engine builders are taught the principles of heat and steam, and the nature of the engines they will have to make and work: ship builders are taught the laws of construction, hydraulics, and hydrostatics: and dyers and painters are taught the laws of chemistry and color. All skilled youth are taught geometry, drawing, and calculation; and in many countries, every youth who shows great talent in any department is promoted to a higher training school and there educated at the public cost. Beside these local schools, other countries have technical colleges of a very high class for the education of masters, and foremen in engineering, mechanics, merchandise, and other practical and technical professions.

"We have not failed to notice that it is precisely those nations which have been systematically giving a course of preparatory training and education to their population in their skilled trades that have shown the most marked progress in national industry in these successive exhibitions. Prussia, Switzerland, Belgium, France and America, seem to make progress in proportion to their excellence of educational training.

"Prussia in steel, iron and general engineering work; Switzerland in scientific engineering, machinery, and watch and telegraph work, and in textile manufactures; Belgium in metal working and mechanical trades; France in metal work, and in steam engines, engineering structure, naval architecture and steam navigation. All these nations seem to exhibit growing skill and progress in proportion to the excellence of the education they give to their manufacturing population."

Quotations to the same effect might be multiplied indefinitely. The result of the discussion and investigation in England was the speedy establishment of a public free school system of education for the masses, and of industrial schools for special branches in many places. At a great public meeting held in England, the following resolutions were adopted:

"That to establish and maintain a system of technical education adapted to the requirements of arts, manufactures and commerce in the United Kingdom, the three following educational reforms should be effected:

1. In the universities, grammar schools, and other educational institutions for the upper and middle classes, instruction in science and art should be placed on the same footing as other studies.

2. Efficient means of primary and secondary education should be brought within the means of the working classes everywhere.

3. Technical institutions for special instruction, adapted to the wants of the various classes of society, and to the industries of the country, should be established and maintained in the United Kingdom.

With regard to these practical schools, which are becoming so prominent in the policy of more advanced countries, some of them are mere schools of apprenticeship in single branches of manufacture. The most of them combine with practice instruction in those branches of mathematics and physical science which bear directly upon the special industry, whilst others add studies designed to give general information and to liberalize the minds of the pupils. Of this latter class, there are schools known by the title of "Schools of Arts and Trades." One of the earliest founded and most famous of these schools of arts and trades is in Moscow, Russia:

"The entire course of study, occupies five years, but is so divided into—first, a theoretical and practical course (elementary in character) which embraces three years; and secondly, a special superior course of two years, that many young men, already qualified to enter the second division, may then fit themselves for practical business in two years. The instruction is given by fourteen Professors in the theoretical departments, assisted by a competent force of practical mechanics and technologists in the workshops and laboratories, which are both numerous and extensive. The five principal workshops—a foundery, forges, shops for setting up machinery, the finishing shop, and the model room—are provided with lathes for wood and metals, powerful machines for cutting up the various materials, trip-hammers, and various tools and machines driven by steam, so that the pupils, working by classes and in harmony with the educational plan of the institution, are enabled, by their own manufacture, to fill orders to the average amount of $40,000 per annum, thus returning to the treasury a part of the $100,000 annually expended for the support of the institution. The school includes, besides these several workshops, a very large laboratory for technological operations and

for chemical analysis—a museum of models and of mechanical and technological apparatus—collections of raw materials used in manufacture, a geological and mineralogical museum, and a valuable scientific and technical library, comprising several thousand volumes."—(Hoyt.)

France has appreciated this class of schools more than she has universal elementary education. As Virginia did with regard to the views of Jefferson, so did France with regard to the enlightened views of her Great Napoleon, viz: adopted fragments of his system of education. Under the influence of Napoleon these "schools of arts and trades" at Chalons sur Marne, Angers and Aix, were established for the purpose of furnishing to the country educated and skilled chiefs and foremen of workshops in the several branches of the useful arts, and these schools have been and are centres of important influence upon the industries of France. The three receive annually about two hundred thousand dollars from the public treasury. Besides suitable literary instruction, practical actual service is required of the pupils at the forge, in the foundery and various workshops. There is also a celebrated school of this character at Lyons. In all four of these schools the course of instruction occupies three years. These high grade Artisan Schools are multiplying in Germany, Belgium, Holland, England, the Scandinavian States, and indeed all portions of Europe.

In Germany there is a peculiar class of schools known as "Building Schools," which are held only in the winter, for the benefit of mechanics whose work cannot be carried on at that season of the year. There is a boarding school of this class at Holzminden, in Brunswick, with accommodations for five hundred pupils, and the establishment is usually crowded. The cost of boarding and lodging for the five months' term is less than $20; charges for tuition, fire and light, washing, medical attendance, and all requisite material for writing and drawing, about $33; total expenses of the term $53.

In Nienburg, in Hanoverian Prussia, is a similar school, with fifteen professors and some two hundred pupils, including machinists and millwrights, masons, carpenters and joiners, cabinet makers and locksmiths, as well as builders proper.

Besides the schools intended to improve the ordinary mechanic arts, and besides a great number of artisan associations for mutual improvement, there is an important class of schools which, in Europe, are called "Schools of Applied Art," and in this country are called "Schools of Design." The art of drawing constitutes the chief feature in these schools, and the object is to create designs, which are needed in endless

number and variety in connection with almost every mechanical and manufacturing industry.

The artistic French first made a specialty of this form of industry, and in consequence thereof surpassed all nations in the beautiful designs exhibited on their ornaments and fabrics of every description. But in time the Germans, Swiss, Russians and English established similar schools, and now they are to be found in almost every city of Europe, as well as in many of the chief cities of America. The School of Design at South Kensington, England, has become one of the most famous of the world.

There is another class of schools found in Europe which is worthy of special mention. These are attached to great manufactories, and are designed to educate and train workmen for those factories. A striking example is to be found at Creuzot, France, in connection with the great smelting, mining, locomotive, and other machine building establishment lately conducted by M. Schneider—an establishment which has been distancing all competitors, and has of late been furnishing locomotives even for English railways. The following account of this gigantic concern, and a similar one in Germany, is quoted from the Edinburg Review of April 1868.

"The works of Schneider, at Creuzot, cover three hundred acres. The workshops and forges occupy fifty acres. The iron works annually produce more than one thousand tons of iron, in addition to machinery, locomotives, iron bridges and viaducts, iron gun boats and war steamers, of the average annual value of £600,000. Nearly ten thousand work people receive wages, which amount to £370,000 per annum, and most of these dwell in and around the town of Creuzot. These steam engines are equal to a duty of nearly ten thousand horse-power, and the new forge is contained under a single roof of thirteen hundred feet in length, and three hundred and ten in width.

"No other single forge can be mentioned of equal dimensions. There are valuable coal and iron mines on the estate, which yield annually two hundred and fifty thousand tons of coal and three hundred thousand tons of iron ore, besides which about three hundred thousand tons of coal and one hundred and twenty thousand tons of ore are purchased. Our present interest is in the *personnel* of this great establishment, a very large proportion of which was born, or has been trained on the spot. It is due principally to a system of education, dating as far back as 1841, that a highly skilled body of workmen, engineers and accountants has been formed; and although the system has been termed elementary, it will be found to be really in part special or technical. The course which is open to all pupils of sufficient capacity, extends over no less than nine years, and includes advanced instruction in French, Literature, History, Natural Philosophy, Geography, the Chemistry of metals, Geometry, mechanical and free-hand drawing, and modeling. Promising boys are sent to higher technical schools elsewhere. No boy is admitted to the works who cannot read and write, or who has been dismissed from the school

for misbehavior. The fruits of this educational system are observable in the activity, extent and perfect discipline of the work.

"In walking through the sheds with Mr. Samuelson, where several pairs of marine engines were in course of erection, Mons. Schneider told his visitor that there was not a man among the mechanics employed in that department who could not make an accurate drawing of the work in which he was engaged.

"In fifteen years, felonies, only twenty-three; annual misdemeanors, forty; policemen, three.

"Krupp & Company, at Essen, consume eight hundred to one thousand tons of coal every casting day, raised from pits within the walls of the works, employ nearly eight thousand men, and produce sixty thousand tons of steel annually, more than twice the whole export of steel of the United Kingdom. At the outbreak of the war one thousand of the men were called under arms, but two hundred and fifty of them were returned lest the manufacture of cannon should be stopped. *All the heads of the technical departments are pupils of the various schools of Germany.*"

With regard to the practical schools which have been noticed above, it may be remarked that some of them are maintained wholly, and others in part, from the public treasury. Many such schools, however, have been founded and supported by private liberality, and a large number by philanthropic societies. In Belgium, practical schools have been made use of by the government as an important means of elevating the lowest class of her population. And in America, the reform schools which are springing up in our large cities for both males and females nearly all include instruction and practice in industrial arts. In Europe there are many industrial schools designed for the especial benefit of females, and such schools are multiplying in America. In Boston the art of sewing has been introduced into the public free schools.

It does not fall in with the drift of this report to notice particularly the higher forms of technical education, whether found in independent special schools, in polytechnic institutions, or in colleges and universities. As remarked heretofore, these higher grades of technical education are intended to make analytic and technological chemists, scientific agriculturists, veterinary surgeons, professional architects, and engineers of the many kinds already alluded to. Schools of this sort are scattered abundantly over Europe and America. It will be seen presently that we have in Virginia quite a number of institutions supplying the means for this higher technological education.

AGRICULTURAL SCHOOLS.

A few chairs of agriculture were attempted in France toward the the close of the last century; but the first separate schools were in the

same year (1799) established in Prussia, Switzerland and Austria. These schools all had a moderately successful career. The Swiss school was established by a nobleman on his estate at Hofwyl, and for fifty years was remarkably successful, and it was the model on which hundred of similar institutions were organized. The Austrian school was established on an estate of 300,000 acres, and still holds a place among the foremost. The Austrian government was so gratified with the experiment that it has continued to multiply its agricultural schools, until it now has forty.

Prussia has more than fifty agricultural schools of different grades, besides a great number of small experimental farms, or stations. Of all these schools, only some eight or nine are of high grade, and these are more or less intimately connected with universities. France has a number of separate agricultural schools. Saxony has five agricultural schools and departments; Bavaria has twelve; Belgium ten or twelve; Baden six; several of the Duchies, especially Saxe-Weimar, make liberal provision for agricultural education, and have among them about thirty schools. Sweden, Denmark, Italy, Spain, and Portugal, and even Greece and Turkey, have all recognized the importance of these institutions, and are bringing them into existence. England has made some effort in the same direction, but without much success; Scotland is making a beginning. Ireland has been more fortunate. For forty-five years she has had a flourishing farmers' school with two hundred acres of land attached. In 1838, another school was established (near Dublin), which is a sort of a normal agricultural school. Ireland has now about seventy agricultural schools.

Russia embraced the idea of special agricultural education in 1824, and now has a very large number of agricultural schools of various grades. The most of these are free, and are supported by the government, with annuities ranging from eight thousand to a hundred thousand dollars. They have on an average from a hundred to a hundred and fifty pupils—one of them four hundred and fifty. No expense has been spared to give these schools the highest efficiency.

There are two agricultural schools in Europe which may be specially noticed—the one at Geisberg, near Wiesbaden, in Nassau; the other at Hohenheim in Würtemberg.

We are indebted to Prof. Grabowskie of Preston and Olin Institute, for the following account of the Geisberg school; which we have condensed:

Formerly the sessions of this school continued most of the year; but now continue only during the winter—the summer months being left

for practice on farms. The change was made for the accommodation of small farmers who required the services of their sons at home during the summer months. Other students labored on farms during the summer as apprentices, or under special arrangements. The students, on returning to the school in the autumn, are required to give an account in writing of their summer labors, and of the farm on which they were employed. There is no farm-practice during the winter. Pupils may enter the Geisburg school directly from the public elementary school; but they not unfrequently come from the Real and mechanical schools, and even from the Gymnasia, Polytechnic schools, and universities. Instruction is given by lectures of a very simple character, copiously illustrated, and by excursions. The entire course has direct practical bearings, the subjects being pruned of irrelevant and less important matters. The institution is highly esteemed, especially by farmers. The regular course is completed in two winters. It consists of the lower mathematics, with surveying, levelling, and drawing, mineralogy and geology, botany, zoology, human anatomy and physiology, and comparative anatomy, physics with meteorology, chemistry, anatomy and physiology of domestic animals, veterinary pathology, therapeutics and obstetrics, agronomy, implements and machines, plant and meadow culture, drainage, stock-raising, agricultural economy, book-keeping, political economy, gardening and agricultural technology and architecture. It is furnished on a liberal scale with appropriate illustrative collections.

The following account of the agricultural school at Hohenheim, near Stuttgart, Würtemberg, is taken almost *verbatim* from Hoyt's Report.

The vast buildings occupy a high swell of ground, commanding one of the most extensive and beautiful views in Germany. The farm embraces between eight and nine hundred acres, and adjoins a government forest of five thousand acres. It is conducted on the basis of a scientific rotation of crops, serving the double purpose of a model and experimental farm. About twenty acres are set apart for experimental purposes, and are under the special charge of the Professor of Agricultural Chemistry. There is also a botanical garden of several acres, in which are grown all sorts of plants possible to the climate and soil of the location. Connected with the institution are a beet sugar factory, a brewery, a distillery, a starch factory, a vinegar factory, a malting and fruit drying establishment, a silk worm establishment, and an agricultural implement and machine factory. The best agricultural implements and machines used in Germany are made at this establishment.

The institution at Hohenheim, or the Royal Academy, as it is called, consists really of three distinct schools, to wit:

1. The Institute, having the character and rank of a professional school of agriculture.

2. The school of forestry.

3. The school of practical farming.

The institute and school of forestry were designed for the sons of the gentry, fitting themselves for the general management of inherited estates, or ambitious young men from the middle classes, looking to a stewardship over large estates. These students pursue a two years' course of study in agriculture and forestry, supported by mathematics, natural history and physical science. Tuition fees are charged in these higher departments, whilst the schools of practical farming and horticulture are supported entirely by the government.

The school of practical farming is designed for the sons of working farmers, who desire simply to acquire a knowledge of the general principles of agriculture, and the most approved practical methods of farming. They spend but two or three hours daily in gaining theoretical and scientific knowledge, and the remainder in actual labor on the farm and in the other practical branches of the academy, under the direction of foremen and managers.

Besides these three distinct branches or departments, there are several special courses or schools designed to give instruction in the principles, and especially in the practice of different branches of industry. There is a special course in vacation for the instruction of school teachers.

The instruction is given by the Director and twelve other Professors. Among the departments we find one of political economy; one of rural architecture, and one of drawing. All the branches of general agriculture, and plant culture, meadow culture, vine and fruit culture, the breeding of domestic animals, dairying, silk worm and bee culture, forestry, &c., are taught by lectures, by demonstrations, by excursions, and by actual manipulations. The scientific course consists of instruction in arithmetic and algebra, planeometry, stereometry, trigonometry, practical geometry, mechanics, taxation, book-keeping, physics, chemistry in all its branches, geognosy, botany, zoölogy, veterinary science, economical architecture, principles of law, and national economy. Besides these, there are special courses in forestry.

This academy, as may be seen, occupies a very wide field. It was established in 1817 by the agricultural society of Würtemberg, under the patronage of the king—has now had a successful career of sixty-five years, and by its great usefulness to the State, has acquired a marked influence, not only in the kingdom of Würtemberg, but in all the countries of Europe.

Concerning all these agricultural schools, it should be remarked that their courses of study vary from two to four years; the student's expenses also vary. The most of the schools are supported by government, and they are entirely free, or charge very moderate fees. Some furnish board and books free, as well as tuition; and at at least one school (in Russia) the pupil, in addition to all this, receives a sum of money for general purposes.

AGRICULTURAL EDUCATION IN AMERICA.

It is only eighteen years since the first agricultural college was established in the United States, and as yet there are very few settled ideas in the country on the subject of agricultural education. No doubt the reason of this late beginning, and of these unsettled views, is to be found in the vast tracts of fresh and fertile lands, which were ever open to the settler at a trifling cost. In 1855, Michigan launched an agricultural college on a farm of six hundred and seventy-six acres of land. This example was in a short time followed by New York, Maryland and Pennsylvania. These States soon learned one thing about agricultural colleges, viz: that they are very expensive affairs, especially when they set out with a liberal programme.

Out of this discovery grew the movement in congress, which ended in the act of 1862, by which nearly ten million acres of public lands were divided among the States to aid in agricultural and mechanical education. In every State there was a grand scramble for the land scrip among colleges *in esse* and *in posse;* and the results of the struggle were various. According to the list given by General Eaton in his report for 1871, sixteen States connected the land grant with colleges or universities, twelve with separate, special colleges, and nine had not acted. Some of the universities which received the grant, were created in part out of this fund, and are polytechnic in character, and in nearly every case the congressional funds are held in separate trust, in order that they may not be diverted to classical or literary studies. These institutions all profess to use the funds for teaching the applications of science to industry, and some of them recognize the wants of those who are to labor with their hands on farms and in workshops. But technical education in America is having the same history that general education has had in all ages. The rich and influential classes are first and most liberally provided for, whilst the toiling masses are comparatively neglected. In former ages the masses were neglected by the ruling classes, because they were despised, and were not regarded as fit sub-

jects for education. This feeling is rapidly passing away, and every enlightened government now recognizes the fact, that national aggrandizement is more dependent upon the education of the people than upon all other causes combined. And, as shown in a former part of this report, European nations include in this the technical as well as elementary education of the people. But one who studies the American technical schools will see that they are cast principally for the higher grades of students. The reason of this may in part be, that public sentiment on the subject is largely controlled by scholarly men, whose tastes revolt at narrow and short courses of study, and who cannot let go the traditional doctrine that the best way to enlighten popular ignorance is by means of constellations overhead. Another reason is, that working people have not hitherto demanded technical education, as they will do ere long. It requires special effort and time to inspire practical men generally with a respect for scientific schools, and a desire to learn the results of science by systematic practice.

But the present in America is a time of experiment and discussion in this field, and our people will not long remain in rear of other nations in regard to any kind of schools.

CLASSIFICATION OF AGRICULTURAL SCHOOLS.

The various forms of agricultural education might be classified as follows: 1. *Didactic.* 2. *Practical.* 3. *Combined.* 4. *Progressive.*

1. Under the head of didactic may be included all schools which require no manual operations from the student. There is a simple teaching of the theory and practice of agriculture, with cognate branches by means of text-books, lectures and lecture-room illustrations, with, in some cases, opportunities more or less extensive of observing agricultural operations. There is no effort to improve the student in manual dexterity, farm management, or general business habits. These he is expected to know beforehand, or to acquire elsewhere as he may have opportunity.

This is the sort of education usually given at colleges and universities which have agricultural departments. Among the best of its class in America may be mentioned the agricultural department of the Sheffield scientific school connected with Yale College. Among the European schools of this class, those of Hallé, Jena and Göttingen are the most celebrated; though these partake of the Progressive, as well as the Didactic character.

2. Schools of agriculture which are here called Practical are such as

are known in Europe as farm schools. Manual labor, or actual practice with tools on a farm under supervision, constitutes the bulk of the course. Two or three hours a day are spent in study, the rest in labor; but the labor is performed under the direction of skillful managers, who are constantly giving instruction by precept and example.

This class of schools is almost unknown in America, but is common in Europe. The Swiss school at Hofwyl was the prototype of this class. These schools have generally had a charitable intent. Count Fellenberg, who established the Hofwyl school on his own estate, had in view the improvement of the sons of the peasantry, who thus might gain a practical knowledge of the most improved methods of agriculture, and also some acquaintance with the scientific principles involved therein.

3. Combined schools are, as the name imports, schools in which theory and practice are combined. There are institutions in Europe in which one season of the year is wholly given to study, and another season wholly to labor or excursions. As for example the Russian school at Lesnoy near St. Petersburg, as well as the school at Geisberg, which has been noticed. In other institutions there are practical classes engaged chiefly in labor, and studying classes engaged chiefly in study, as at Hohenheim. But in the majority of well-equipped schools, the didactic elements predominate, whilst only from ten to twenty hours a week are spent in manual exercises. The Massachusetts Agricultural College is a good example of this class; and Cornell is a young giant who is destined to amaze the world with such a combination of erudition and handicraft as has never been seen; but as he gets older he may grow less practical.

4. Under the term *Progressive* may be included those forms of agricultural instruction which are designed to prepare students for original investigation. The teaching is carried on largely by means of analysis and experiment. Baron Liebig is the most distinguished exponent of the sort of teaching and investigation here referred to. Largely owing to his influence, universities have engrafted this feature upon their courses, and what are called experimental stations have been established by governments, and are rapidly multiplying all over Europe. In connection with these stations, and with some of the higher universities, there are extensive chemical and physical laboratories, and even collections of domestic animals, with all needed facilities for studying physiological problems. The agricultural experiments are usually conducted on a few acres of land, from twelve to twenty, and here are studied those fundamental principles which underlie all successful practice, and out of the knowledge of which will grow agricultural advancement.

AGRICULTURAL AND MECHANICAL COLLEGES.

Having considered these two classes of colleges separately, it now becomes necessary to consider them together. In so doing, we must discard all classifications heretofore made, and form a new classification which shall not be too minute in its sub-divisions, and shall be equally adapted to the two grand divisions of the subject. The grades in the classification should represent corresponding schools. No doubt these grades will become more numerous as schools become more special in their character; but for the present in our State it will be sufficient to divide combined agricultural and mechanical education into three grades or classes, representing the wants of three grand divisions of our population.

First Class.—In this class we would place schools for training Engineers of all sorts, Architects, Chemical Technologists, Manufacturers and Scientific Teachers, Investigators and Explorers. These belong to the Mechanical and Technological department. For the agricultural branches, schools of this class would educate analytical chemists, agricultural professors and experimenters, veterinary surgeons, and such agriculturists as desire a thorough scientific knowledge, including, as of necessity it does, almost the entire circle of physical sciences, besides studies of an abstract and literary character.

This grade of agricultural and mechanical education belongs naturally to the highest class of literary and polytechnic institutions; and on this grade must we depend for the most valuable, but not the most immediately available results.

Second Class.—This class of schools should aim to meet the needs of farmers and mechanics who expect to continue in their vocations. Of course the great mass of these are neither able, nor anxious, to pursue an extensive or protracted course of study; but the experience of other countries, and to some extent of our own, has abundantly shown that there is a considerable and a constantly increasing proportion of ordinary farmers and mechanics who have a desire to know something of the scientific principles underlying their vocations, to learn the results of scientific experiment, and become acquainted with the most approved methods, implements and machines pertaining to their pursuits. This is the population who are provided for by the most of the agricultural and artisan schools of Europe, and this is the grade of education which has produced such telling results in advancing the interests of the continental nations.

3d. The third class consists of schools of practice simply, or chiefly,

and will usually be connected with the reform or eleemosynary operations. But the example of Hohenheim shows that an almost purely practical department may be connected with schools of higher grade.

We have at length reached the question—

WHAT SORT OF SCHOOL SHOULD BE ESTABLISHED AT BLACKSBURG?

1. Let us first look at the terms of the grant. The act of congress uses the following language concerning the proceeds of the land scrip. They "shall be inviolably appropriated by each State which may take and claim the benefit of this act to the endowment, support and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

The State law disposing of the fund uses nearly the same language.

It will be observed that this fund is to be used not for the benefit of all classes, but of certain classes which are specified, and are denominated "*the industrial classes;*" and that these are to be benefitted, not in some remote and indirect way, but by the actual education of the people belonging to these classes.

Now who are the industrial classes? They are the men who carry on the industries of the country. This word industries, when used in a concrete sense, has acquired a technical meaning, and refers to the physical or material operations of the country—those which change the form of crude materials. The industrial classes then are not the bankers, capitalists, merchants, or men belonging to the learned professions, but they are the men who handle tools, the men of the field, the mine, and the workshop. That these are the men referred to is evident from the character of the branches required to be taught; they are the branches suited to enlighten farmers and mechanics.

But it is not required that the sort of education provided for these industrial classes shall be a mere apprenticeship, a mere matter of tools prefaced by the "three R's." It can be as liberal in its provisions as may be desired; it *must* include those branches of liberal and scientific study which have practical applications. Practice is to be reached through science.

The classes to be provided for, and the studies required, clearly indi-

cate that the style of school required is one of applied science—a technical school, as distinguished from a liberal school—a technical school, with liberal appendages if you choose, but still a *technical* school. There will be little danger of erring as to the character of the school if the fact is recognized that the ultimate object aimed at is the immediate utilization of science for the development of the material resources of the country.

2. In order that any institution may be made available for the industrial classes, its costs and charges of every sort must be small, otherwise a very small proportion will be benefited. The earnings of the industrial classes beyond their necessary expenses are very small, particularly in our State at this time. Very few working farmers or mechanics can afford to pay from four to six hundred dollars a year for the support and education of each son.

3. The new college ought to trench as little as possible upon ground well occupied by institutions already existing in the State. Even if it would not be a perversion of the fund to use it for the establishment of an ordinary classical college, it would certainly be very bad economy to do so, as well as very unjust to such as are already established and doing good service. Sadly have our people already erred in the undue multiplication of colleges. What richly endowed and splendidly equipped institutions we might have had if the funds distributed among our nine colleges had been concentrated on half the number. The true friend of education will seek to abate the evil rather than aggravate it.

If our funds can be applied in providing forms of education different from any provided in our existing institutions it would seem manifestly wise so to employ them. The review which has been made in this report of industrial education in other States and countries, taken in connection with our own condition, seems plainly to show that there is not only room, but a crying demand, for a different school from any we now possess.

The principles which have been laid down will exclude the various engineering courses from the new college. Whilst the engineer stands next above the industrial classes, he does not belong to them. Moreover, his wants are abundantly provided for in the colleges, military institute, and universities of the State, many of which have full and special courses of engineering. The general principles of engineering must be taught in the new college, with special application to farm roads, bridges and draining, with something of surveying and mining, and a good deal of motors and mechanical powers, but to provide a

complete set of professional engineering courses would of itself absorb all the funds of the institution.

Similar remarks apply to architecture. Something must of course be taught of building and building materials—something of the laws of proportion and ornamentation, and something of the different orders of architecture; but the professional architect needs a much fuller and deeper knowledge of all these things than the builder, and he needs something above and beyond this. He needs a mind highly cultured by classical and esthetic, as well as scientific studies. He needs to understand the face of nature and the principles on which nature and art may be made to harmonize. He needs to understand man, his tastes and habits, and all the uses for which architectural structures are reared. The true architect is a creator, having to originate and to adapt. He needs both genius and common sense, and having to meet all wants, and to please all tastes, he must be possessed of endless resources. Such a result as this comes only from an elevated and many-sided culture, such as can be found only in universities—general or polytechnic. For analogous reasons the new college ought not to undertake to make professional chemists—that is, men who make it a business either to teach chemistry, to analyze ores, mineral waters, soils, agricultural products, manures, or technical products, to compound medicines, or to make original investigations. Simply to equip such a department as this would require a large share of the entire endowment of the institution. Nor ought the new college to provide for all the wants of that class of agriculturists who not only desire a liberal education, but who wish to take a wide range among studies relating to agriculture, and to pursue those studies exhaustively.

When we remember the ample provisions made for this high grade of instruction in our superior schools of learning, we need not regret that the inadequate endowment of our prospective institution will prevent its entering into competition with those higher schools.

Before leaving this point, we may, without disparagement to other well-appointed institutions, allude to the fine development our State University has made in this direction. A large building has been erected and thoroughly furnished for the purposes of Applied Chemistry; the best advantages are offered in the department of Natural Philosophy; a professorship of Agriculture has been established, and a portion of the University grounds set apart for experiment and illustration. The agricultural department is based upon the Miller fund of $100,000, and this whole department of Applied Science may, and doubtless will,

ultimately afford the grand desideratum of a high grade school of agriculture and the mechanic arts.

4. If these views be correct, the proper sphere for the proposed college is that of a middle grade agricultural and mechanical school—one which teaches chiefly results and practical methods, and only so much of mathematical and physical science as may be necessary to render results and methods fully intelligible. The proposed farmer and mechanic should go there simply, or chiefly, to learn what there is in science and in improved methods and machinery to make him a better farmer or mechanic. And the spirit and tendency of the institution should be, not to educate its students *away from* their vocations, but *in* and *for* them—not to send them home with a distaste for manual labor, and a craving for some more literary or less toilsome pursuit, but to send them back with fresh zest for their work, and a higher sense of its dignity and its capabilities, and with their own powers so strengthened that they may command a degree of success which they could otherwise never have attained. Any agricultural and mechanical school of the kind we are now considering, which does not have this effect upon the mind of its students is a failure as regards its proper object, whatever success it might have as to numbers. Therefore all the studies and arrangements of the school should be carefully disposed so as to develope in the young farmer and mechanic a higher appreciation of his vocation, and a more resolute determination to excel in it.

But, as before remarked, it does not follow that because the design of the institution is special, there should be nothing taught there except strictly special studies. There is a certain degree of general intelligence and of mental culture, which are essential in order to enable the student to profit by the special studies, and to use them effectively after they have been acquired. Hence some liberal studies are needed for their training and liberalizing effect, as well as for the light they directly cast upon the path of the student. The difficult task which now devolves upon this board is so to select among the many branches of study, and so to commingle the general and the special, as to produce the best possible result upon the student, and through him upon the material interests of the State.

COURSE OF INSTRUCTION.

5. Advancing a step further into the heart of the subject, we next enquire what should be the studies of the new college. Having heretofore considered the field lying above it, we may now for a moment con-

sider the field lying below it, and thus be able to define its position more sharply. It is perhaps sufficient to say, in general terms, that the field properly belonging to the existing public school system of the State ought not to be invaded on the one hand any more than that of the colleges and universities on the other. Therefore it ought to be required that the pupil shall have availed himself of the provisions of the common schools before being admitted into the technical college. The six elementary studies taught in these schools are an essential introduction to the studies of the higher school, and should be thoroughly mastered.

There is reason to fear, however, that as yet comparatively few of our country schools give as complete instruction in writing, arithmetic, geography and grammar as the college student ought to have, and therefore it may be proper, at least temporarily, to include in our curriculum the higher grades of those studies. The student should be required to pass a good examination in spelling, reading, writing, elementary grammar, intermediate geography, and arithmetic to the end of decimal fractions.

Having now laid off the ground on both sides of the new college, it remains to arrange a programme for the college itself; and this is really the most difficult as well as the most important part of this report.

Before undertaking this task, the Chairman, besides conferring with the other two members of the committee, and finding that their views harmonized entirely with his own, put himself in communication with the Faculties of all the colleges in the State. He gave them his views of what the new college ought to be, and asked theirs in return. He has heard from nearly all of them, and is pleased to find that the views of the committee are cordially approved by most of the representatives of these literary institutions. Of these, the following gentlemen have furnished plans of instruction, viz: Professors Campbell and Allan, of Washington and Lee University; Williamson, of the Virginia Military Institute; Estill and Shepherd, of Randolph Macon College; Davis, of Roanoke College; Professor Martin, of Christiansburg; and Colonel Grabowski, of Preston and Olin. Letters containing suggestions have been received from President Ewell, of William and Mary; President Atkinson, of Hampden Sidney; Professors Smith and Mallet, of the University of Virginia; and Professor E. B. Smith, of Richmond College. A communication has also been received from Colonel J. T. L. Preston, of the Virginia Military Institute, proposing a course of action, which differs from the others, but is given on his individual responsibility. Colonel Venable, of the University of Virginia, also wrote a letter to a member of the committee expressing friendly sentiments.

All these communications are filed with this report, and it is hoped that it may be the pleasure of the Board to hear them read.

Your committee beg leave, however, to submit a plan which differs somewhat from the others. It provides, as will be seen, for a three years course of instruction, or rather, for an introductory course of one year common to all the students, and two courses of two years each for agricultural and mechanical students respectively.

Proposed Course of Instruction.

FIRST YEAR.

Commercial Arithmetic.
Book keeping.
Algebra, through Equations of first degree.
English Grammar, Elocution and Composition.
Geography with Map Drawing.
Descriptive Astronomy.
Penmanship.
Free Hand Drawing.
Lectures on Physiology and Hygiene, Habits and Manners, the value of Agriculture and the Mechanic Arts to society, *etc.*
French or German.
Farm or Shop Practice.
Military Tactics.

SECOND YEAR.

Agricultural.	*Mechanical.*
Geometry, Plane Trigonometry and Mensuration, Surveying and Agricultural Engineering.	Geometry, Trigonometry and Mensuration, Descriptive Geometry.
Agricultural Physics and Mechanics.	Physics and Mechanics.
Agricultural Architecture and Machines.	
History and Literature, partly as a class exercise in Reading and Geography.	History and Literature, partly as a class exercise in Reading and Geography.
French or German.	French or German.
Mechanical Drawing.	Mechanical Drawing.
Essays.	Essays.

Daily Practice.

THIRD YEAR.

Agricultural.	*Mechanical.*
Agricultural Chemistry and Geology, with special reference to the soils and geological structure of Virginia.	Analytical Geometry.
	Industrial Chemistry.
	Mineralogy and Metallurgy,

Agricultural Botany and Zoölogy (with simple veterinary arts).	Machinery, e. g. Steam Engines, Mill Wheels and Gearing, Lathes, Planing and Boring Machines, &c.
Systems of farming, planting, gardening, dairying, fruit-growing, stock-raising, &c., with special attention to the climates, crops, peculiarities and capabilities of Virginia.	Building and building materials.
Farm Economics including labor, accounts, buying and selling, renting, &c.	Lectures on the Resources of Virginia as to Water power, Timber, Barks, Coal, Metals, Ores, Building Stone, and other valuable minerals; also on the existing industries of Virgina.
Lectures on Government, Political Economy, Business Economy, Psychology and Ethics.	Drawing.
French or German.	Lectures on Government, Political Economy, Business Economy, Psychology and Ethics.
	French or German.
Daily Practice.	

Your committee do not offer this as a plan of instruction to be fixed upon by this board at present; but only as an expression of the views of the committee, with the hope that it may please the board to approve at least its general drift. The working programme must be left to the faculty.

6. Concerning the professorial corps, it may be remarked that the success of such a school as has been sketched depends more on obtaining the services of men having the peculiar qualifications needed, than upon all other circumstances combined. The cast and design of the school being different from anything now existing in our section of the country, we have among us no class of men trained in its special ideas and methods. Our only hope is to seek out men of education who are in sympathy with the objects of the institution, who have natural versatility, and who have had some experience in the direction aimed at. Mistakes in the selection of instructors would be so certainly fatal to the young institution, that where there is doubt as to suitability, temporary appointments should be preferred to permanent. Among the officers, of course the most important is the president. His general duties will leave him but little time for the instruction of classes. Beside the attention he must give to all the varied internal affairs of the institution, he should give much thought and labor to its advancement in public estimation, and especially in securing an enlarged endowment, and donations for special purposes. It is thus that the means for increasing the endowments and facilities for these applied schools elsewhere have been obtained, and their success assured.

As to the size of the Faculty, that is of necessity regulated by the funds. Four instructors beside the president and the practical mana-

gers might suffice for some years to come, and even fewer might answer in the beginning—but an increase will certainly be wanted in the future.

There will be no difficulty in securing the necessary means for carrying on the institution, if we can only succeed in creating such a one as will really meet a great public want.

MATERIAL APPLIANCES NEEDED.

Having thus fully considered the scholastic department, we may now enquire what *material* provisions will be needed to give full effect to the teachings of the lecture and recitation rooms. It is obvious that in an agricutural and mechanical college, the physical apparatus should receive a compartively large development. In fact, there is properly no limit to its expansion, because the field covered by the curriculum is boundless, and infinitely diversified. So that, whilst valuable instruction may be given with a moderate supply of apparatus, the advantages of the school will be improved in proportion as its illustrative appliances are increased.

In this, as in everything else, we must be governed by the funds available for the purpose, and there is nothing so important to any institution as to husband its means, and avoid debt. But it is well to have an ideal toward which we may aspire, however far we might come short in the beginning. And with due regard to both these considerations, we may consider first, what is desirable, and second, what is feasible.

The material appliances alluded to may be divided into such as pertain to the lecture-room, and such as pertain to the farm and the shop. Proceeding in this order, we remark that in the mechanical department, beside the usual chemical materials, mineralogical specimens, mechanical and physical apparatus, and mathematical instruments and models, it is desirable to possess a large assortment of models of machinery of all sorts, showing the actual applications of motors and mechanical principles, and illustrating those peculiar and often abstruse mechanical combinations and expedients which have to be resorted to occasionally; also models exhibiting joints and splices, roof construction, &c., and where models cannot be obtained, drawings and photographs thereof; also collections of woods, stones, metals, clay, and other material used in building and manufacturing.

The professors in the agricultural department, besides chemicals, physical apparatus, mineralogical specimens and herbariums, would be

much aided by a class of illustrative models, such as are now made in great perfection in France and Germany.

In the botanical department, models are now made of flowers, the cultivated plants, and grains, on a magnified scale, so that the lecturer can exhibit separately every part of a plant, or of a seed, so as to be distinctly visible to each member of a large class. There are also very useful engravings and photographs of cultivated plants with their separate organs and structure. In addition to these are needed miscellaneous collections, illustrating the materials, processes and products of agriculture and horticulture.

The chair of Veterinary Science should be supplied with a great variety of instruments and models. Almost every part of a domestic animal is now illustrated by models, life size, showing the abnormal, as well as the natural condition of each limb and organ. At Cornell University there is a model of a horse of life size which cost the institution nearly $1,000. It is constructed like a manikin, with every limb and organ complete, and yet capable of being dissected and exhibited in detail. Drawings are also used with advantage in this department.

The department of Zoölogy generally has use for a large museum. In the entomological branch a full collection of insects, useful and injurious, is very valuable.

The chair of technical agriculture is assisted by models of farm buildings, fences, bridges, wagons, implements, and agricultural machines of every sort. Cornell has a collection of 187 models of ploughs, exhibiting all the forms of the plough from the earliest period of history to the present time. The collection cost about $400.

The outside appliances of an agricultural and mechanical school usually consist of a farm and a workshop.

With regard to the latter, it being impossible to illustrate all trades at one institution, the best idea seems to be to exhibit the working in wood and iron, as the leading occupations. If complete, these shops would be well stocked with hand-tools and labor-saving machinery driven by water or steam, as well as materials for working up. The iron department is of course capable of indefinite expansion. The blacksmith's shop, foundry and machine shop represent the three grand divisions of iron work—hammering, casting, and finishing. A large and well-appointed shop is no small affair as to cost.

A farm is the great theatre of agricultural illustration. Familiar as a farm is to every eye, one does not often see a farm properly improved, stocked and managed, as should be the case with a college farm. Every feature should be a model of its kind. A grain and cattle barn should

exhibit the most improved method of housing crops and cattle, of feeding, grooming, and nursing the domestic animals; the horses, sheep and cattle should be of breeds best suited to the State, and their increase properly managed; the implements and machines should be in full supply and of the best patterns; the crops selected, the enclosures, drainage, manuring, ploughing, cultivation, and general management, should be unexceptionable. Experiments should be systematically carried on. Cheese and butter making, tree and fruit growing, gardening, plant houses, and many other things are worthy of attention; and they will all be provided for in the course of time, if the college is so managed as to commend itself to the enlightened common sense of the people.

But of course an extensive and complete establishment like the one described is beyond our reach at present, and the difficult task is ours, of determining what we shall begin with, and how far we shall attempt to go with our means. Prudence readily suggests that the expenditure should be rigidly controlled by the income, and that it would be better to attempt too little than too much. A few things well done will give far more value and reputation than many things poorly done.

But the question recurs—What should be the first thing? The embracing of any opportunity which may offer for purchasing a suitable farm seems to claim the precedence over everything else. The next thing probably should be to provide necessary accommodation for teachers and pupils; then comes an immediate demand for helps in teaching; after which the farm and shops may receive attention.

Before dismissing the plan of instruction, there are two points on which something should be said, viz:—Manual labor, and military tactics.

MANUAL LABOR.

Manual labor by students of technical colleges is a subject on which there is a variety of opinions. A prejudice exists in the minds of some persons against the manual labor system, because some forty years ago the experiment was tried in several American classical colleges of providing workshops wherein students of small means might aid in paying for their education, but the plan was properly abandoned as being an attempt to unite studies and labors which had no natural relations to each other, and to establish an unsound system of economics. But in technical schools there is a direct relation between the studies and labors of the pupils, and the design is not economical, but educational.

There are four sets of views on this subject actually put in practice in schools of this class:

1. Some make no provision for manual labor.

2. A larger number require from one to two hours labor daily, without pay of all the students.

3. In perhaps a still larger number a certain amount of labor is required, and extra work is allowed and paid for.

4. In others all labor is voluntary, and paid for.

The subject is an embarrassing one, and yet the following views seem to be established by experience as well as reason.

In superior schools of applied science, in which the students are expected to become engineers, chemists, and such like, or to have simply the general management of farming, mining, or manufacturing property, the labor feature may be wisely omitted.

But in schools designed specially for those who are to handle tools, actual practice should form a regular part of the course—actual labor under skilled managers. To say that the manipulations and processes of the shop and farm may be learned at home, is to suppose that the home processes are good models for imitation; which, if true, would indicate that there is no need of schools; but home practice is just what needs improvement. There are not only improved methods to be learned, but there is a training needed for the eye and the hand, which has great educational as well as practical value, and which should be conducted with as much system and careful supervision as instruction in penmanship and drawing.

The most troublesome question is as to the regulations under which the labor should be performed. Should it be voluntary, or involuntary? We think it should be required of all without distinction, and at the times and seasons should be as much prescribed as any other part of the course of instruction.

The value of the labor should be taken into consideration in fixing the terms of admission, and not be paid for currently. The question of allowing and paying for *extra* labor is also one of some difficulty. It seems to be proved that laboring even one or two hours a day on the farm may be made very useful to the student and valuable to the institution.

It has been found more difficult to utilize the labor of students in mechanical work; but the problem seems to have been solved at Worcester, Massachusetts. In each of the great wood and iron shops connected with the mechanical Institute at that place, there are a number of skilled workmen who take charge of the students as they come in, find out by experiment what degree of skill each one has in the use of

tools, and put him to work on some part of a job that suits his attainments. The pupil is kept working at that point of advancement until he becomes expert, after which he is promoted to a higher grade of work, and so carried forward according to his aptitude and industry, until before completing the course he may become a thorough master mechanic. The work turned out of that shop has taken the highest premiums at competitive exhibitions. The finished work is all sold, and much of it is done by contract. The shops do not quite pay expenses, and yet the annual deficit is not large.

MILITARY TACTICS.

The military feature offers another embarrassing problem. There is great power in the military system, but as General Lee once remarked—"To be effective, it must be perfect;" that is, not only complete in organization, but backed by military authority and penalties.

The act of Congress having been passed during the war, the clause requiring military tactics to be taught may have been prompted by some intention to establish the Prussian military system over the whole land. But if such an idea ever existed it has passed away, and there now seems no disposition on the part of congress to be exacting with regard to the military feature in these technical schools. In point of fact, the colleges which received the land grant have, with a few exceptions, given no prominence to this feature, and would be glad to omit it altogether.

Still, whilst the law exists, military tactics must be taught in some form. We do not understand that the term "military tactics" covers the whole ground of military science and tactics, but has special reference to field evolutions. Therefore an opportunity given to the students for military drill would satisfy the law. Some of the disciplinary regulations might be usefully adopted, if it should be concluded to board all the students on the college grounds.

The terms on which students shall be admitted is among the first points to be decided. The Board is aware that the act of Assembly requires that a number of students shall be received without charge, corresponding with the members of the House of Delegates. It is for us to decide whether any charges shall be made in other cases. It is hoped by this committee, that the time will come when all our State institutions will be free to the people of the State. But this cannot be thought of at present for this institution, because its income alone could not furnish the needed facilities for instruction; and yet prudence and

propriety seem to dictate the policy of making the fees very moderate. A certain amount of attainment, a good character, and a minimum age, say 15 or 16, will, of course, be required of applicants for admission.

It is taken for granted that the salaries of regular professors will not be inferior to those received at other colleges, and will be paid partly from the annual proceeds of the endowment, and partly from tuition fees.

A LARGER INCOME.

Whilst with proper management we can in due time open our doors and offer to the youth of the State a school well worthy of their patronage, we cannot hope to accomplish all our wishes and purposes in the beginning, and we should cast about at once for an increase of income in order that the college may grow into a fully equipped institution. There is reason to believe that Congress will add to the grant already made, and unless our State proves to be an exception, our wealthy citizens will make donations; but our main dependence is upon the heart of the people.

We have this tremendous argument to back our appeal for an increase of endowment, viz: that this is the first thing the State has ever done in the way of collegiate education for the masses of her people, and even this is but the turning over of a gift from the Federal government. To neglect the special wants of the great producing classes is not only unjust, but exceedingly unwise. It is toward them the vitalizing power of technical education should be most studiously directed, and the forms of education should be so varied that its forces will take effect throughout the entire mass.

The Land-Grant was a recognition by Congress of the claim of the producing classes for forms of scientific education really suited to their wants, and the action of the Legislature of Virginia in creating a separate college was a similar recognition. This action of our Legislature was as wise in policy as it was just in principle, and may be regarded as an indication of the intention of that body to provide whatever may be necessary for its support. We cannot suppose that our industrial classes will be left wholly dependent upon the bounty of Congress for the means of technical education. Day laborers being left out of view, farmers and mechanics constitute the great bulk of our population. There are in Virginia, by the census of 1870, 73,000 farms, which no doubt represent at least that number of farmers (including proprietors and tenants). We have not yet been able to ascertain the number of mechanics in the State, but supposing it to be one-third less than the

number of farmers, we have something like 125,000 white farmers and mechanics in the State, which is within 25,000 of the whole number of white registered voters in 1869.

These facts compared with our educational statistics show where lies the great field for technical education, and furnish a guaranty for the ultimate success of the Virginia Agricultural and Mechanical College.

WM. H. RUFFNER,
Chairman.

J. R. ANDERSON,
W. T. SUTHERLIN,
Committee.

MEETING OF THE BOARD AT YELLOW SULPHUR SPRINGS.

This meeting was held on the 14th of August. Present—Messrs. H. Black (Rector), Robert Beverly, John Goode, Jr., Jos. R. Anderson, Jos. Cloyd, John Cowan, D. C. De Jarnette, W. A. Stewart, W. H. Ruffner, Superintendent Public Instruction, James C. Taylor, Attorney General, and Lewis E. Harvie, President Virginia State Agricultural Society.

Instead of the instruction contemplated in the action of the previous meeting, a Chair of English Language and Literature was established. The following faculty was then elected: Charles L. C. Minor, President; James H. Lane, Professor of Natural Philosophy and Chemistry; Gray Carroll, Professor of Mathematics; Charles Martin, Professor of English Language and Literature. Military Tactics was assigned to the Chair of Natural Philosophy and Chemistry; Modern Languages to the Chair of Mathematics; and Ancient Languages to the Chair of English. The election of a Professor of Technical Agriculture and Mechanics was postponed to a meeting to be held in Richmond on the 7th of January next; and Natural History was assigned to that Chair. At this meeting a Farm Manager will be appointed.

Messrs. Anderson, Taylor, Sutherlin, Beverly and Ruffner were appointed a committee to memorialize Congress in behalf of this institution, and to ask for it a special donation of public land; this committee to act in conjunction with any similar committee that may be appointed by the authorities of the Hampton Normal and Agricultural Institute.

Messrs. Taylor, Goode, Anderson, De Jarnette, Cloyd and Ruffner, were appointed a committee to memorialize the General Assembly of Virginia to pay full interest on the bonds of the State held by this institution.

The Rector reported that $17,500 of Montgomery county coupon bonds had been delivered to him, and that the balance of the county subscription would be paid by warrant on the treasurer of the county.

Mr. Cowan was made a member of the Executive Committee, and appointed agent of the college, and authorized to receive subscriptions in its behalf.

The Executive Committee reported that probably a hundred and thirty students could be accommodated with board and lodging in the college building and in the town of Blacksburg; that the price of table board would be twelve dollars per month; and when a room, bedding, furniture and fuel are supplied, the price would be fifteen dollars per month. Coal abundant at fifteen cents per bushel.

The Faculty was requested to report a programme of instruction and government for the institution to the meeting in Richmond on the 7th of January; and also to report on the necessities of the institution generally.

The report of the Committee on Organization with the abstract of the proceedings of the Board, heretofore ordered to be published in pamphlet form, was adopted as the annual report of this Board to the General Assembly.