

### THE CONNING TOWER OF THE GUNBOAT "HELENA."

The "Helena," recently ordered to Key West, is a light draught unarmored steel gunboat, one of two sister ships, contracts for which were placed with the Newport News Shipbuilding and Dry Dock Company. The ship was especially adapted for service on the rivers of China, and was originally intended for the Asiatic station, whither she was proceeding by the Mediterranean route when directed to remain at Lisbon until further orders. There were at that port also the "San Francisco" and the "Baneroff," the three vessels composing our European squadron, when, on March 12, the Secretary of the Navy ordered the "Helena" and the cruiser "Baneroff" to Key West. The "Helena" left Lisbon on the 14th of March and reached Funchal, Madeira, on the 16th. Especial interest has been attracted to the movements of these vessels from the fact that the Spanish torpedo boat flotilla sailed from Cadiz on March 13, for Porto Rico and Cuba.

The "Helena" is 250 feet 9 inches long on the load water line, with an extreme breadth of 40 feet  $\frac{1}{4}$  inch, and draws 9 feet of water. She is driven by twin screws, actuated by vertical triple expansion engines, which give her a speed of 16.8 knots. Her complement of men is 10 officers and 165 men. Her main battery comprises eight 4-inch rapid firing guns. Her secondary battery comprises four 6-inch and four 1-inch rapid firing guns, 2 Colts and 1 field gun. She carries a fighting mast of very peculiar type, as it carries a conning tower some 40 feet above the water line.

The ship was always designed to be available on the rivers of China. While she was being planned a Japanese officer happened to see the plans and he suggested the utility of a conning tower of sufficient elevation to overlook the banks of the Yellow River of China, the Yang-tse-Kiang. These banks are so high that they exclude the view of the country from those on an ordinary ship's deck. The Navy Department acted on the hint and our cut shows the result.

The fighting mast is composed of an outer and inner tube. The outer tube is 6 feet, the inner tube is 2 feet in diameter. A spiral staircase winds around the inner tube and gives access to the conning tower. Immediately below the lower top and partly supporting it is the tower.

This is carried on a sort of sponson on the mast. It contains a steering wheel and all appliances for communication with the different parts of the ship. The windows have hinged shutters with small openings. The metal of the conning tower is but  $\frac{3}{8}$  inch thick. In it, from a height of nearly 50 feet, the commanding officer can overlook the obstacle presented by the high banks of the river, and can observe the enemy's actions to great advantage, should an inclination be shown to attack the ship.

The inner mast tube rests upon the berth deck, its lower open end projecting a few inches below the same. Thence it runs to the upper top. It contains an ammunition hoist. Seven and a half feet above the berth deck is the main deck, and on this the outer 6-foot mast tube is carried. Above the upper deck the mast passes through the chart house and pilot house and above all this comes the conning tower. The after portion of this is coincident with the 6-foot mast tube. The tower has an extreme width of 6 feet. Its length fore and aft is 10 feet.

Upon its top is the lower fighting top, in plan a circle of 14 feet diameter. Its weight is partly carried by the conning tower. Access to this top is had by foot rounds attached, ladder fashion, to the outside of the 2-foot mast tube. The spiral stairs stop when they reach the floor of the conning tower. The 2-foot tube, still rising, carries the electric light top, and above this a fighting top, a 6-foot circle, with a 10-foot ring bracketed above the top and concentric with it. From the center of the upper top the signal pole rises nearly 28 feet further.

### COLUMBIA UNIVERSITY.

Morningside Heights, whose lofty plateau is crowned by the stately buildings of Columbia University, is undoubtedly the noblest site that could have been chosen for the future home of this historic seat of learning. Nature and art have conspired to render the spot at once commanding and picturesque, and history has enriched it with memories which will forever appeal to the hearts and stimulate the patriotism of the alumni who throughout successive generations will frequent the halls of New York's famous University.

The new buildings of the University will form the central and dominant group of a collection of noble edifices, academic, ecclesiastic and commemorative, which will render the Heights, architecturally speaking, the Acropolis of New York. The imposing pile which forms the home of the college library looks down upon the great metropolis of the New World with something surely of the same pride with which the Parthenon of old surveyed the ancient Athenian city.

We have spoken of the historic associations of the site. It is scarcely necessary to remind the reader that the buildings stand upon the ground where the battle of Harlem was fought on September 16, 1776, as record-

enced many of the vicissitudes of the revolution, and did duty as both a barracks and a hospital. On May 1, 1784, the State Legislature passed "an act for granting certain privileges to the college heretofore called King's College, for altering the name and charter thereof and erecting an university within the State." The college now took the name "Columbia." In 1857 the college moved to the buildings purchased from the Institution for the Instruction of the Deaf and Dumb, situated on Madison Avenue, between Forty-ninth and Fiftieth Streets. These premises were enlarged and improved from time to time during the next forty years, until the year 1897, when the University removed to the present commodious site on Morningside Heights.

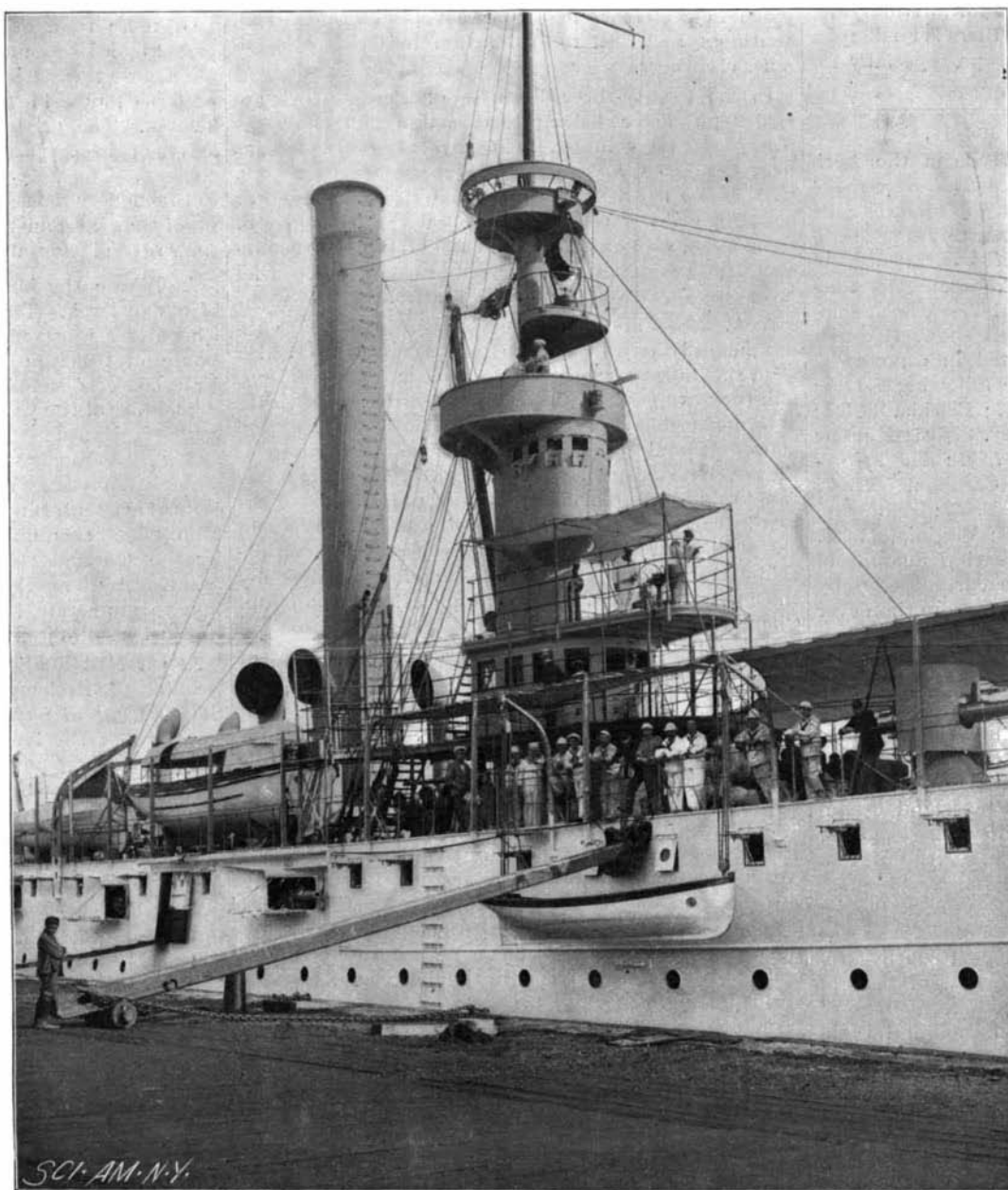
The University grounds are bounded by One Hundred and Twentieth Street and One Hundred and Sixteenth Street on the north and south, by the Boulevard on the west and Amsterdam Avenue on the east, and they comprise some seventeen acres of land. The southerly ten acres of the ground are level, standing about 150 feet above the Hudson River, and it is here that the buildings of the University are located. The central and most imposing building of the group is the Library. It is approached from the south by a vast court 375

feet in width and 200 feet deep. From the court two flights of steps lead to the general level of the central and side courts of the buildings, and from this a noble flight of 22 steps carries the eye up to the great portico of the Library building. This superb structure, which is the gift of the president in memory of his father, Abiel Abbot Low, was erected at a cost of \$1,250,000. It is built in the form of a Greek cross and the style is pure classic. The extreme width of the building is 192 feet and the height to the summit of the dome is 135 feet. The basement is built of Milford granite and the building above this is of Indiana limestone.

Entrance is had through a lofty portico supported by ten massive but symmetrical Ionic columns, whose largest diameter is 4 feet and their clear height 35 feet to the top of the caps. In the frieze of the cornice is inscribed "The Library of Columbia University," and the dates 1754 and 1897, and in the large panel above are inscribed the leading historical facts which we have already mentioned in this article. On entering the vestibule one gets the first glimpse of the great rotunda of the reading room, beyond the massive pair of Connemara marble columns which are seen to the left in our picture of the hallway or corridor. These two columns alone cost \$10,000, and they are built of the largest blocks ever turned out at Connemara, the weight of each column being 25 tons. Indeed, it was only the unavoidable delay in furnishing the marble that

prevented the use of this material for the sixteen columns which support the galleries in the rotunda. The main reading room beneath the dome is octagonal in plan, the short diameter being 75 feet and the longer diameter 85 feet. The four shorter sides form the piers for four great semicircular arches of 50 feet span which assist in carrying the dome. In the arches are large semicircular clerestory windows which serve to light the interior. Below the springing of the arches are the galleries, whose inner support consists of sixteen extremely handsome dark green marble columns. These columns, as well as those in the vestibule, are surmounted by capitals of solid bronze, each of which weighs nearly half a ton and is heavily plated with gold. The lower half of a set of these columns is shown in the bird's eye view of the reading room. The railing of each gallery is provided with four pedestals for the reception of classic statuary. A statue of Demosthenes is already in place, and in the same bay will be others of Pericles, Cicero and Julius Cæsar.

The dome is a meritorious piece of constructive work. It consists of an outer dome of brick and limestone and an inner false dome of steel framing and plaster. The outer dome is struck on a 52 foot radius. It is 4 feet thick at the springing and tapers in thickness to 9 inches at the crown. The thrust of the dome is taken



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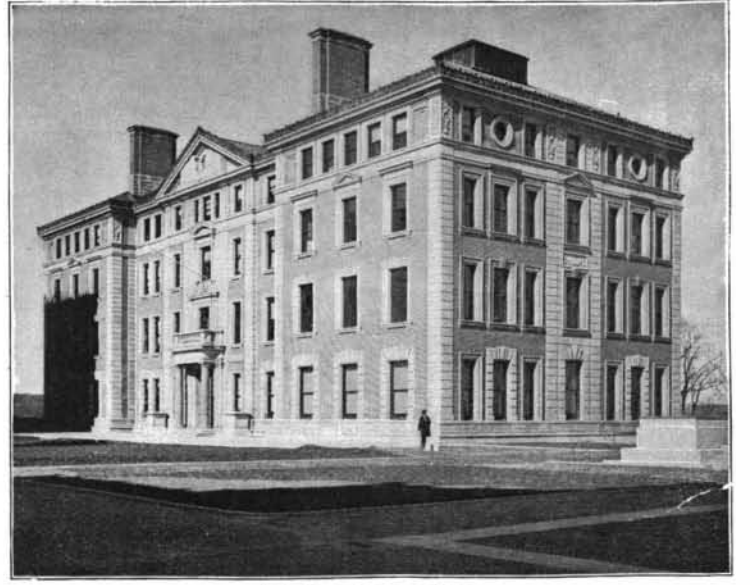
ed in a dispatch from General Clinton to the New York Convention, announcing the success of the American troops. The facts are recorded on a tablet which has been placed on the walls of one of the college buildings.

The foundation of Columbia College dates back to the year 1754, and one of the most treasured relics in the Library building is the original college charter. This is preserved in a glass case let into the wall of the trustees' room, at the left of the fireplace, just below the portrait of William Samuel Johnson, who was president of the college from 1787 to 1800. The panel in which it is contained will be noticed in our illustration of the trustees' room. The portrait above the fireplace is that of Samuel Johnson, the first president, who controlled the destinies of the college from 1754 to 1763. The larger portrait to the right of the mantel is that of Dr. Barnard, who occupied the presidential chair before the present incumbent, Mr. Seth Low. The first building occupied by the college was located on what was known as King's Farm, and King's College, as it was called, was erected on that portion of the farm lying on the west side of Broadway between Barclay and Murray Streets, the grounds reaching to the Hudson River. It was described at the time as being "in the skirts of the city."

The new college, which was occupied in 1760, experi-



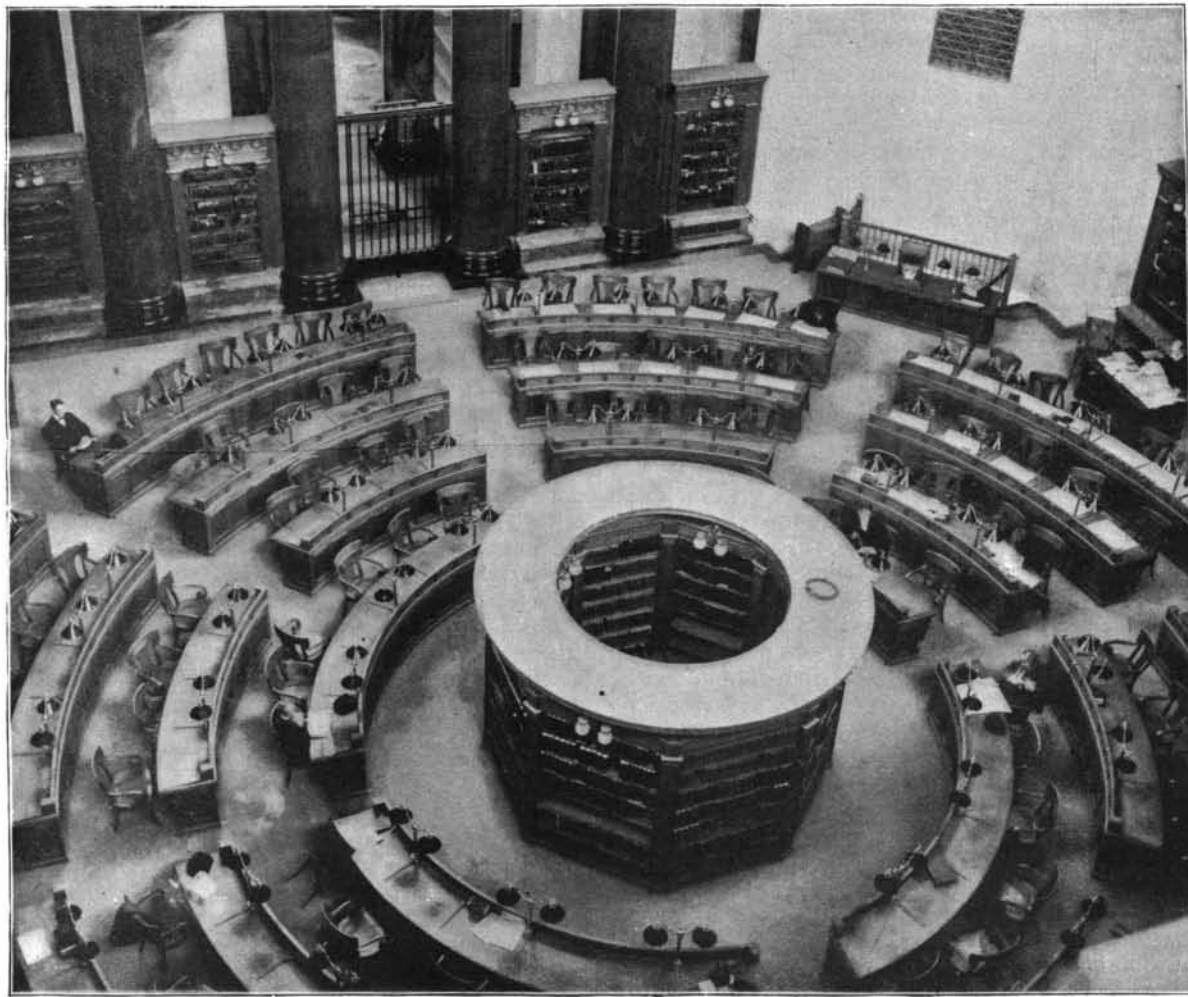
TRUSTEES' ROOM.



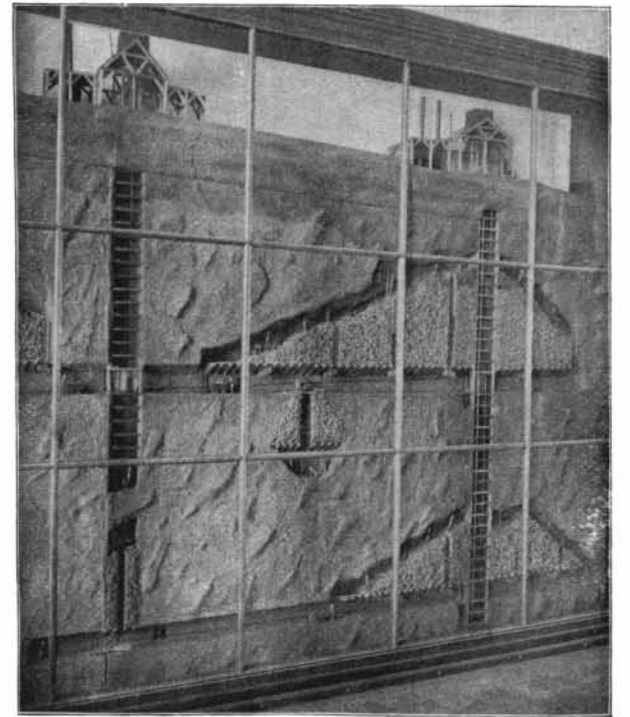
HAVEMEYER HALL.



PROF. KEENER IN HIS STUDY.



READING ROOM, LOOKING DOWN FROM THE GALLERY.



MINING ENGINEERING—MODEL MINE SECTION.



THE AVERY TABLET.



HALLWAY. LIBRARY.  
COLUMBIA UNIVERSITY.



LAW READING ROOM.

by two great bars or straps of steel 1 inch in thickness by 12 inches wide, and the tendency to deformation is also resisted by the weight of several encircling steps of heavy masonry. About 16 feet below the dome proper is a wonderfully light false dome which forms the ceiling of the rotunda. The ribs of this dome consist of 2½ inch inverted T-irons spaced 4 feet apart at the springing, upon which are laid 1 inch by 1 inch angles and a covering of iron lathing. The plaster is laid directly on the lathing, and the ceiling thus formed is tinted a deep blue.

The lighting of the upper portion of the rotunda is accomplished by a large suspended "moon"—a plain wooden sphere painted white. This is illuminated by powerful concealed projection lanterns, and the effect is a soft reflected light thrown without shadows into the dome and the upper galleries of the rotunda. This method of illumination will be treated of in a subsequent article.

By reference to the illustrations it will be seen that the reading desks are arranged concentrically about a central circular book rack. Book shelves also fill the spaces between the columns and the walls of the four galleries. The volumes in these shelves will be chiefly reference books. Others are stored in the various rooms in the wings of the building, and the bulk of the library is in the great stack room in the basement below. Altogether, provision is made for 1,000,000 books.

It is impossible within the limits of this article to refer to the various divisions of this noble building in detail, but special reference must be made to the Avery Architectural Library, in the east wing, and the Law Library, in the north wing on the first floor. Each of these rooms measures 50 feet by 65 feet. The west wing is occupied by the periodical room, the catalogue and delivery room, and on either side of the vestibule are the trustees' room and the president's public office.

The law school has 360 students in attendance and its library contains some 25,000 volumes. It occupies the whole north wing. One of our illustrations shows the dean of the law faculty, Prof. William A. Keener, in his private study. In addition to the law library this school has at its service a lecture room seating 255 students, "club courts," a "social center" room and various studies and smaller rooms. The schools of philosophy and political science are also located on this floor. Mention must be made of the "seminars," which are large book stack rooms, which by sliding doors can be split up into smaller rooms, each room connecting with its own set of stacks. The third floor contains two lecture rooms of 188 chairs, one of 240 chairs and seven smaller lecture rooms of from 35 to 58 chairs.

Before leaving the Library we must speak of the unusual excellence of the furnishings, an excellence which characterizes the whole group of buildings. These are, without exception, of the best quartered oak and they are remarkable alike for their solidity, good taste and beautiful wax finish.

Next in importance to the Library Building and exceeding it in size is the truly enormous University Building, which is situated at the point where the grounds begin to dip toward Manhattan Valley on the north. It is only partly built, the basement and sub-basement alone being at present erected. When it is completed, it will be the largest university building in existence. It will cover a plot of ground 180 feet in width and 260 feet in length, and will be rectangular in plan, with a semicircular northern end. The sub-basement will contain a semicircular swimming pool 100 feet in diameter and 9 feet deep in its lowest part. The area surrounding the pool will be paved with marble and the floor of the gymnasium above will be supported on two concentric rows of massive pillars of Vermont marble. The floor of the bath, the diving platform and the walls will also be in the same material. Behind the swimming tank will be smaller bathrooms and a rowing room in which to give the crews winter practice.

On either side of the building, handsome stairways of Tennessee marble lead from the sub-basement to the basement, on which is situated the great semicircular gymnasium, which has an extreme width of 180 feet and a height of 35 feet from floor to ceiling. The floor is of fireproof construction: steel, brick and concrete. The under wood flooring is of white pine and above this is a flooring of yellow pine inlaid with mahogany. Twelve feet below the ceiling and supported partly from the columns and partly by suspension rods is a running track measuring nine laps to the mile, which is well banked and carefully padded. The center of the building on this floor contains a locker room with 1,500 lockers, and provision is being made for putting in 1,500 more.

We are indebted to Superintendent E. A. Darling for the following details of this remarkable building:

The main entrance on the south will have a Corinthian portico, supported by fourteen columns, each 4 feet in diameter and 32 feet in height. Surmounting the portico will be a pediment and entablature. The dining room will extend back 120 feet and its width will correspond to the width of the portico. It will be lighted by clerestory windows. It will provide seating capacity for 1,000 people, and it will be used as a memorial hall, the walls being adorned with portraits and

tablets in memory of distinguished alumni. It will be finished in oak and stone after the manner of King's College, Cambridge, England. To the east and west will be private dining rooms, club rooms and cloak rooms for the use of officers and students. The dining hall will terminate in what will be the proscenium arch of the academic theater. The theater will be arranged in classic form, and, like the dining hall, will be finished in heavy oak and stone. It will resemble the Chamber of Deputies in Paris, both in its arrangement and finish. It will have a seating capacity of 2,500, which is greater than that of any theater in this city, with the exception of the Metropolitan Opera House. The basement is built of local stone and has a granite base and granite quoins, sills and lintels. The portico will be of Stony Creek granite. The part of the building above the upper level will be in the Italian Renaissance style and finished with Harvard brick and Indiana limestone.

With the exception of the Library, all the buildings of the University will be in the same Renaissance style as the university building and constructed of the same materials. It is evident, as one passes through the various museums, lecture halls and class rooms, that the style lends itself admirably to academic needs, notably in respect of the generous windows with which every room is provided.

In addition to the two great buildings already described, four others have been completed at the present date. These are Havemeyer Hall and the Engineering Building, which stand to the west, and Schermerhorn Hall and the Physics Building, to the east of University Building. Ten other buildings, about equal in size to the Engineering Building (which measures 55 feet by 150 feet), are to be added at a later date.

One of the most creditable features in the fine equipment of the university is the power house, located in the basement of the University building. Here we find two simple Allis-Corliss engines each of 150 horse power and two 75 horse power Armington-Sims compound engines. These are all direct connected to the dynamos which supply the whole university. Steam is furnished by ten batteries of Babcock & Wilcox boilers, and the fuel is brought up in front of the furnaces in small trucks running on a system of tracks, this being the well known Hunt system of fuel handling.

From the power house one can pass by the tunnel which carries electric mains and steam piping to the great testing laboratory. This large vault is on the basement level and is located in front of Havemeyer Hall. It is 31 feet wide, 25 feet high and 210 feet long, and is divided into three sections. The eastern 65 feet will contain the five Worthington pumps with their accumulators—an equipment which is quite unique in laboratories of this kind. The second section, 84 feet in length, will be occupied by a large Allis-Corliss engine which compresses air in three stages to 150 pounds pressure. It is also arranged to drive a Dodge experimental rope drive, in which the various problems connected with the subject of rope driving will undergo a thorough investigation. This also is the first installation of its kind. The western section, 60 feet in length, will contain Baldwin's celebrated compound "Columbia." It is a 4-cylinder engine built under the well-known Vauclain patents, with cylinders 14 inches and 22 inches in diameter. The testing plant must make provision for 1,600 horse power, or 400 horse power per wheel.

Another novelty, as far as laboratory equipment is concerned, is an electric car equipped with Walker motors. In an alcove will be placed a complete Westinghouse brake outfit, such as is used on railroad instruction cars, and the laboratory will also contain two experimental Otto gas engines. Experimental work will also be carried out on an Otis elevator, which will be driven by two types of pump, a Worthington and a Quimby screw pump.

Havemeyer Hall, of which we present an illustration, is 80 feet in width by 210 in length. It was erected by his children as a memorial of Frederick C. Havemeyer. Like all the buildings in the grounds, it is six stories in height. In the west half of the sub-basement and basement are the department of metallurgy, the laboratory, library and draughting room; and in the east half are the department of assaying, the chemical laboratory and furnace room. The three stories above this are given up to chemistry, and the whole of the fourth story to architecture. In the rear of the building is an exceptionally fine semicircular lecture room, seating 325 students. The lecturer's table or counter is equipped with gas, blast, vacuum, electricity, hot and cold water. He can get a current of 500 amperes if desired, and three electric lanterns, projecting on three screens, are at his disposal for purposes of illustration.

Schermerhorn Hall, the gift of Mr. William C. Schermerhorn, is a sister building to Havemeyer Hall. It is devoted to the natural sciences. It contains the museums, laboratories, etc., of the departments of botany, geology, mineralogy, and zoology. Its mineralogical collection is the largest of its kind in the country.

The adjoining Physics Building contains the departments of physics, astronomy, mechanics and mathematics. Fronting it across the great central court is

the Engineering Building, to the adequate description of which the whole of the present article could easily have been devoted. In the sub-basement are the electrical laboratory, the thermodynamic laboratory and those of ore dressing and mining. A fine dynamo room and a large ore dressing laboratory are conspicuous features in the basement, and the four floors above are given up to museums, lecture rooms, small and great, and the best arranged, lighted and furnished draughting rooms it has ever been our privilege to see.

The success of Columbia University, its future growth in learning, numbers and wealth, are amply guaranteed by the ambitious and generous efforts which are being made to promote the interests of the University. The group of buildings on Morningside Heights, moreover, is well worthy of the chief seat of learning of the metropolis of the New World.

#### Finding Gold in New York State.

So much has been said about Alaska and the glory of its Klondike that the Empire State has been for some time without a furor to equal it, and New York never likes to be outdone. Until recently, the only part New Yorkers played in the great chase for gold was the sending of parties to try their luck in that distant, frigid region; but now the Empire State has a well developed gold furor in the chase for the precious metal within its borders, and thousands of prospectors are excited by the finds in northern New York, and Hadley, Warren County, seems to be in the center of the territory now creating interest.

Hadley is a village on the shores of the upper Hudson, with a scant population and few industries, save a large paper mill, to keep it alive. For years it has been celebrated more for its picturesque situation in the foot hills of the Adirondacks than as a town of energy. But now it is awakening suddenly to the realization of recently discovered advantages. It is the place where most aggressive gold-seeking action has been taken, and is the center of the district in which claims have been filed covering a large area in Warren, Saratoga, Fulton, Essex, Washington and Herkimer counties.

If these assertions are doubted, one has but to visit the office of the Secretary of State and witness the number of claims which are being daily placed on record there. During the last few months the claims of those who would get rich quickly number no less than 5,000.

Among those who own land at the foot hills of the Adirondacks, and all through the great northern wilderness, there is more excitement than the public is aware of, and all the more strange is this when one considers that it was not supposed that there was an amount of gold in that neighborhood to be worth the work of extracting it.

There is now one mill established at Hadley, and it looks as though the next six months will find many others scattered throughout the several counties where finds have been made. Many are awaiting the results of the experiments now being made, and are uncertain about the process to employ in extracting the metal.

The gold in this section is found in a fine state, and adheres to the grains of sand. The difficulty has been to separate it from the sand by a process which is economical. At the mill at Hadley it is ground or pulverized into a fine powder, and the metal is then collected by the quicksilver process.

In some places the sand in which the gold is found is about twenty-five feet deep and at other points still deeper down. It is believed that the resultant yield will be equal to four dollars each ton passed through the crusher and treated. This certainly compares favorably with the Western mines, and this news has brought the people in droves to see the place where gold is being taken from soil which all along has been considered too poor even for the tilling or raising of live stock. A process which is to be tried is called the combination cyanide-chlorination method. The territory worked at Hadley extends about one and a half miles above and below the town. Above, on the high plateau, is located the hostelry known as the Wayside Inn, which is a favorite summer resort. The Sacondaga Mining Company has its mill near Hadley, and a little above the junction of the Sacondaga and Hudson Rivers is the spot considered the richest field so far found. It was at this point that the soil was so poor and the rent of the dwellings so cheap that the few remaining members of the Abenaki Indian tribe located because of poverty. Here they lived for many years in tents and latterly in dilapidated houses. Surprising must it be to realize that they had pitched their tents, in their search for a spurned location, upon a tract below whose surface gold exists in paying quantities.

For a longtime operations were conducted as secretly as possible, but this only added to the curiosity of the neighborhood. Mr. Worden, of the Worden House, at Saratoga, is the president of the company located here. The mill is a building about fifty feet square and three stories high. It contains a sixty horse power boiler and a fifty horse power engine. As there are two mills now going up below the junction of the Sacondaga and Hudson, it shows that there is an established faith in the gold-mining enterprises of New York State.

CUYLER REYNOLDS.

# SCIENTIFIC AMERICAN

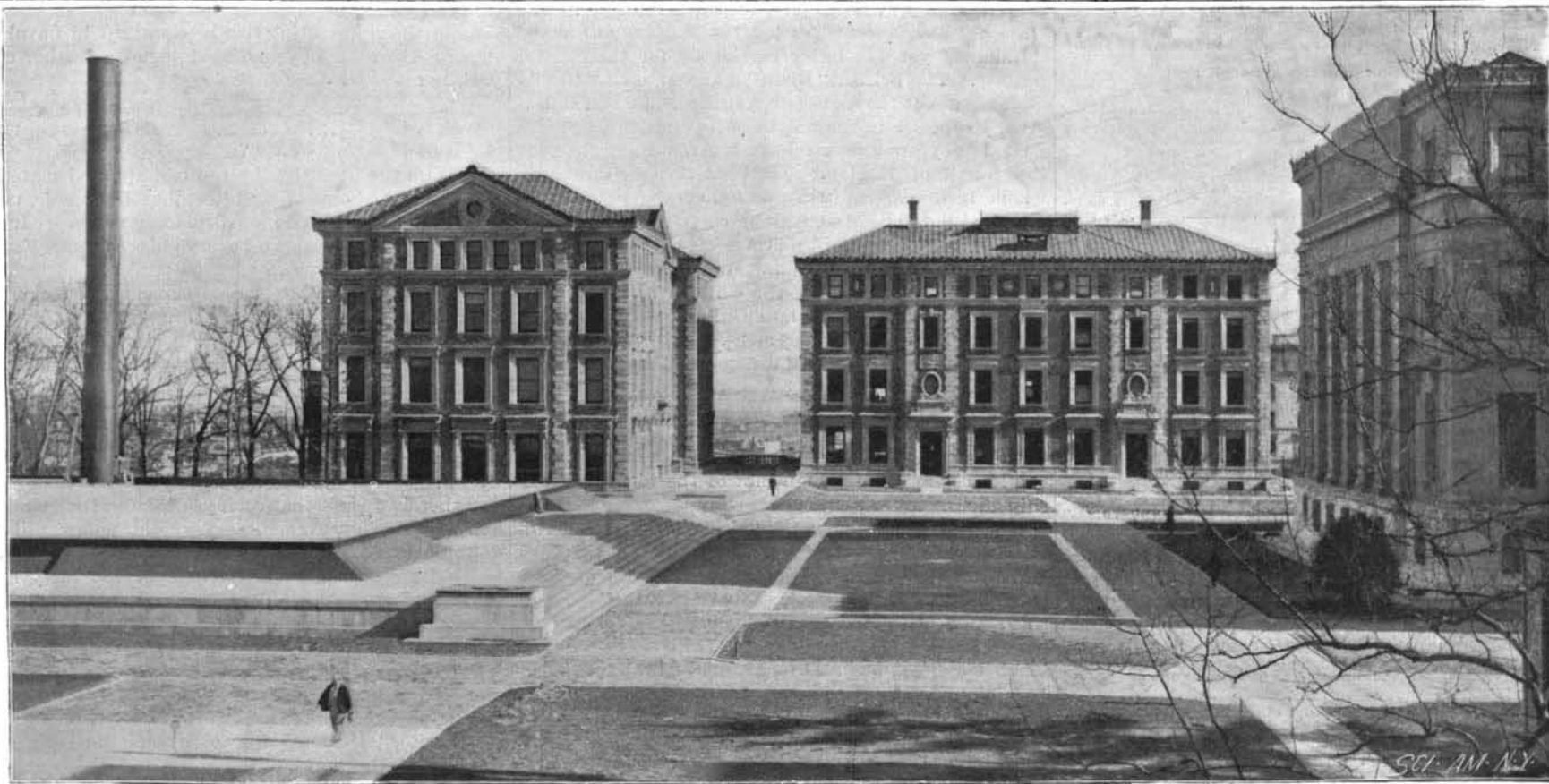
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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXVIII.—No. 13.  
ESTABLISHED 1845.

NEW YORK, MARCH 26, 1898.

[\$3.00 A YEAR.  
WEEKLY.]

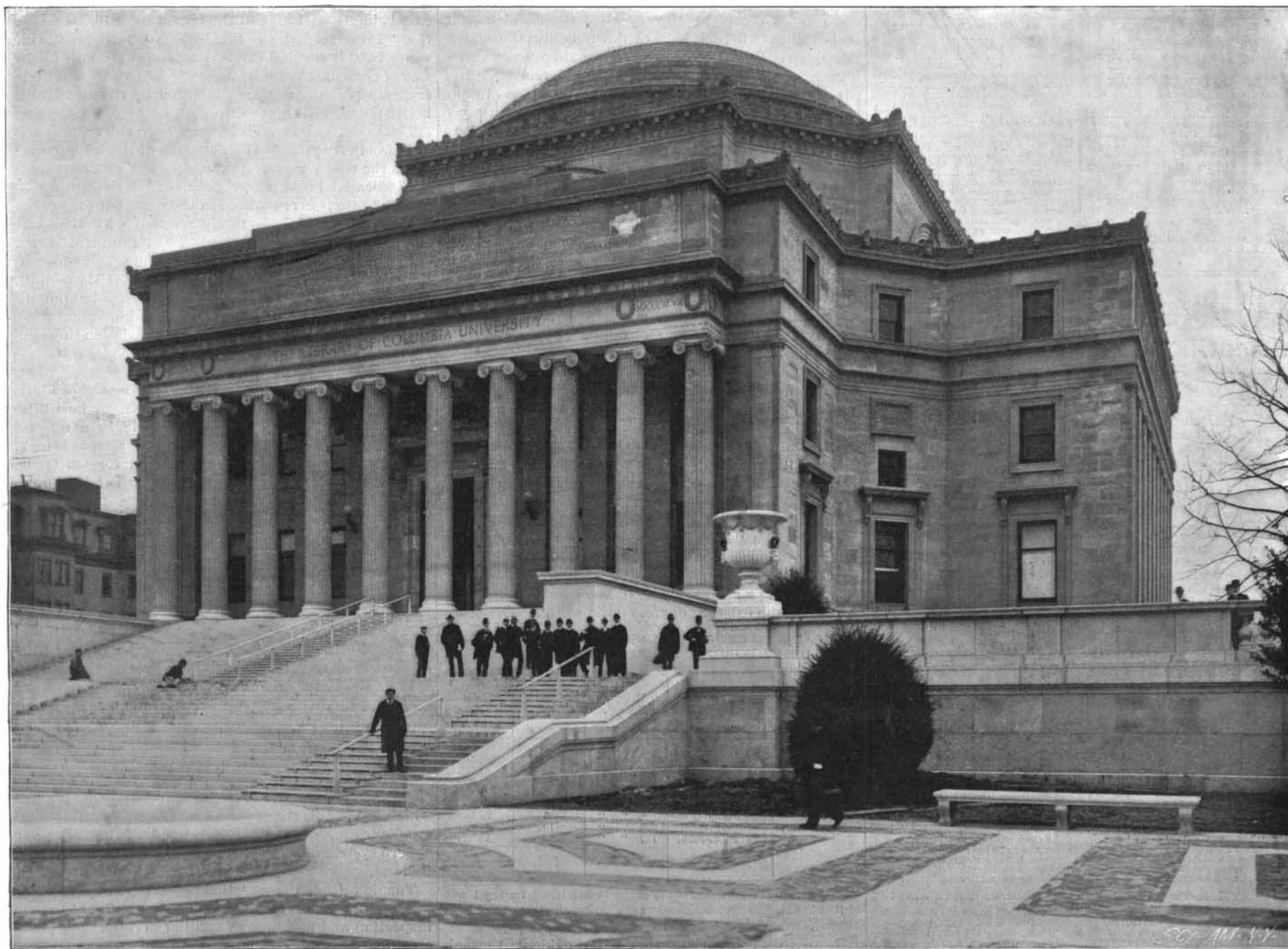


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THE LIBRARY PRESENTED BY MR. LOW, PRESIDENT OF THE UNIVERSITY;  
THE NEW COLUMBIA UNIVERSITY.—[See page 200.]