SCIENCE

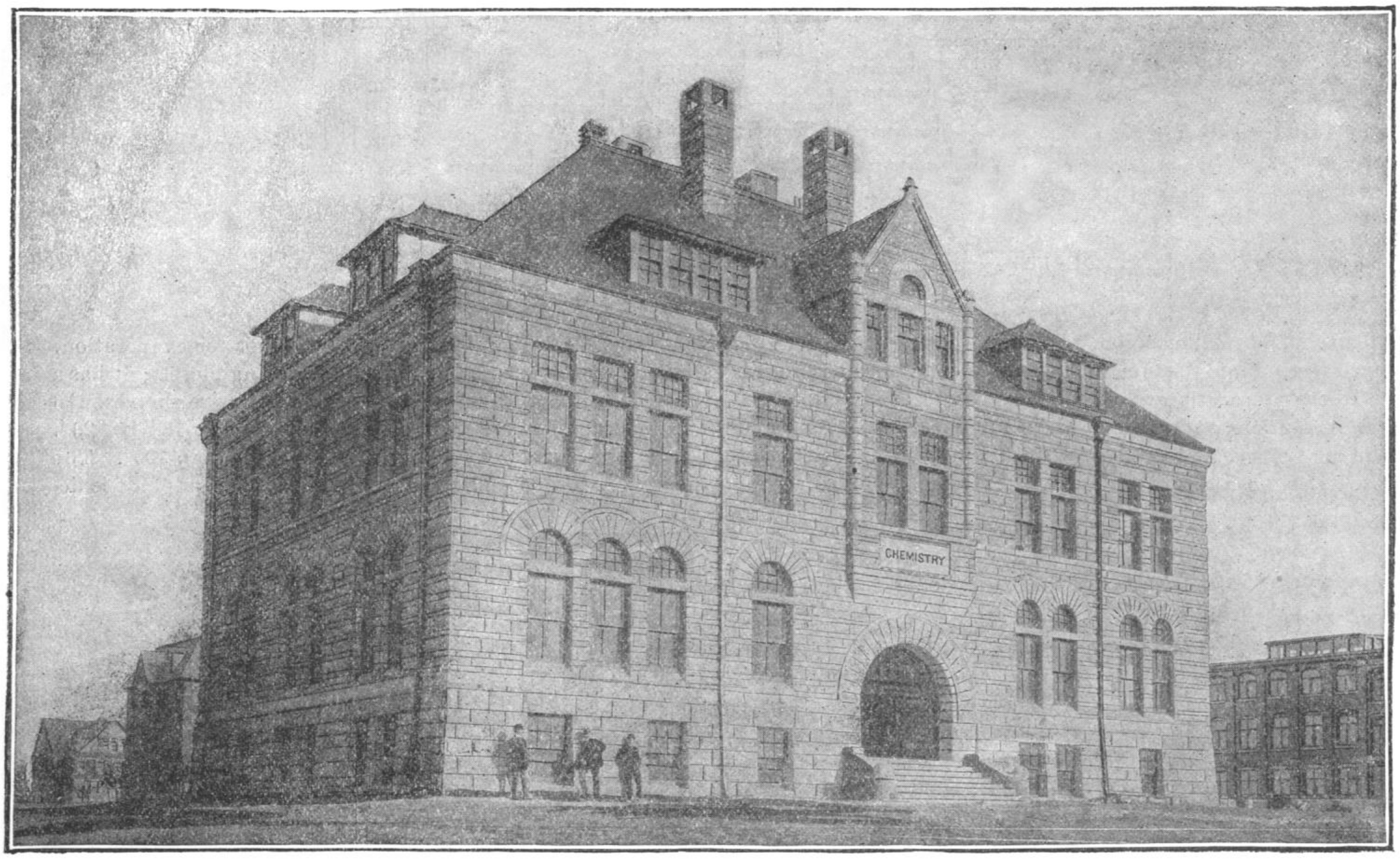
NEW YORK, MAY 13, 1892.

THE NEW CHEMICAL LABORATORY OF THE CASE SCHOOL OF APPLIED SCIENCE.

WITH the rapidly increasing attendance in all institutions of learning, it is hazardous to plan buildings for educational purposes with only sufficient room for present needs or for prospective growth in the immediate future. Every prosperous institution has abundant evidence of this fact in the necessity for enlarging buildings that a dozen years ago or less were regarded as ample in their accommodations, or in the overcrowded condition of those that do not admit of extension. This is especially true of the chemical laboratory, in which within fifteen years the demand for practical instruction has increased several fold. In some respects provision for prospective enlargement is not consistent with the best construction of a laboratory, yet with the necessity of providing for elementary laboratory training of large freshmen classes still rapidly increasing in numbers, it would be unwise not to include ample provision for future growth.

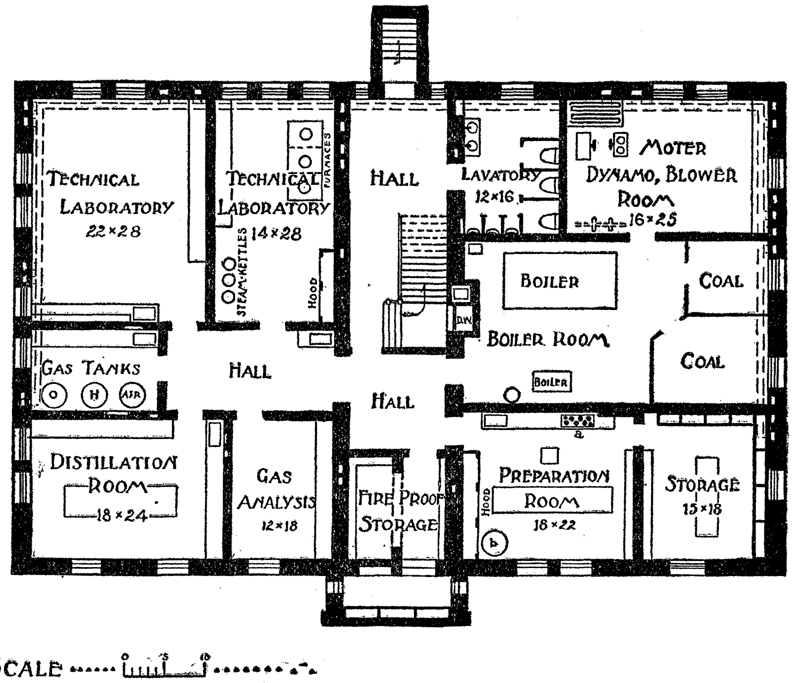
In devising plans for this laboratory, while I felt that it was not good economy to construct a building several times larger than present needs demanded, I was impressed with the importance of providing for the possibility of unlimited extension, especially in the earlier years of a school of science. The building was therefere given a plain, rectangular form, and it was found that extension of the main hall into a wing of any size would not interfere with a convenient arrangement of the rooms for present use.

As shown in the plans two stories are included beside a high basement and an attic floor. Each story is 16′ high, and the attic is the equivalent of another story, through the aid of large dormer windows, leaving still an ample space above for general storage. The basement is 13′ high, and the floor 4′ 6″ below grade. An elevator, capable of carrying a load of several hundred pounds, connects with all the floors above the basement.



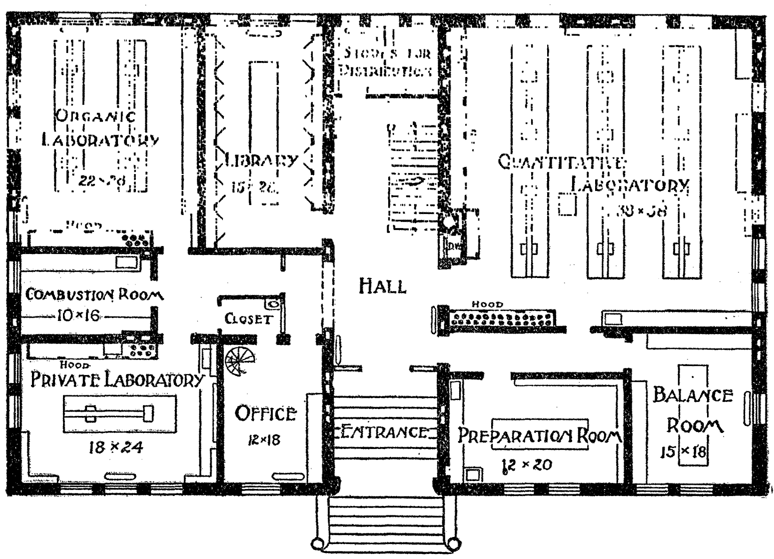
Laboratory Case School Applied Science, Cleveland, Ohio.
Buff Amherst Stone. S. R. Badgley, Architect, Cleveland, Ohio.

The outside walls of the building are of Amherst sandstone, with all inside surfaces of stock brick laid in red mortar, except within the hoods a special form of vitrified brick is laid. The basement floor is of Portland cement throughout, and the quantitative and general laboratories have floors of asphalt laid 1¼″ thick. All flues for hood ventilation are built into the cross-partition walls, the outside wall carrying the inlet flues for room ventilation to the basement, where they are connected by a 14″ iron pipe, shown by the dotted lines near the outside wall, to the blower in the motor room. The position of the three horse-power motor, blower, counter-shaft, and a steam coil for heating the air when necessary are shown in this room. A large tubular boiler supplies steam for laboratory uses, beside heating the building. It is inclosed in brick, and air is brought into the enclosed space through an outside flue and carried to the quantitative laboratory above, which is sufficiently warmed by this means even in the coldest weather without the aid of steam. The smaller boiler is for high-pressure steam, and it is connected into the pipe supplying steam to the laboratories.



BASEMENT.

In the preparation room, on this floor, the janitor prepares solutions and other material in general use throughout the laboratory. A large steam sink, *a*, with holes of sufficient size to admit a three-litre flask, is extremely convenient for making solutions. The tank, *b*, supplies hydric sulphide through lead pipes to the larger working-rooms. The space under the entrance steps is enclosed in masonry and iron doors for the storage of inflammable material. Distillations are conducted on slate tables in a room with the wood-work covered with sheet-iron. For lighting the central hall the doors of the adjacent rooms are glazed. Three gas tanks, each with a volume of 50 cubic feet, supply gases to the combustion-room directly above and to the lecture-room.

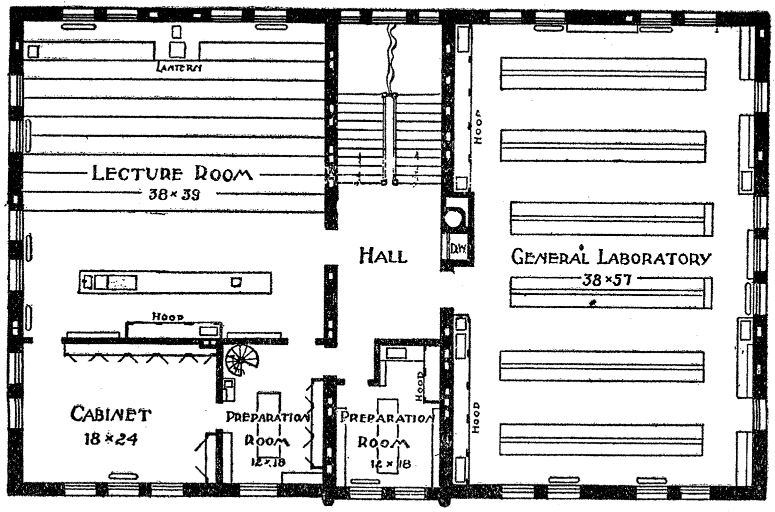


FIRST STORY.

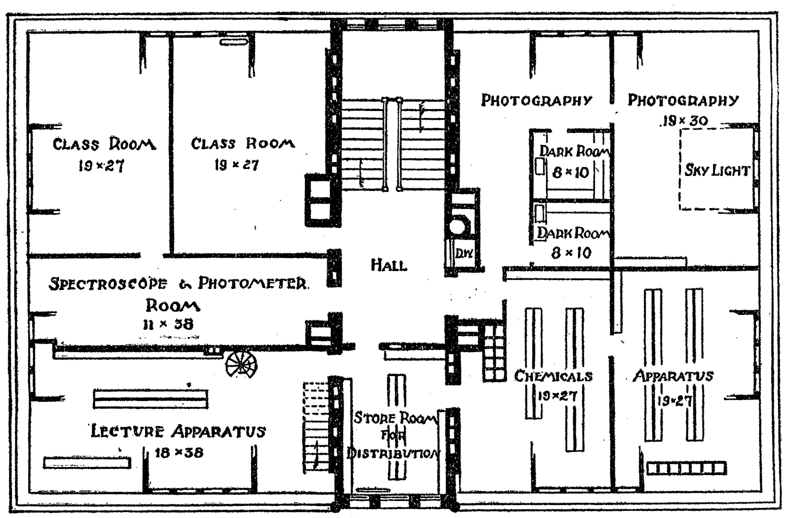
The quantitative laboratory on the first floor has 48 desks covered with porcelain tiles, like the other working tables on this floor. A steam hood has separate cups for evaporation, and the space beneath is enclosed for drying closets; it has a metallic lining with a large steam coil and wire shelves. In the general hood are two copper plates, each 18″ by 20″, above long burners for temperatures higher than 100°. The smaller hood contains the air-baths. Hydric sulphide is delivered from the lead pipe directly beneath a flue-opening. All hoods are glazed throughout with sashes running between a stationary inner and an outer sash, to protect the cord and to extend the efficiency of the hood to the lower level of the running sash. To avoid obstructing the space with pillars, the ceiling of this laboratory is supported on a heavy iron plate-girder thickly covered with asphalt paint. The organic laboratory has accommodations for twenty students, and as in most of the working tables on this floor and the basement there is an abundant supply of steam, water, and waste pipes for distillations and other uses.

The general laboratory on the second story contains ninety-six desks capable of accommodating one hundred and ninety-two students, and the light and ventilation[1] are all that could be desired. At either end of the outside aisle is a case of drawers beneath a table for material in sufficient quantities for large classes, and several shelves contain large bottles for solutions. The blast lamps in this laboratory and in the other principal rooms are supplied with air by a small pressure blower driven by the motor in the basement.

In the lecture-room 200 persons can be seated comfortably. The lecture-table is supplied with gas, water, steam, oxygen, hydrogen, blast, suction, and an excellent draught. In front of the hood are suspended two blackboards, one supporting the other, and a curtain falls from a spring-roller for lantern illustrations. In the rear of the lecture-room are the cabinet for collections and a preparation room, which is connected by a spiral stair with the office and with the room above, which serves for storage of lecture apparatus. The large dormer windows render the rooms on the third floor as serviceable for certain uses as they would be on a lower floor. A large amount of available room is thus secured without extending the outside walls to form a third story. A section of this floor devoted to photography contains two rooms one with two dark closets for students and instructors, the other with a large skylight for general work. Extension of the roof without interruption affords sufficient height to the flues to ensure good draught. The tops of the flues are eighty feet from the basement floor. Within the space enclosed in brick for the elevator, a stand-pipe is carried to the attic floor, with an opening, on each story, to which is attached a hose of sufficient length to reach every room.



SECOND STORY.



THIRD STORY.

Excavation for this building was begun June 1, 1891, and by the middle of February, 1892, all the working-rooms were in use. In the preparation of the working-plans, the architectural features, and in the substantial construction the trustees were fortunate in securing the skill, good judgment, and faithful service of the architects, Messrs Coburn and Barnum. Of the illustrations in this paper, the excellent view of the building is due to the courtesy of the Cleveland

[1] A description of the ventilation of this laboratory will appear in the American Journal of Analytical and Applied Chemistry.

Stone Company, who furnished the Amherst stone, and the reproductions of the floor plans to the kindness of the architects.

Charles F. Mabery.

THE STATUS OF EXPERIMENTAL AGRICULTURE.

The average farmer is eminently conservative when about his routine of work. He dislikes innovations as to methods and distrusts ways and means not clearly "practical." This obtains naturally from his life work. His maintenance depends upon the precarious lives of plants and animals, which in turn, in so far as they as beings are concerned, thrive or perish according to the fiat of life principles, of the working conditions of which, he, in common with the rest of humanity, knows comparatively little. Experiments are costly on the farm, time is cash in hand, and new methods or added work, either apparent or real, must be backed by necessity or success, else the usual method or condition will remain unchanged — "The good old way, good enough."

Because of this general conservatism, held principally in position by the abstruse nature of the principles of life, principles and practice of agriculture advance to place, gain permanence of character, recognition slowly, indeed, in comparison with development of other occupations, even with that of the adoption of farm conveniences, would at first thought seem almost at a standstill, so that, ease of work, convenience, better machinery and appliances, yet seem to leave the yield of labor much on an old-time basis.

This is the dark side of the prospect of agriculture; that, after all the years of man's efforts on the soil, virgin lands still predominate in yield, and regions once prosperous are no longer up to the standard of the new. Belief that such should of necessity have occurred, or that the present new shall eventually become as the old, need not here be disclaimed,— conditions differing much from those of old militate against such retrogression. The true agriculturist no longer rushes blindly along with or against working principles of nature, — taking all or getting nothing according as her resources yield to methods used, — but stands in many aspects master of principles which, under rational control, constantly tend toward lasting improvement, greater returns in every field of labor.

Aside from that which accrues from rapid general enlightenment, many factors unite in this country to place principles of agricultural pursuits upon a higher plane, amongst which may be named the rapid occupation of available wild lands — the removal of a strong incentive to those of most changeful mood as to locality. But by far the most hopeful aspect, the condition most distinctive of agricultural development, is the recognition of the idea of experiment and the value of such effort upon the farm. Many, indeed it may be said almost all of the most enlightened, successful farmers spend a great part of their individual time in work of an experimental nature, such work as a few years since would have been spoken of as "puttering boy-play." While, as previously noted, agriculture as an occupation has in general, from the beginning, made less definite systematic advance as to principles of action than that noted in other professions, this can scarce be said of its later years. Indeed, it is hardly to be questioned that in the last decade greater progress has been made in agriculture as a science, more definite principles of procedure gone into test than in all other occupations of the country. Never before has the farmer been so willing to accept, try new methods, acquiesce in scientific theories and demonstrations; questions that never broke through the cloud of sadness mantling the face of the fate-beridden agriculturists of yore are handled, discussed, and worked upon in the light of experimental effort, often with results most pleasing and not without pleasure even in case of economic failure; for, with men who compile results, negative ones are no longer considered as not to be counted. Questions concerning effect of crop on soil, soil on crop, crop on that which follows are in test by every cultivator of enterprise; stock-breeding is made to follow definite laws of development, desert lands made to yield, and diseases of plants and animals, that of old were pests sent by chance or the Evil One, not to be availed against, meet a man actively prepared to resist according to the dictates of reason and direction of those who have previously succeeded or may authoritatively advise.

While the average farmer is thus markedly in an experimental mood, willing to test as is best known, few have time or bases of fact for initiation of experiments. Herein lies the legitimate work, duty of the experiment station, and with wise provision of the general government, every State and Territory in the country is possessed of such an institution. From the first establishment of these institutions, the impetus given to proper agricultural investigation has been most noteworthy. While more has generally been expected of them than has been forthcoming, yet in this connection it is to be remembered that experimental facts are established only after a proper lapse of time. Nevertheless, much of the work, as shown in the published reports and bulletins, is more fragmentary and less indicative of efficient experimental effort than an enthusiast would wish.

There are numerous reasons for the unexperimental indication of many station publications pertinent to anyone conversant with such work. But, aside from all such apparent elements as may vex the ultra-scientific mind, none bears heavier upon the future usefulness of the experiment station than the varying ideas within the stations themselves as to the true mission of the experiment station. Is it primarily educational for the dissemination of facts not commonly known, or is it experimental — to delve after that which is unknown? Among the stations, types of both are to be found, but many are hybrid. Few publications outlining attempts at pure experimentation are open to harsh criticism, but many most lamentable conglomerates appear as the result of the other two ideas. Perhaps attempt at methods "practical" and writings "popular" is an *ignis fatuus*.

Closely associated with this indecision of purpose is the point of how much should be undertaken. In general, it may be said of the individual stations that too broad a field is attempted, considered from the standpoint of the whole force, and with few exceptions with reference to individual work. Only such an expansive (more properly, perhaps, filling) effort, or a disregard of the literature of the subject, could result in a *résumé* upon "Wheat Rust (*Uredineæ*)," appending a recommendation of same preventive applied to smuts of small grains. In this connection remarks upon the effect of unfortunate recommendations upon experimental ardor of the farmer are unnecessary.

With the possible exception of experiments directly relative to the soil, results of scientific worth reached at any one station will commonly be found generally applicable. In order to attain something like systematic effort, and to prevent useless, costly repetition, it may yet be found effectual, necessary, to league the experiment stations of the country. Each station could support one or two departments of inves-