Union Iron Works, with G. W. Prescott, president; Henry T. Scott, vice-president and treasurer; and Irving M. Scott, general manager.

The full equipment of the works for the special purpose of building iron and steel ships, and armored war vessels of the greatest power, has been so recent that it is believed the plant in these respects is fully equal to that of any other establishment in the United States, and will compare favorably with any other in the world. The buildings, except the sheds, are all of brick, and cover an area of more than four acres, the covered works, including ship yard, slips and dry dock, embracing an area of nine acres. The fitting, erecting, boiler shops and foundry are all spanned by heavy traveling cranes, to lift from twenty to fifty tons each, and the equipment includes special machine tools in large variety, some of them weighing over 100 tons each. The works are underlaid throughout with a high pressure hydraulic system, employed in lifting, forging, riveting, shearing, etc., and an ample electric light plant supplements the abundant light and ventilation afforded by well planned construction. An interesting feature of the works is the great hydrulic dry dock and slip, having an area of 30,450 square feet. A working force of fifteen hundred hands is employed in the various departments.

The building of mining machinery was for a long time the principal business of the establishment, and in this specialty the Union Iron Works continues to hold a leading position. From these works have been sent out the principal proportion of the mining machinery for the great Comstock mines, and most of the other mines in Montana, Utah, Mexico, and all through the Pacific Coast and Territories, as well as in South America and other parts of the world where mining operations are carried on upon a large scale. The making of compound engines, stationary and marine, early formed a leading branch of the business, and it is one in which the company have, in late years, obtained a degree of excellence which places them, by general acknowledgment, among the prominent engine builders of the country.

But it is rather on account of the contracts undertaken by the Union Iron Works in the building up of our new navy that the establishment now occupies a position of so much general interest. Here were built and equipped the highly successful cruisers Charleston and San Francisco, and here also was built the monitor Monterey, now receiving her finishing touches, and being supplied with what are believed to be some of the most perfect of high-powered guns yet made anywhere. In addition to this work there is now on the ways one of the largest of the new battle ships, the Oregon, to have a displacement of 10,000 tons, and to cost, exclusive of armament, nearly four million dollars. She will carry four 13-inch breech-loading rifles, weighing sixty tons each, and protected by seventeen inches of armor, and will have seven tubes for the discharge of torpedoes. Work upon this vessel is now being energetically pushed forward, and the company will unquestionably be active competitors for any further work the government may have to offer upon the various war vessels yet to be built.

The Tinkering Crank.

There is a great deal of truth in what the *Manufacturers' Gazette* says about some men who never seem to be happy and contented unless they are tinkering. They are always watching for a chance to use a monkey wrench or hammer, and not only waste valuable time, but do more toward spoiling the machinery in their charge than years of constant wear will ever do. If a machine is out of order, or there is some part that needs tightening up or repairing, the tinkerer takes his monkey wrench and screwdriver and goes at it, regardless of where or what the trouble is. He spends an hour or two twisting and turning nuts and bolts, and when he gets tired of this amusement concludes that everything is all right and starts up the machine, only to find that he has not improved it any by tinkering. Then he goes at it again. Such men are not profitable workmen. The competent and experienced man never tinkers. If the machinery needs fixing he does not go about it in a haphazard manner, but looks it over carefully until he locates the trouble, and then does what is needed, without making a bad matter worse by acting upon the supposition that because one part is out of order the whole machine needs tinkering.

Brooklyn Institute of Arts and Sciences.

According to the report of the Brooklyn Institute of Arts and Sciences, the present membership numbers 3,869, showing an increase of 1,039 over the membership of 1891.

The membership is divided up as follows among the different departments:

Archeology, 115; architecture, 255; astronomy, 113; botany, 154; chemistry, 135; electricity, 215; engineering, 126; entomology, 50; fine arts, 361; geography, 137; geology, 140; mathematics, 47; microscopy, 133; mineralogy, 117; music, 114; painting, 80; philology, 442; pedagogy, 206; photography, 170; physics, 154; political science, 404; psychology, 144; zoology, 67.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 861.

For the Week Ending July 2, 1892.

Price 10 cents. For sale by all newsdealers.

A NEW SCHOLARSHIP AT SIBLEY COLLEGE.

The Frederick William Padgham Free Scholarship in Mechanical Engineering has recently been established in Sibley College by Mr. Amos Padgham, of Syracuse, N. Y., in memory of his son, lately deceased. The young man was a graduate of the public schools of Syracuse, an apprentice with Professor John L. Sweet, and, later, a graduate of Sibley College and Cornell University. He was employed after his graduation by the C. W. Hunt Co., of New York City, and made for himself an excellent record. He died suddenly, of typhoid fever. He was an only son, and this beautiful monument is erected by his father in his memory as the best and most permanent, as well as the most useful, possible.

The provisions of the deed of gift are that it shall be open to competition, first, to scholars from the public schools of Syracuse; next, none such appearing, to any competitors from the State of New York. The superintendent of schools of Syracuse and the principal of the high school in that city are to be kept informed of the opportunity thus offered their scholars to enter upon a course of study in mechanical engineering in Sibley College.

This adds one more to the already long list of scholarships at Cornell. The State provides one at each annual examination in each assembly district. Five hundred and more young men and women are enjoying these opportunities, for which the State pays simply the interest on about a half million dollars which it holds as the proceeds of the sales of the land grant of the Morrill Act of 1862. More correctly, the State receives, through the generosity of the United States, and at no cost to itself, 512 scholarships in Cornell University. The university receives about $50 each for them, and pays out about $300, annually, to provide them. The State has, as yet, contributed nothing to this cause out of its own treasury. There are, besides the above, about fifty other scholarships granted by the members of the early boards of trustees, by President White, and by other private contributors. The State scholarships give free tuition, and the others pay to the successful competitor for them $200 a year, which suffices, usually, to pay all necessary costs at the university. There are, also, at Cornell, fifteen university fellowships, paying from $400 to $500 each. Those taking the higher grade of fellowship are often allowed to travel abroad for study. There would seem to be little reason for the son or the daughter of any citizen of the State of New York failing to secure an opportunity to obtain a good education, either liberal or technical, or both, at Cornell University, if really possessing talent and character. All the university scholarships and fellowships are named for their givers, or in accordance with their wishes, and thus constitute the most beautiful and durable of monuments to the men thus honored.

NITRIC ACID BACTERIA.

The development of bacterial study during the last few years has been very striking. The methods of attack supplied by the gelatine culture, divided plate and microscope brought the subject within the scope of ordinary laboratory manipulation, and took it to a certain extent out of the region of the recondite, which is so unfavorable to rapid study and early acquirement of results. The most extensive processes of decomposition and fermentation are now found to depend upon these exceedingly minute beings. Insignificant as they are in size, they derive their importance from their numbers, from their enormously rapid propagation—twenty minutes sometimes answering for the lifetime of a complete generation—and from their power of bringing about with certainty some of the most difficult of chemical combinations.

The production of ammonia or of nitric acid from the nitrogen of the air has long been a dream with inventors. Hitherto neither combination has been practically effected, and they have seemed almost impossibilities. It was found inexplicable in view of this fact that some plants seemed to derive nitrogen from the air, for it was not easy to see how their green foliage could effect the fixation of nitrogen.

This problem of the fixation of atmospheric nitrogen by plants has been a much-debated subject for many years. Here the bacteria have appeared in the beneficent role of nourishing and supporting plant life. It has been found that plants undoubtedly do absorb the nitrogen of the air, so that it enters into the combinations of their tissues, and this power is dependent on the presence of certain bacteria about their roots. If the soil is void of these colonies of low organisms, then no fixation of atmospheric nitrogen occurs. The presence of these microbes is indicated by swellings and tuberosities on the roots, which tuberosities are thickly colonized with the microbes, but these swellings are to be taken rather as a sign of health than of disease.

Again, for different plants it has been found that different organisms are essential, or at least that for each plant there is an especially beneficial form of microbe that supplies it more thoroughly with nitrogen than any other. The importance of these operations cal-