A SUBSTITUTE FOR GLASS IN PHOTOGRAPHY.

In addition to the value of photography as a means of recreation, it is also found to be an invaluable aid to professional men. Engineers, architects, and draughtsmen use it for recording the progress of their work, making pictures of machinery, buildings, copying, drawings, and an infinite variety of work, which saves a vast amount of hand labor. Physicians find it useful in making memoranda of surgical operations. Insurance men use it in inspecting risks and adjusting losses by fire. Artists find it indispensable as an aid to sketching. Correspondents for illustrated papers and magazines now carry cameras as a part of their outfits, and even traveling sign painters photograph their work and send in the picture as a voucher on which to draw their pay.

All this has been accomplished by the introduction of the gelatine dry plate; but there are many who are still prevented from practicing the art by the weight of the apparatus and material, which has to be carried about to make even a few pictures. The weight of the glass is such a serious burden, especially in the larger sizes, that it discourages even the most enthusiastic after a few trials, and many cameras have been laid aside for this reason when they would otherwise be a source of unending satisfaction to their owners.

By reason of several recent improvements it has been found possible to prepare paper of fine and close texture upon a large scale, with an even coating of an extremely sensitive bromide of silver gelatine emulsion, so perfectly that positive silver prints made from the paper negatives will show no grain in the half tones, and be equally as clear and perfect as if made from glass.

The sensitive paper is prepared in sheets for use in ordinary plate holders, as shown in the pile to the right in Fig. 8, and in spools, as shown in Fig. 11. The film carrier in Fig. 8 is a flat board made of several strips of narrow wood glued together edgewise to prevent warping, between which and the spring metal frame lying flat, the sensitive sheet is clamped, as shown, by laying the board over the back of the paper. The whole is then slid into an ordinary plate holder like a plate.

When used in long strips, the paper is wound upon a wood spool, arranged for use in an instrument termed a roll holder, the principle of which is to draw the sensitive paper from the supply spool at one end over an exposing platform, occupying the same place as the focusing ground glass, to a winding-up reel at the other end.

These parts are inclosed in a highly finished mahogany case, shown in Fig. 6, with the vulcanite slide partially withdrawn, exposing to view the sensitive paper lying smooth and flat upon the exposing platform. A removable back supporting the working parts is attached to the case by four flat spring catches, plainly seen in Figs. 1, 2, and 3.

In taking the holder apart in the dark room to either insert a new spool or remove a reel of exposures, these catches are thrown out, the key socket and indicator knob on the side pulled out, and the case lifted off. (Fig. 3 shows it partly raised. Fig. 2 shows position when entirely removed.)

The light, blackened frame of brass holding the various parts is pivoted to the back by two pairs of sliding spring bolts, one pair being shown at the right in Fig. 1. Supposing that the frame occupies the position in Fig. 2, we draw inward with the right hand the sliding bolts, and with the left raise the whole, as shown in Fig. 1; this affords access to the spool mechanism. The supply spool is next inserted, as in Fig. 4, by raising the pressure spring brake, and pushing the end of the spool upon a projecting plug, seen upon the left, the opposite end being fastened by a thumb-screw. A suitable spring friction mechanism is provided, not shown, for giving tension to the paper when unwound from spools. After insertion the frame is lowered, locked to the back with the spring bolts, and the opposite end raised. The free end of the paper is then drawn up over an exposing platform and down to the reel under a flat brass pivoted clamp. When the paper is properly centered, the clamp is pressed down, holding and drawing the paper as soon as the reel is rotated. The reel is inserted and removed in a manner similar to the supply spool, but is constructed so that it will be impossible to put it in the same plane as the latter.

A spring pawl bears upon the head of reel and a gravity pawl upon that of the spool (see Fig. 2); these are thrown off during the process of changing spools.

A guide roll is placed at each end of the platform, the one on the right, Fig. 2, being termed a measuring guide roll, in which is a longitudinal slot used as a guide for the point of the knife in cutting off the exposed from the unexposed paper. The roll has a pin at one end for operating a flat spring, making a sound alarm, and in addition on its axis a spur wheel geared with a larger wheel for rotating the indicator. Metal points project slightly above the surface of the reel at each end, which puncture the margin of the paper at each revolution. As the circumference of the roll is one-fourth the length of the picture, four alarms are sounded, and the indicator at the same time makes one revolution, when one exposure has been wound up. Fig. 12 is a cross section showing the light flat brass springs which bear against margin of the paper, preventing the same from curling up. Fig. 7 shows the manner of operating the holder; a key with a screw thread is inserted in the key valve and rotated like the winding of a clock, revolving the reel, which winds up the exposed sheet, and brings a fresh surface into place ready for the next exposure. When the indicator has made one revolution, and the fourth click been heard, then the operator knows that the change has been accomplished.

After exposure, the paper on the reel may be readily removed, and a new one inserted to take up the balance of the unexposed paper. By counting four dots on the margin from the end after the sheet has been severed, as in Fig. 2, the length of the picture is easily determined, and may be cut off with a pair of scissors.

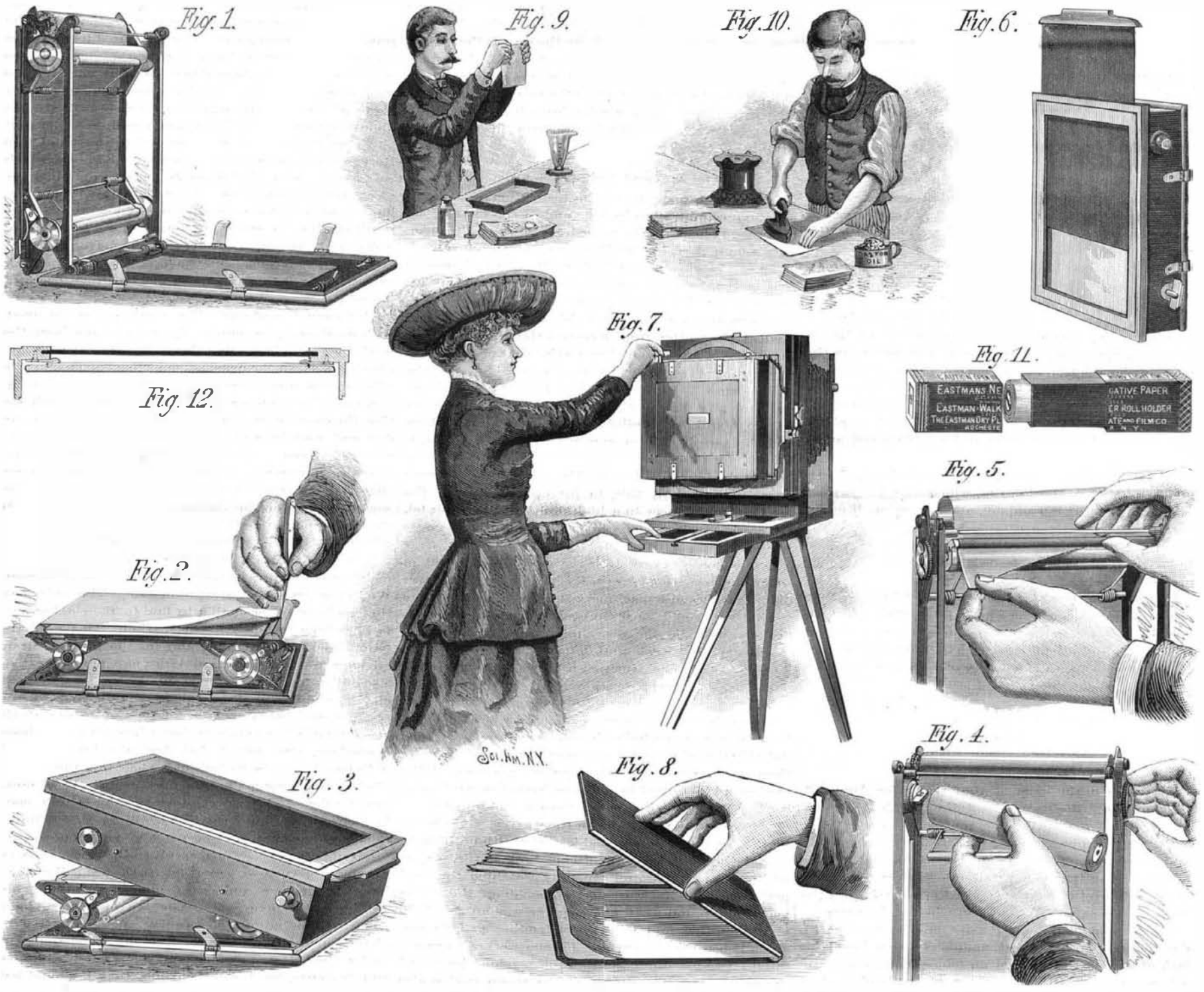

Fig. 1.—Roll Holder Thrown Back. Fig. 2.—Cutting off the Film. Fig. 3.—The Case Partly Raised. Fig. 4.—Putting in the Spool. Fig. 5.—Inserting the Free End. Fig. 6.—The Case—Slide partly drawn. Fig. 7.—Operating the Holder. Fig. 8.—Single Film Carrier. Fig. 9.—Developing. Fig. 10.—Making Films Transparent. Fig. 11.—The Package. Fig. 12.—Cross Section of Slide Aperture.

NEW PHOTOGRAPHIC APPARATUS FOR MAKING NEGATIVES ON PAPER.

The exposed sheets, as they are cut off, can be developed several at a time in one tray, with the usual pyro developer; Cooper's developer, described on page 197, No. 13, vol. 53, of the SCIENTIFIC AMERICAN, being preferred. Fig. 9 shows the tray, the developed negative being held up for examination to the red light. The developer is sold ready mixed, thereby insuring to the novice success at the outset.

After the negative is fixed and dried, positive silver prints may be made from it in the usual way; but to quicken the process, oiling the paper with castor oil and a hot iron, as shown in Fig. 10, is recommended, which renders it translucent. Paraffine wax may be used in place of oil.

The primary advantage of paper over glass is its extreme lightness. An 8 x 10 apparatus complete, with camera, lens, roll holder for 24 exposures, tripod, and case, weighs 28½ pounds less than a glass equipped outfit.

Such a saving makes the taking of large photographs attractive, and enablest he amateur to obtain panoramic or other views of inaccessible regions with considerable comfort. The danger of breakage is avoided, thereby making rough transportation of the negatives perfectly safe.

The compact way in which the negatives can be packed should not be overlooked; they can be kept in books, thereby affording as easy a means of reference as if they were in a photographic album—a point of much value in any large concern. They can be used in photographic ink printing processes without the need of transfer, so common with glass plates. They are splendidly adapted for large work, and, as an instance of their success in this respect, we have but to refer to the very fine exhibition of life-sized direct portraits which was given at the Buffalo Photographers' Convention, in Buffalo, N. Y., last July.

The softness and delicacy of the shadows and the brilliancy of the high lights were specially noticeable.

The retouching of paper negatives is more easily done than on glass, for the back of the negative is worked upon by a pencil; any mistake can be readily erased. With crayon stubs very pretty cloud effects can be worked into the sky of landscape negatives. Perfect freedom from halation is one of the special characteristics of the paper, making it valuable in the photographing of interiors. All portions of the holder are made interchangeable.

The enterprise of the Eastman Company in introducing so noteworthy an invention as their roll holder, and the excellent sensitive paper film used with it, is illustrative of the characteristic push and energy so often displayed by American inventors; we bespeak for their improvement an important future, and consider it an advance in the art of photography which will be welcomed both by the amateur and professional. A silver medal was awarded the company at the London International Inventions Exhibition for the novelty of the invention and the fine workmanship displayed.

Particulars as to the sizes and prices of the paper may be found in our advertising columns. Further information may be had from the Eastman Dry Plate and Film Company, 1347 State Street, Rochester, N. Y.

Bread Mixtures.

Even in the most ancient times different foreign matters were mixed with bread.

In Thracia, bread was mixed with powdered dried roots, in Syria with dried mulberries, in Egypt with whole grains.

In modern times, in Sweden they add to the bread powdered dried fish; in Ireland and in Iceland, moss, which besides being nutritious keeps the bread from drying; in Prussia, white clay, which contains alkali salts and makes bread very light; in Russia, powdered bark or finely chopped straw. On western shore of England certain kind of sea weed (*Porphyra laciniata*) is gathered, washed, boiled, and then baked with oat meal flour.

In Africa, powdered dried locusts are mixed with bread, in India potatoes and pea flour, and during the famine even stones ground to fine powder were used in the latter country.

SIBLEY COLLEGE, CORNELL UNIVERSITY.

THE NEW SCHOOLS OF MECHANICAL ENGINEERING AND THE MECHANIC ARTS.

Cornell University, notwithstanding its youth, has already, just twenty years after the date of its incorporation, become one of the distinctively great collegiate institutions of the United States. Whether considered with reference to the number and magnitude of its buildings, the extent and beauty of its grounds, the largeness of its endowments, the munificence of its founders and benefactors, the number and completeness of its courses of instruction, the practical usefulness of its outfit of apparatus and machinery, the number of its students, or, most important of all, the number and character and fame of its little army of professors and teachers, it stands well among the three or four admittedly pre-eminent colleges and universities of our country. Cornell enjoys the proud distinction of being the first of all universities, whether in this country or in Europe, founded explicitly as a university, designed to give a real and broad university training, in which the needs of the people are fully recognized by the provisions of its charter, and in which the "leading objects" are asserted to be the instruction of students, "without excluding other scientific and classical studies, and including military tactics," in "such branches of learning as are related to agriculture and the mechanic arts." Thus, while giving opportunity for securing an education of the broadest and most liberal character, its founders intended to make sure that the special needs of a nation of workers should be recognized, and that schools of agriculture and the mechanic arts, of the several branches of construction and of the highest departments of engineering, should take their place beside the schools of classical and of scientific learning. From the first, it was intended to become a real university, of such scope as should give to the citizens of this country the means of educating their sons and their daughters in such manner as should best fit them for the work of meeting the difficulties of life. It has been thus organized, and is now a great institution of learning, exhibiting the novel feature of schools of engineering and of the useful arts side by side with those departments which usually constitute, alone, the older colleges.

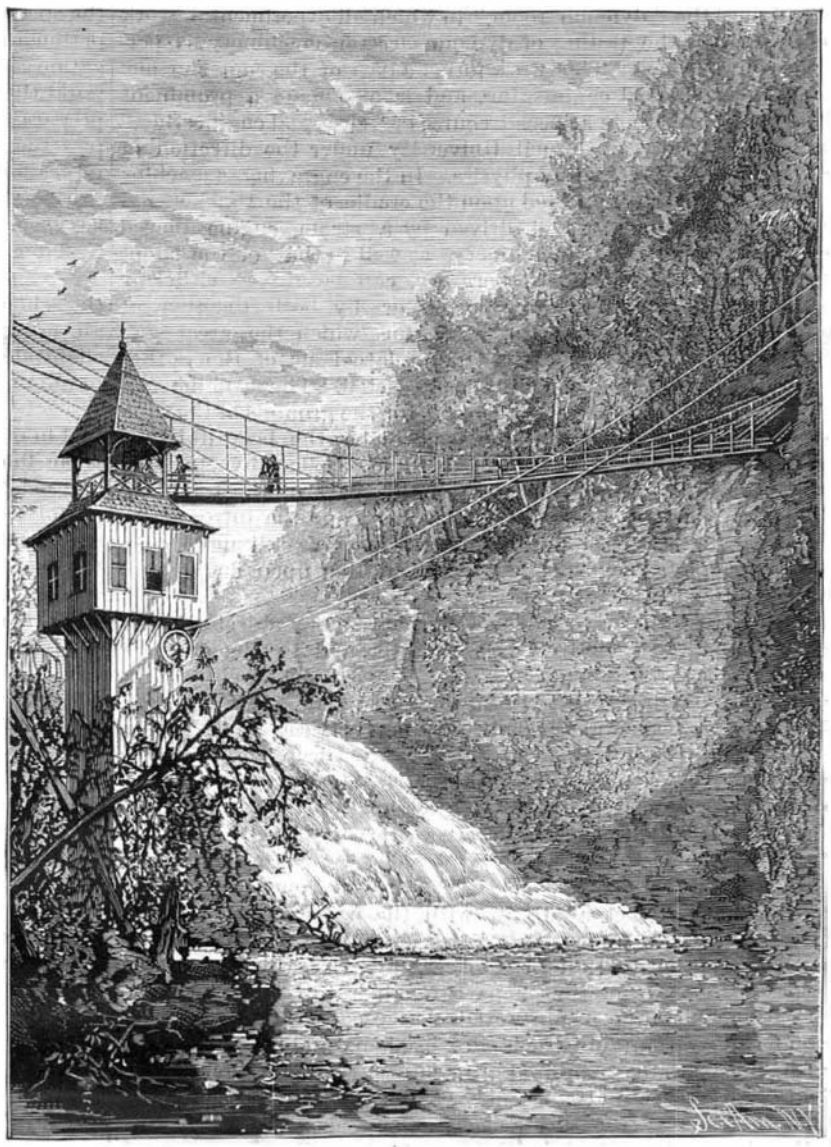

Fig. 9.—SIBLEY COLLEGE WATER WHEEL HOUSE.

Cornell University was incorporated in the year 1865, endowed by the State of New York with its land scrip, representing nine hundred and ninety thousand acres, and by Ezra Cornell with a half million of dollars in money and two hundred acres of land, adjacent to the city of Ithaca. Since that date this endowment has been amplified by the generosity of Henry W. Sage, John McGraw, the late Mrs. J. McGraw Fiske, Hiram Sibley, Andrew D. White, and others. The university is beautifully located, above the city of Ithaca and overlooking the forty miles length of Cayuga Lake; is conveniently accessible, from every direction, by the six lines of railroad intersecting each other at Ithaca. Fig. 2 gives a striking view of the grounds of the university, as seen from the top of the tower of Sage College, the college endowed by Mr. Sage for the benefit of the young women among the students. Sage Chapel, in which the most distinguished clergymen of the country are invited from Sunday to Sunday to preach non-sectarian discourses, is in the foreground; the library building, known as the McGraw Building, flanked by Morrill Hall and White Hall, beyond, while in the distance may be seen the great laboratory building and a corner of Sibley College. Away beyond, apparently not far from the lake, but, in fact, nearly a mile from it, is the house of Mrs. Jennie McGraw Fiske, the magnificent mansion of a lady whose philanthropy left nearly a million of dollars for the erection and endowment of a hospital and a great university library.

Cayuga Lake, with its picturesque banks and gorges, fills the distance. The grounds themselves are among the most beautiful in the country, if not in the world, and are bounded at the right and left by wonderfully picturesque canyons, through which the rushing waters fall some four hundred feet to the lake below.

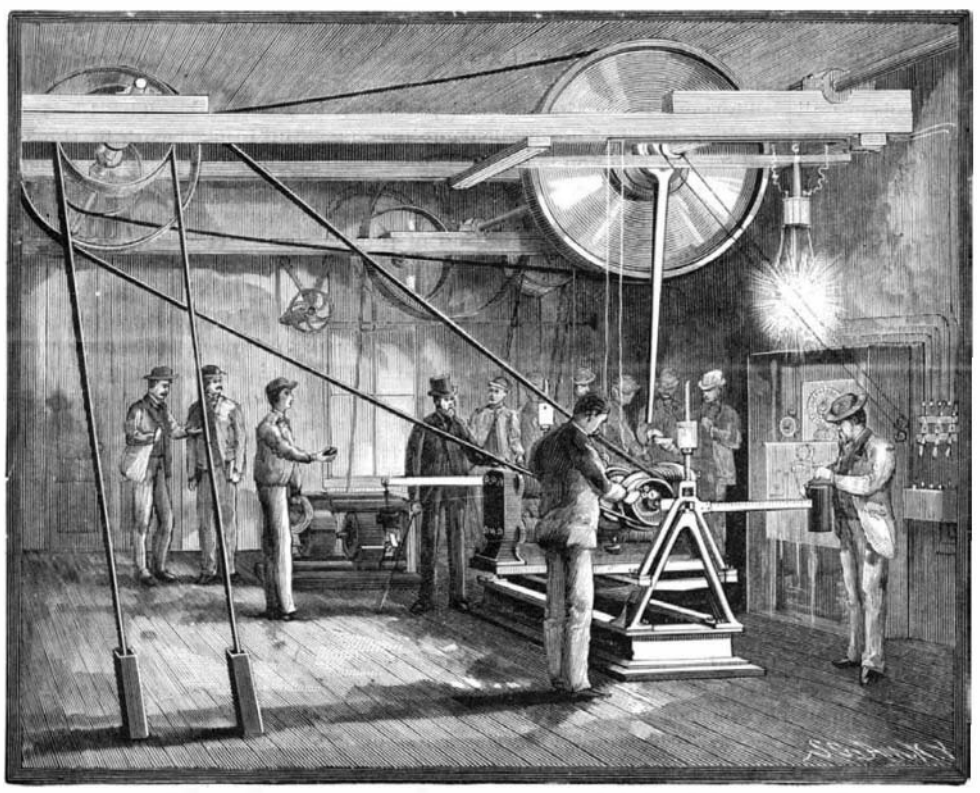

Fig. 10.—SIBLEY COLLEGE DYNAMO AND ELECTRICAL ROOM.

Sibley College is the school of mechanical engineering and of the mechanic arts of Cornell University. It was built and endowed, and supplied with a splendid outfit of machinery, workshops, models, and apparatus by the Hon. Hiram Sibley, of Rochester, himself a mechanic by original occupation and training, and later one of those princely men who built up the existing great systems of telegraphy in this country. Like Cornell himself, he turned a good proportion of his profits into the hands of the Trustees of the University, for the benefit of the youth of the present generation, in remembrance of those earlier days when he would have given so much for such opportunities, then not to be found anywhere in the land.

The Sibley buildings were designed by Prof. Morris; as shown in Fig. 4, they consist of a main building 160 feet long by 40 feet wide and three stories high, in which are the lecture rooms, the drawing rooms, and the museums of the college; and of a series of workshops seen in the rear and at the side, consisting of a wood working shop, a machine shop, a blacksmith shop, and a foundry, and also including a very extensive "mechanical laboratory." These shops are usually about forty feet wide by forty to sixty long, are well equipped,