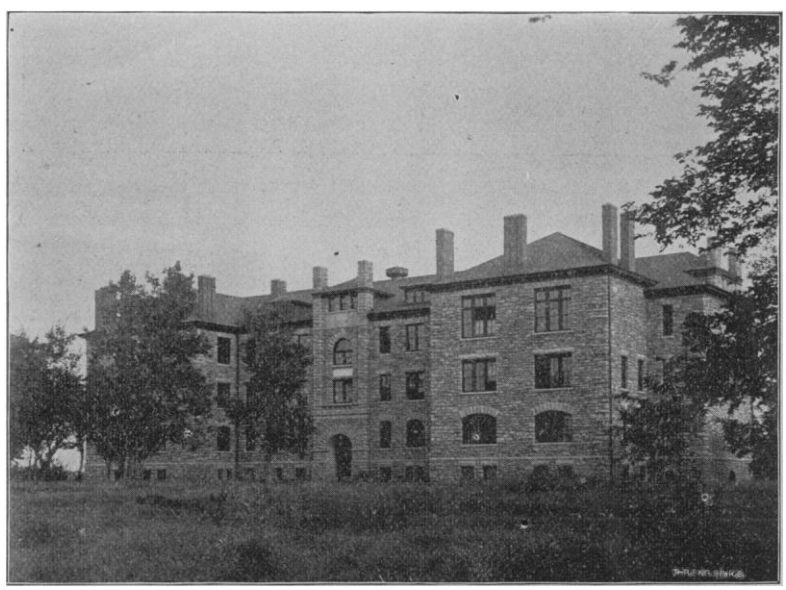
THE NEW CHEMICAL LABORATORY OF THE UNIVERSITY OF KANSAS.

As a new laboratory has been constructed during the past year at Lawrence, to accommodate the departments of chemistry and pharmacy, some facts in regard to the building, and the appliances furnished, may be of value to others who contemplate erecting buildings for this purpose.

The material used, as shown in the cut, is native limestone, laid in horizontal courses with recessed pointing. A large portion of this was quarried on the site, as the upper courses of rock were removed in order to obtain a solid foundation on the lowest of a series of ledges. Some of the courses in the excavation were of light stone, while others were colored yellowish by iron oxid; the light rocks are used for the outside layers, except on the back side, and the yellow rocks for interior filling. For trimmings, a limestone, known as Jefferson County, which occurs in ledges something over a foot in thickness, within a few miles of the city, is utilized.

The plans were drawn by J. G. Haskell, architect, and the director of the laboratory with the assistance of his colleagues, after personal inspection and study of many of the largest and best appointed chemical laboratories in the country. The building is plain and massive in construction, and while very little was expended for adornment, no expense was spared to secure the best practical conditions for chemical and pharmaceutical work, according to modern methods.

The length of the building is 187 feet and the greatest breadth 70 feet, with a central portion devoted to offices, private laboratories, etc., and two wings for larger laboratories and lecture rooms. Below the basement floor there is a plenum four feet in depth, and as the building is upon the side of the hill, three sides of the basement are above the ground, and well lighted. Each of the three other stories is twelve feet in height, and the attic is commodious and well lighted.

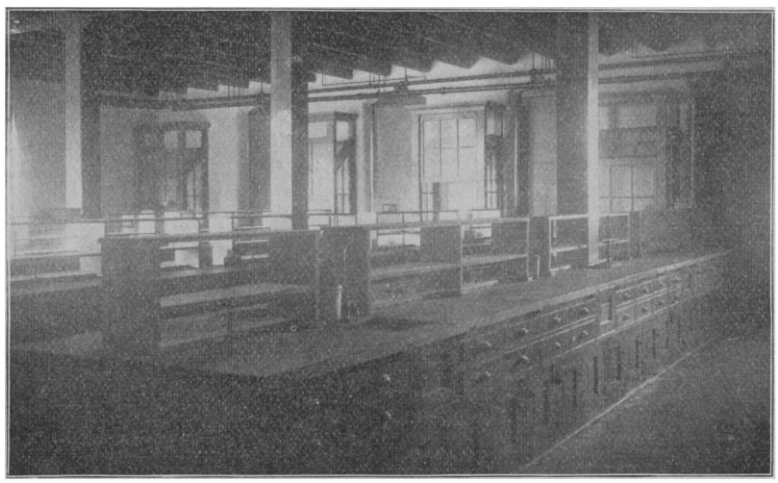


Chemical Laboratories. South Front.

As the so-called mill construction is used

throughout the building, the joists and ceilings are finished with shellac and hard oil, and the double floors, which are made of one

the central portion of the building, as shown in the floor plans, is a four-foot brick wall, which carries the heating flues, and some

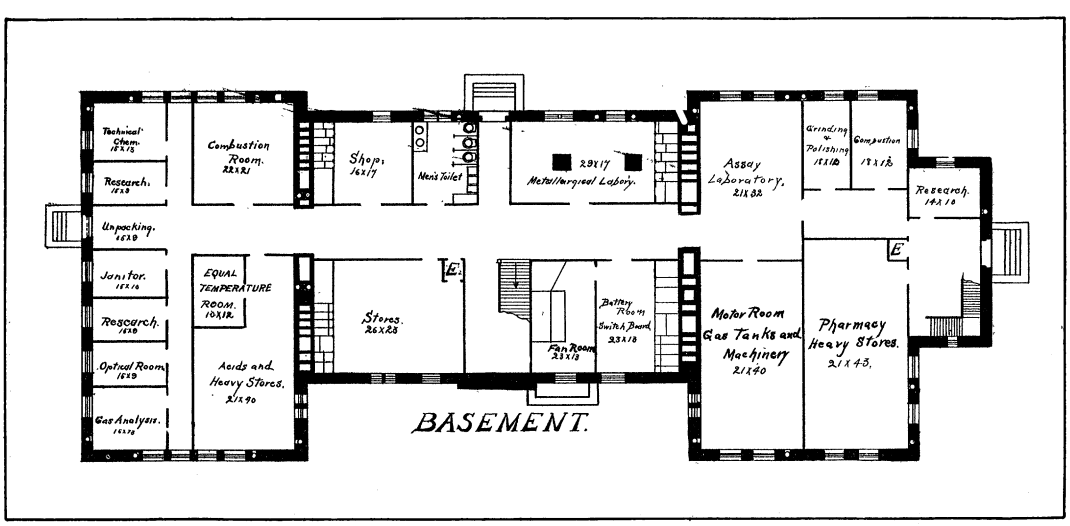


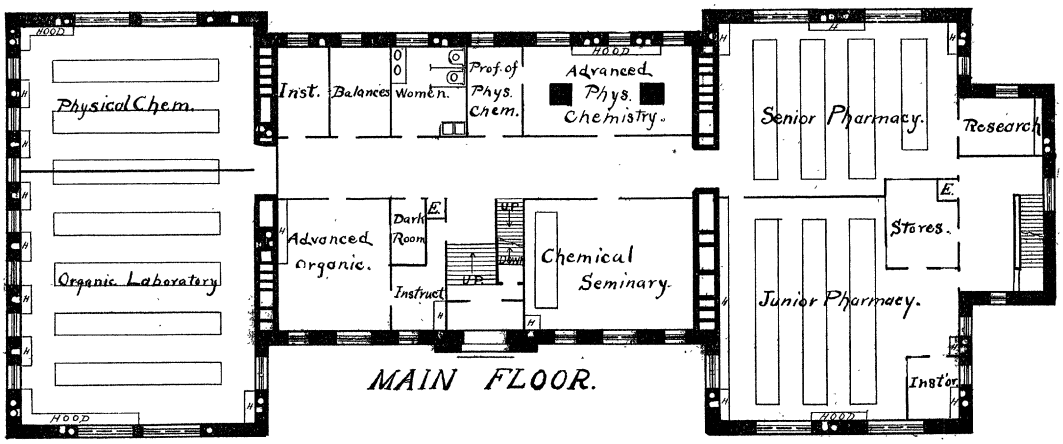
In the Qualitative Laboratory.

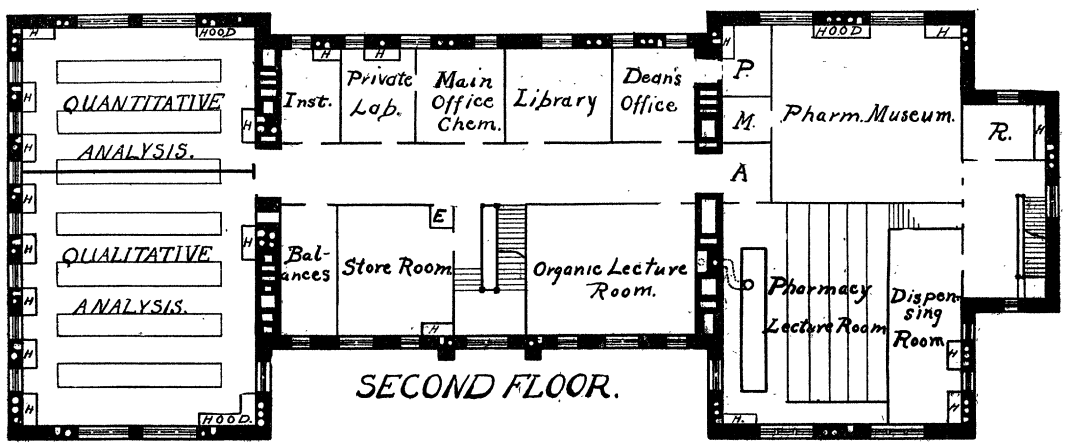
and one-fourth inch hard pine, are separated by a half-inch air space and tarred paper. The corridors are twelve feet wide, and the walls, instead of being built of stone, are of wood, with the spaces between the studs 'nogged' with brick. The building is plastered with 'cement plaster.' At each end of

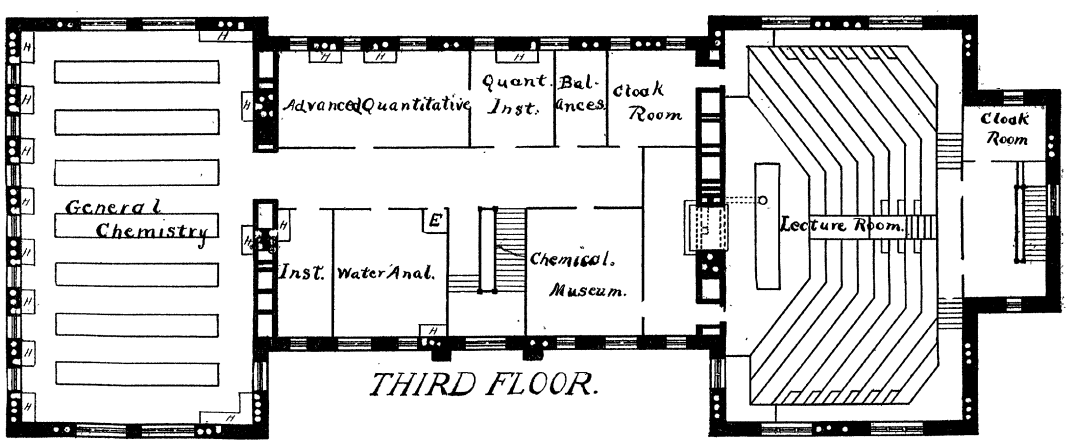
ventilating flues, where there is space available for them.

The system of heating and ventilation, which has been arranged with special care, includes a fan blower driven by a 11½ K. W., direct current, electric motor; primary coils having 1,900 feet radiating sur-




Physical Chem.
Inst.
Balances
Women.
Prof. of Phys. Chem.
Advanced Phys. Chemistry.
Senior Pharmacy.
Research
Advanced Organic.
Dark Room
Instruct
Chemical Seminary.
Stores.
Organic Laboratory
Junior Pharmacy.
Instr'or
MAIN FLOOR.


QUANTITATIVE ANALYSIS.
QUALITATIVE ANALYSIS.
Inst.
Private Lab.
Main Office Chem.
Library
Dean's Office
P.
M.
A
Pharm. Museum.
R.
Balances
Store Room
Organic Lecture Room.
Pharmacy Lecture Room
Dispensing Room
SECOND FLOOR.


General Chemistry
Advanced Quantitative
Quant. Inst.
Balances
Cloak Room
Inst.
Water Anal.
Chemical Museum.
Lecture Room.
Cloak Room
THIRD FLOOR.

face through which the air is drawn and 'tempered'; and secondary coils at the base of the brick walls above mentioned. By means of dampers, which are operated from the several rooms, either tempered or heated air can be discharged into rooms, and thus an abundant supply of fresh air is always assured. This system is completed by removing the foul air from the rooms by means of nine-inch circular tiles connected with the hoods, which are placed between the windows,and indeed at every other point where there is available wall space. There is an eight-inch opening near the bottom of the hood, and a five-inch opening near the top, and the tiles terminate above the peak of the roof, each hood being ventilated by an independent flue, and those flues are grouped into brick chimneys. The construction of the hoods may be understood from the cut of the interior. There are no pipes for gas, water or waste in the hoods, as these are all carried outside and below the floor of the hood.

Referring to the floor plans which are here shown, it will be noticed that there is a separate entrance in the east wing to the pharmacy laboratories on the first floor, the laboratory for pharmacognosy, the pharmaceutical lecture room, with preparation room attached, and the model drug store on the second floor. This same entrance leads to the large chemical lecture room on the third floor, which is arranged to accommodate 325 students. Attached to this lecture room, is a commodious preparation room, and communicating with it is also a chemical museum.

In the west wing are situated the large laboratories of the department of chemistry; on the top floor, that for general chemistry, on the second floor, those for qualitative and quantitative analysis and on the first floor, those for organic and physical chemistry. Each floor accommodates 224 students, one-half working at a time. The basement will be used for special research rooms, assay and metallurgical laboratories, and store rooms.

The offices of the professors of chemistry and of pharmacy and their private laboratories, are on the second floor, so as to be as convenient as possible to all parts of the building, and on the same floor is a library, a balance room, a store room for the dispensing of chemicals and apparatus, and a recitation room which will accommodate seventy-five students. An elevator connects the basement stock room with the store room, and extends to the attic, while a similar elevator at the east end accommodates the pharmacy department.

On the first floor is a smaller laboratory for advanced organic chemistry, with a private laboratory for the instructor, a balance room, lavatory, dark room, a smaller laboratory for physical chemistry, with an office for the instructor adjoining, and a seminary room.

The students' tables in the main laboratories are substantially built of yellow pine, paneled, full one and a-quarter inches thick. Each student is provided with a locker and two drawers, all fastened with a rod which passes through the drawers and is secured by a padlock. At the right or left of each student is a deep sink, twelve inches by thirteen, with a pantry cock for delivering water. Underneath a low bottle rack, which stands on the table, a sufficient number of four-way gas cocks are placed. The panel under the sink is movable, and in this opening the gas, water and waste pipes are brought up through the floor. As the gas pipe is led in a groove along the table under the movable bottle rack, every pipe is easily reached in case of a leak.

The two-inch table top is stained black with an anilin dye, which is not readily acted on by acids or alkalies.

Since the large laboratories are placed one above the other, they can be supplied

by the same system of pipes, and the drainage of the sinks is simple and not liable to get out of order. The drain pipes connect with four-inch delivery pipes on each side of the room, by sanitary T's, and these discharge into soil pipes in the corners. All the drainage is thus taken from the building by four pipes provided with traps, with an additional sewer pipe, of course, to drain the lavatories.

The plan of the building also provides for a system of high pressure steam pipes from the university engineering shops, for blast and vacuum pipes for each room, and for distilled water to be prepared in the attic by boiling water with the high pressure steam. The distilled water is then conveyed to the different laboratories by means of block tin pipes.

There has been expended upon the building the sum of $55,000, leaving some of the less important rooms unfinished, and the furnishings in others incomplete. It is estimated that when the building is completely furnished, as the plans provide, the total cost will be about $80,000.

In the construction of this laboratory no great originality is claimed, but the effort has been made to combine the best features of several of our most modern buildings, as far as this could be done at moderate expense. So far as tested the arrangements for heating and ventilation, perhaps the most important points in laboratory construction, which have some novel features, seem to be very effective. It is believed that greater utility can with difficulty be secured anywhere at the same cost.

E. H. S. BAILEY.

SCIENTIFIC BOOKS.

A Treatise on the Theory of Screws. By SIR ROBERT STAWELL BALL, LL.D., F.R.S., Lowndean Professor of Astronomy and Geometry in the University of Cambridge. Cambridge, The University Press; New York, The Macmillan Company. 1900. Pp. xix + 544, quarto.

Ball's famous work was first given to the world in 1876; later (1889), in a German treatise edited by Gravelius with Ball's cooperation and additions by the editor. Both of these having become inadequate, the present monumental publication, containing a systematic presentation of the present state of knowledge on the subject, was undertaken and completed by the original author. The theory of screws in relation to rigid dynamics begins, on the one hand, with the kinematic theorem of Chasles, that any displacement of a rigid body may be reached by a translation along a definite line called the central axis, and a rotation around it; and on the other hand with the dynamic theorem of Poinsot, that any number of forces or of torques actuating a rigid body in any way may be reduced to a single force and a single couple (collectively a wrench), with the axis of the latter parallel to the direction of the former. The reasoning thence is naturally along the lines of modern geometry or of quaternions, for a screw is a linear magnitude with a definite unit called pitch (advance per radian) associated with it. A twist thus bears the same relation to a rigid body that a vector does to a point. Hence the reader wishing to derive full advantage from Ball's great treatise must be familiar with the modern treatment of geometry. A good account of Ball's theory is given in Schell's 'Theorie der Bewegung und der Kräfte' (Vol. II., Chapter VIII.), as well as in Routh's 'Treatise on Analytical Statics.' However, such is the lucidity of Ball's style, that the reader who knows only the ordinary dynamic methods will find the book accessible somewhere in almost all parts except those specially devoted to higher geometry.

The chapters follow an orderly development: After the fundamental principles are laid down in the first five chapters, equilibrium, inertia, potential, harmonic motion are successively discussed in the four chapters following. Thereafter the six orders of freedom are treated consecutively in nine chapters. The eight remaining chapters deal with the higher development of the subject in ordinary as well as in non-euclidean space. The generality of the methods