When the rivet is put in, it flows out and fills the space thus formed, becoming, therefore, of greater diameter at the middle than at the ends. When the plates are under tension, the rivet will cant, and the ring-like projection around its centre will pry the plates slightly apart, as Mr. Robinson has satisfactorily demonstrated by experiment, thus allowing the escape of the steam in the case of a boiler, and avoiding an explosion; while, on the removal of the stress, the plates come tightly together again, provided the strain on the rivet were adapted not to exceed its elastic limit. The simple conical reaming-out of the holes, however, was not found to be just what was wanted; as it was possible for the metal of the rivet to be forced out between the plates farther than was wished, preventing their coming together tightly at all, even at first. To obviate this objection was the object of Mr. Robinson's second invention, which consists in cutting out a small hemispherical ring in each plate around the rivet-hole, and reaming out to this ring, so that when the plates are put together the conical enlargement of the hole at the centre is followed by a chamber in the shape of a circular ring; and into this 'relief-chamber' the metal of the rivet can flow out. But, as the amount of metal to be so forced out is never to be great enough to fill this chamber, the plates are brought closely together in the process of riveting, while the action of the rivet under great pressures is the same as has been described.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Geological survey.

Geology. — Prof. L. C. Johnson reports that the Ripley group of the cretaceous in Alabama and Mississippi presents some curious and interesting features. It is an interrupted formation. Beginning in Mississippi, north-west of the Corinth group, it runs southward one hundred miles, and there runs out. It also appears in the extreme south-east, on the Chattahoochee River, in Barbour county, Ala., and extends westward to a point undetermined, but not reaching the Alabama River. It also occurs as a wedge between the elder cretaceous and the great lignitic A.

Chemistry. — The chemical division of the survey is at work on analyses of alkaline and saline waters from the Great Basin, collected by Mr. G. K. Gilbert and I. C. Russell; notably, the waters of Humboldt River, Walker Lake, Pyramid Lake, Mono Lake, Lake Tahoe, etc. There are also on hand, awaiting analysis, specimens of water from Helena hot-springs, Montana, from warm springs of Emigrant Gulch and from Livingston, in the Yellowstone valley, in Montana, collected by Dr. A. C. Peale during the past summer.

Prof. F. W. Clarke is also engaged upon a complete revision of his specific-gravity tables, which form part i. of the Smithsonian Constants of nature.

A white porcelain-like clay from the Detroit copper-mine, near Mono Lake, California, proves, upon analysis by Professor Clarke, to be a very pure halloysite, thus adding another to the list of localities for this mineral.

A mineral sent in from Big Springs, Texas, said to occur there in abundance, proves to be a mixture of gypsum and sulphur, the latter predominating.

Miscellaneous. — The topographical parties have all returned to the office in Washington. The total area surveyed during the season amounts to fifty-one thousand square miles.

Early in September, while attempting the ascent of the 'Three Sisters,' a group of peaks in the Cascade range in Oregon, Ensign Hayden, who accompanied Mr. J. S. Diller in his reconnaissance of the Cascade range, was thrown from the edge of a cliff by the crumbling of the rocks, and seriously injured. As a result of the accident, he has recently had to suffer an amputation of one of his legs. The operation was performed at Portland, Or. Mr. Diller, in rescuing Mr. Hayden, was also hurt, but not seriously, by the falling rocks.

The library of the survey has just secured a copy of the 'Codex Cortesianus,' by Léon de Rosny, of which eighty copies have just been published in Paris (1883). The line of Mexican manuscripts for the study of the Maya alphabet, in the library of the survey, is now complete, with the exception of a manuscript in the possession of Señor D. Alfredo Chavero, in the city of Mexico. It is entitled 'A MS. explanation in Italian of the Codex Borgiana, by Fabregat.' Steps are being taken to secure a copy of it for publication.

The manuscript for two survey bulletins has been sent to the government printer: viz., No. 3, 'On the fossil faunas of the upper Devonian, along the meridian of 76° 30′, from Tompkins county, N.Y., to Bradford county, Penn.,' by H. S. Williams; and No. 4, 'Lists of elevations,' by Henry Gannett.

Five volumes of the monographic publications of the Hayden survey are still unpublished. The general direction of the completion and publication of these quarto reports has been put in charge of the director of the geological survey. Two of these volumes are almost wholly in type, and will be issued shortly.

The London *Graphic* of Nov. 17 has a double-page illustration of the Transept in the Kaibab Grand Cañon of Colorado River, which is an engraving reduced from plate xviii. of the atlas accompanying Capt. Dutton's 'Tertiary history of the Grand Cañon' (vol. ii. of the monographs of the survey).

PUBLIC AND PRIVATE INSTITUTIONS.

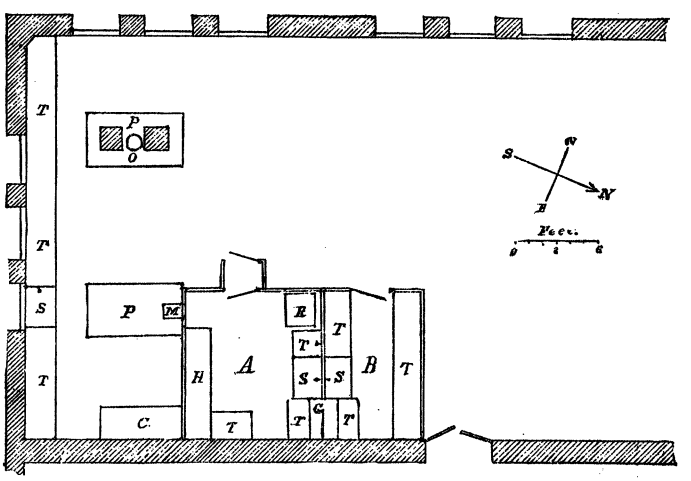
Massachusetts institute of technology.

The new photographic laboratory. — Since the recent invention of the gelatine dry-plate, photogra-

phy has been advancing rapidly in the number of its applications to the arts and to the industrial and applied sciences. The Institute of technology has not been behindhand in recognizing this fact; and in the new building, now nearly completed, a large room in the south-west corner of the basement has been appropriated to the establishment of a photographic laboratory, perhaps the first ever constructed in connection with a scientific institution, for the especial instruction of students in photographic manipulations, and for purposes of original research, in this most interesting department of applied science.

The following plan shows the arrangement of a portion of the room, which measures sixty feet in length by thirty in breadth.

P, *P*, are two brick piers surmounted by solid stone slabs, and constructed on foundations entirely independent of the building, in order to avoid all possibility of shock or jarring. Upon one of these, brick columns are built, which pass through the ceiling into the 'fourth-year' physical laboratory, which occupies the room above. The other one reaches a height of three feet, and forms a solid foundation for the support of a heliostat, microscope, spectroscope, or other instrument. *A* and *B* are the two dark rooms, entirely separated from one another by a partition, and by a wooden frame containing the gas-jet *G*, which is partially surrounded on three sides by sheets of Carbutt's ruby paper. *S*, *S*, *S*, are soapstone sinks, the two former of which are supplied with vacuum pipes for the purpose of accelerating filtration. *T*, *T*, *T*, represent tables, the one in the window being used for printing purposes, while the others are to support photographic apparatus and accessories. Gas will be introduced into the dark rooms over the sinks for lighting when they are not in photographic use. It will also be supplied at the small square table in the larger dark room for heating purposes, such as boiling emulsions. *C* is a case of shelves and drawers to contain books, paper, and apparatus. *H* is a series of shelves for the storage of plates and chemicals. *M* is a square wooden box resting on the pier, but connecting by an aperture measuring ten inches by twelve with the interior of the larger dark room. This is to contain a microscope for researches in photomicrography, the light coming from the heliostat through a small hole in the box. The image is thence projected upon a screen placed inside the dark room, where the operator can examine it at his leisure. This screen is supported upon the focusing table *R*, which rolls upon a track, and may be placed at any distance less than three metres (ten feet) from the aperture at *M*. The dark room is thus converted into a large camera, inside of which the operator stands and exposes his plate, while he may at the same time be developing another one previously taken. The greatest efficiency, convenience, and economy of time are thus combined by this arrangement.



PLAN OF PHOTOGRAPHIC LABORATORY.

Both dark rooms are constantly ventilated by a system of double walls, with openings at the ceiling and floor, whilst the draught of the lamp *G* is utilized to increase the circulation. The light thus becomes a source of health, instead of vitiating the atmosphere, as is the case in most dark rooms. The room *A* is provided with double doors, so that the operator may leave the room at any time during an exposure, without the slightest fear that even the most sensitive plate could possibly be fogged by a chance ray of stray light. This arrangement, though convenient at all times, will be particularly so when working with long exposures of two or three hours in length; and, indeed, it is only by some such arrangement that these exposures become possible. Besides the aperture at *M*, a smaller one six inches square is made through the wall of the dark room. This is intended for spectroscopic and astronomical work. Either window may be closed by a sliding shutter when the other is in use.

Between the brick columns of the pier *P* is placed a shelf, on which will be kept a large carboy containing a saturated solution of potassium oxalate, from which the developer bottles may constantly be replenished by means of a siphon permanently attached. We thus avoid the trouble of continually making up fresh solutions, and at the same time do not require to have the developer bottles inconveniently large. The hyposulphite-of-soda and sulphate-of-iron solutions will be similarly provided for, the latter being covered with a thin film of oil to prevent oxidation from the air.

The routine work of the department will be arranged somewhat as follows. Only those students at the institute taking the courses in mechanical and electrical engineering, architecture, chemistry, natural history, physics, and the general courses, will

receive photographic instruction. Each of them will be required to perform at least ten hours' work, divided into five days of two hours each.

Some experience has already been attained in teaching photography upon a small scale (last year this department had sixteen students); but, should the present venture prove a successful one, it is hoped it may be adopted by other colleges, and that photography may in the future come to be regarded as a necessary portion of every professional man's college education. WM. H. PICKERING.

NOTES AND NEWS.

IT is generally known that Williams college secured a table early last year at Dohrn's international station at Naples. The table may be occupied by any American scientific scholar recommended by the faculty of the college. Any one wishing to use the table should send an application to President Carter, and the application should be accompanied by evidence of ability to improve the unrivalled facilities for original investigation afforded at Naples.

Each occupant is expected, soon after his return, to give a brief course of lectures at Williamstown on some subject connected with zoölogical work. The lectures by the first occupant, Dr. Edmund B. Wilson, formerly fellow in the Johns Hopkins university, are to be given in January and February.

In assigning the table, any regular graduate of Williams college will be recognized as entitled to precedence; but, in case no graduate of the college worthy of the honor is an applicant for the position, the appointment will be determined as far as possible by distinction already attained. The successful applicant will be at once informed of his appointment, and his name communicated to *Science* and the *American naturalist* for publication.

The table is at present used by Dr. Samuel F. Clarke, professor of natural history in Williams college, but will probably be vacated on or before April 1, 1884.

— The department of the interior, at the request of the Italian government, has issued a circular, calling attention to the Bufalini prize of five thousand lire for an essay on the experimental method in science, and giving the conditions under which writers must compete. The character of the essay may be gathered from the following extract from Bufalini's will: —

"Let the learned consider, therefore, whether they can pardon me for daring to appeal to them ten years after my death, and after that every twenty years, to solve the following problem: the necessity of the experimental method in arriving at the truth and the relation of all the sciences being assumed, it is required to demonstrate in a first part how far the said method is to be used in every scientific argument, and, in a second part, to what extent each of the sciences has availed itself thereof during the time that has elapsed since the last competition for a prize, and how they may be brought to a more faithful and complete observance of the method itself."

— According to *Nature*, a meeting was recently held in Sheffield for the purpose of carrying out, in connection with Firth college, a proposed technical department having reference to the trade of the district. Among those who spoke were Mr. Mundella and Dr. Sorby; and all agreed as to the desirability of establishing such a department, and the necessity of educating the captains as well as the privates of industry in the principles of their crafts. For that, Mr. Mundella insisted, is the true technical education. He gave the experience of a friend who has just been visiting the United States, and inspected the means for technical education existing there. The distinct conclusion was, "that there is more skill and intelligence in American industrial pursuits than there is in our English industrial pursuits."

— At the meeting of the Institution of civil engineers, Nov. 27, the paper read was on 'The new Eddystone lighthouse,' by Mr. William Tregarthen Douglass.

The necessity for the construction of a new lighthouse on the Eddystone rocks had arisen in consequence of the faulty state of the gneiss rock on which Smeaton's tower was erected, and the frequent eclipsing of the light by heavy seas during stormy weather. The latter defect was of little importance for many years after the erection of Smeaton's lighthouse, when individuality had not been given to coast-lights; but, with the numerous coast and ship lights now visible on the seas surrounding this country, a reliable distinctive character for every coast-light had become a necessity. The tower of the new Eddystone is a concave elliptic frustum, with a diameter of 37 feet at the bottom, standing on a cylindrical base 44 feet in diameter and 22 feet high, the upper surface forming a landing platform 2 feet 6 inches above high water. The cylindrical base prevents in a great measure the rise of heavy seas to the upper part of the tower, and has the further advantage of affording a convenient landing-platform, thus adding considerably to the opportunities of relieving the lighthouse. With the exception of the space occupied by the fresh-water tanks, the tower is solid for 25 feet 6 inches above high-water spring-tides. At the top of the solid portion the wall is 8 feet 6 inches thick, diminishing to 2 feet 3 inches in the thinnest part of the service-room. All the stones are dovetailed both horizontally and vertically, as at the Wolf Rock lighthouse. Each stone of the foundation-courses was sunk to a depth of not less than 1 foot below the surface of the surrounding rock, and was further secured by two Muntz-metal bolts 1¼ inches in diameter, passing through the stone and 9 inches into the rock below, the top and bottom of each stone being fox-wedged. The tower contains nine rooms, the seven uppermost having a diameter of 14 feet and a height of 10 feet. These rooms are fitted up for the accommodation of the light-keepers and the stores necessary for the efficient maintenance of the lights. They are rendered as far as possible fireproof, the floors being of granite covered with slate. The stairs and partitions are of iron, and the windows and shutters of gun-metal. The oil-rooms contain eighteen wrought-iron cisterns capable of storing 4,300 gallons of oil; and the water-tanks hold, when full, 4,700 gallons. The masonry consists of 2,171 stones, containing 62,133 cubic feet of granite, or 4,668 tons. The focal plane of the up-