POLYTECHNIC COLLEGE OF PENNSYLVANIA.

Reported for the Scientific American.

The Annual Commencement of this well known seat of technical education was held in the new and spacious Horticultural Hall, Philadelphia. It was attended by a large audience, comprising many of the leading manufacturers, iron masters, and officers of railways and mines, not only of that city but of the interior of the State. On the stage were grouped leveling and transit instruments, models and apparatus symbolical of architecture, mining, chemistry, and civil and mechanical engineering.

During the performance of a march by the Germania Orchestra, the procession, consisting of the Trustees and Faculty of the College, the reverend clergy and other other invited guests, the alumni association, and members of the graduating and other classes of students, entered the hall, and advancing to the stage, took the seats assigned them. The Hon. John P. Vance, President of the Board of Trustees, announced the order of exercises, which were opened with an impressive prayer by Rev. Phillips Brooks, Rector of Holy Trinity Church, Philadelphia. The introductory address was delivered by Gustavus Remak, Esq., who drew a vivid picture of the great undeveloped industrial resources of the country, north, west, and south, and pointed to the polytechnic system of education as the true and proper means whereby such development may be economically secured. Graduates under that system in Europe were chiefly relied on as directors of her great industries, and now that the system had been successfully transplanted to America, those educated with its advantages were found to be most worthy of confidence, and were therefore more and more in demand. He then traced the history of the Polytechnic College of Philadelphia from the date of the incorporation fifteen years ago, and closed by congratulating the officers and students upon its steady and prosperous career. The recent establishment of the Preparatory School, which he said was the first American "*Realschule*," he hailed as another step toward the attainment of a high standard of polytechnic education in this country.

The degrees of the college were then conferred by the President of the Board of Trustees upon the gentlemen whose names are appended.

The charge to the graduates was delivered by Hon. Titian J. Coffey, whose address was a powerful and convincing argument in behalf of scientific education and against the too exclusive study of the dead languages, which now characterizes the usual college course. That course had remained unchanged for centuries. Meanwhile the labors of the learned had created the natural sciences. Skilled experimenters and artisans had discovered and invented, remodeling the material earth and elevating man. Yet the so-called classical course practically ignored all this progress and denied to its students that robust mental discipline which, severe though it be, the young investigator of modern scientific truth enjoys, as he feels it indeed to be the best training for the sharp conflicts of life. His observation is made acute, and from the habitual determination of the nicer characters of his specimens, he gradually learns to discriminate between men. His imagination finds scope in the theories of chemistry and the study of the imponderable forms of light, heat, and electricity, and his reasoning powers are matured as he solves the sublime problems of terrestrial and celestial mechanics. Mr. Coffey denied that the classical course was the best training for the literary man, and cited in proof a list of the most vigorous, powerful, and influential writers and thinkers of modern times, and adduced the testimony of the first educators and scientific men of Great Britain in behalf of his position. In his closing charge he spoke of the great cause which the graduates had to be proud of the college, and instituted a comparison between their advantages and those of European graduates.

The following is a list of the graduates, of the technical schools in which they studied, and the subjects of their graduating theses:

I.—SCHOOL OF MINES.

DEGREE OF BACHELOR OF MINE ENGINEERING.

1. Edward H. Hughes, Newbern, N. C. Origin and Use of Coal.
2. Samuel Hunt, Carsaunqua, Lehigh county, Pa. Preparation of Ores.
3. William Jolliffe, Virginia. American Silver Amalgamation.
4. Richard Lewis, Trevertown, Northumberland county, Pa. The Ventilation of Coal Mines.
5. Gratz Mordecai, Philadelphia, Pa. Preparation of Fuel.
6. Gilbert R. Van Alen, Danville, Montour county, Pa. Metallurgy of Iron.

II.—SCHOOL OF MECHANICAL ENGINEERING.

DEGREE OF BACHELOR OF MECHANICAL ENGINEERING.

1. Murray Bacon. On Lubricants.
2. Harry B. Salkeld, Mauch Chunk, Carbon county, Pa. The method of Constructing Steam Boilers.

III.—SCHOOL OF CIVIL ENGINEERING.

DEGREE OF BACHELOR OF CIVIL ENGINEERING.

1. John Israel Bishop, Columbus, Burlington county, N. J. Tubular Bridging.
2. Alfred Augustus Curtis, Newark, New Castle county, Del. Underwater Foundations for Bridges.
3. Henry Freedley, Jr., Norristown, Montgomery county, Pa. Iron-girder Bridges.
4. Benjamin P. Howell, Jr., Woodbury, Gloucester county, N. J. Limes, Mortars, and Cements.
5. Samuel H. Ladd, Woodbury, Gloucester county, N. J. Ventilation of Buildings.
6. Herman H. Mund, Philadelphia, Pa. Stone Masonry.
7. Emilio V. Munoz, Santiago, Cuba. Construction of Canals
8. F. H. Oliphant, Jr., Spring Hill Furnace, Fayette county, Pa. Tunneling Through Rock.
9. Amos M. Shuster, Frenchtown, N. J. Construction of Roofs.
10. Joseph E. Thropp, Valley Forge, Chester county, Pa. Detaching Rock.
11. B. B. Van Dusen, Knoxville, Tioga county, Pa. Permanent Way.
12. Rowland Whitman, Philadelphia, Pa. Suspension Bridges.
13. A. D. Wright, Farmington Center, Tioga county, Pa. Common Roads.

The Master's Degree was conferred upon the following graduates of three year's standing:

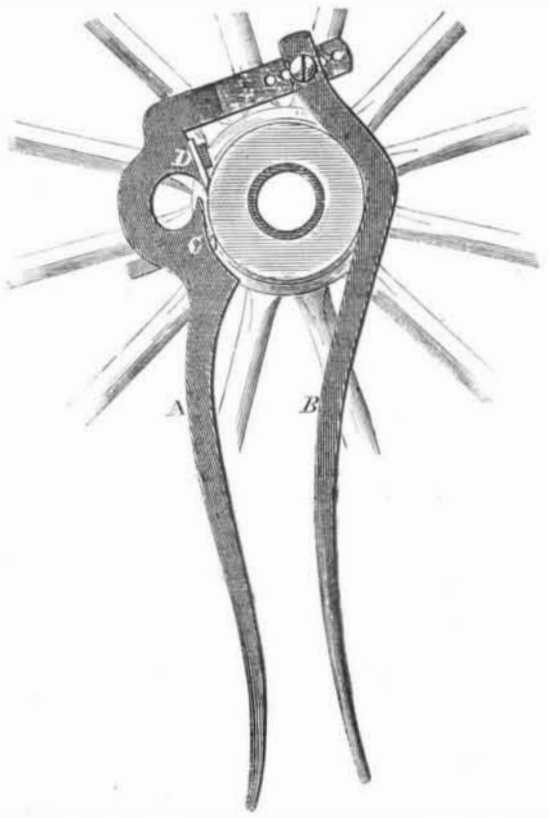
Master of Mine Engineering, on Price Wetherill, mining engineer, Mahonoy City, Pa.

Masters of Civil Engineering—Jonathan R. Jones, C. E., Conshohocken, Pa.; Henry H. Corson, C. E., Plymouth, Pa.

THE Scientific Association at Chicago adjourned on the 12th inst., after the usual resolutions of thanks to all concerned, and the election of Prof. J. W. Foster, of Chicago, as President of the next meeting, to be held August 16, 1869, by invitation, at Salem, Mass.

STONE & HEBBERT'S PATENT TOOL FOR FITTING HUB-BANDS.

The simplicity of this tool is such that the practical carriage maker or wheel-wright will understand at once its action and operation, by an examination of the accompanying illustration. It is intended to save the clipping with mallet and chisel usually practiced to fit the hub of wagon wheels to the band. The implement consists mainly of two handles, A, having a right-angled arm to which B is pivoted by means of a bolt. B is sufficiently bent to bear at two fixed points on the perimeter of a hub, whether it be large or small, and A has also a concave face for the same purpose. To further adapt the instrument to varying diameters, the handle, B, may be set nearer to or further from the other by shifting its pivot bolt, for which purpose the arm of A is furnished with



a series of holes. C is a marking or scribing cutter, and D, a chisel; both adjustable by means of set screws and slots. In operation the wheel is swung and revolved while the work, man holds the tool on the hub.

Patented through the Scientific American Patent Agency July 14, 1868, by Charles E. Stone, Amesbury, Mass., and Alfred Herbert, Salisbury Mass. For the entire patent, State rights, or further particulars, address either of the patentees, box 163 Amesbury, Mass.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents

The Union Pacific Railroad Company.

MESSRS. EDITORS:—Have you space for a brief article upon the Union Pacific Railroad, and the country which it traverses? I am prompted to write this for your columns, because, having recently traveled over that railroad for a distance of seven hundred miles west from Omaha, and having seen every mile of it by daylight, I am qualified to speak somewhat strongly of its character, and to emphatically deny some of the charges that have been made against it. I was one of the editorial party of thirty who have recently returned from the end of the line, and who were given the fullest opportunity possible for thorough investigation into the construction and management of the road.

I have spoken of charges made against the character of the road. Evidently some of these charges are prompted by prejudice, and more by utter ignorance of the subject. It is not long since a prominent newspaper published a letter of complaints against the Union Pacific Road, the strong points of which were that the bridges were made of pine! and were actually built without arches! The blundering letter-writer was right—the bridges *are* built of pine, which you know to be the best bridge timber in the world, and every one of them is a Howe truss bridge, whose peculiar strength lies in the fact that there is not a sign of an arch about it. I have now before me two letters published in a Brooklyn paper, evidently written by one person. These have sundry charges against the Union Pacific Railroad, a part of which are frivolous, and others more tangible. Let us see what foundation the writer has for his denunciations.

A large part of the letters is taken up with sneers at "deadheads," who go over the road at the expense of the company, and are charged with being thereby bribed to tell a flattering tale I suppose he would include our whole party under that head, because we were invited by the agents of the railroad company; so let us see what our circumstances were Every invitation to join the party said, in substance, "send some gentleman of sound sense and good judgment, who can state clearly the condition of things as he sees them, and who can criticise intelligently, if he finds occasion to do it at all." In response to this invitation, we had gentlemen of a standing and repute not to be bought up with good eating or comfortable quarters, if such a thing had been desired. Then, the gentlemen in charge of the party, and who represented the railroad company, took a special train from Omaha, which went fast or slow as was desired, which stopped whenever it was desired by the guests, to examine the road or its surroundings, and which passed over the entire line by daylight, either going or returning. Hence the members of the party had a far better opportunity for seeing the exact character of everything pertaining to the road than the writer referred to, or any traveler by ordinary trains could have. What was the verdict? Hon. Charles A. Dana, editor of the New York *Sun*, is a credible and responsible witness; and he speaks the sentiment of the entire party when he says:

"Their unanimous opinion is, that the road is constructed in the most thorough and solid manner, and that it is superior in firmness, smoothness, and capacity, for rapid running, to any other new road which they have ever seen. The work is well done, both as respects the judgment with which it is laid out, and the thoroughness of its construction; and there is no part of it which could, under the circumstances, be better than it is. All reports to the contrary are erroneous and mistaken."

The critic referred to says that he anticipated seeing "marvelous cities, beautiful villages, and delightful settlements," all along the line, and seems to have been surprised to find a congregation of bad characters at Cheyenne. Then, he must have known less of the inevitable character of a new country than men of ordinary sagacity. To expect to find New England or eastern Pennsylvania towns in a region just opened to civilization, one or two years ago, shows a credulity which deserves disappointment. But Cheyenne, Laramie, and Benton, *have* successively deserved the title of "marvelous cities," or villages. Theirs is not a pleasant nor an attractive growth to an eastern man; but Omaha on the one side, and San Francisco on the other, have both passed through similar experience, before law and order succeeded the reign of vice and violence. For one, I have never yet seen any description, even from a "dead-head," of these places, which represented them to be the abodes of peace. The tendency has invariably been to exaggerate their lawlessness, and make the hair of a timid man stand on end at the thought of visiting them.

In regard to the road itself, the paragraph I have quoted above expresses just what we all felt after thorough examination. On our return, we made the run from North Platte to Omaha, a distance of two hundred and ninety miles, at an average rate of over thirty-four miles an hour, and ran fifty-five miles in one hour. No railroad officer in the country would dare do that, or suffer it to be done upon his road, if the latter was not in splendid condition. This portion of our trip was made with as much comfort to us as any other part of the whole run from New York to the Rocky Mountains; and I claim that this one fact will convince any candid man that it is a gross libel to speak of "the miserable and absolutely unsafe manner in which the road is constructed." Here are some of the details of construction: The iron is of the very best American manufacture; the ties number 2,650 to the mile (the average upon the railroads of the country is about 1,700); the rails are all joined by "fish-plates," of a pattern approved by the best railroad engineers; the road is being ballasted with broken stone brought from the Black Hills; the culverts are now made of substantial timber, which would be good for ten years' wear; but the contract is already made for immediately replacing them with heavy dressed masonry. The equipment of the road is superb. The locomotives are of the best Taunton, Providence, Trenton, and Paterson make; while the freight and passenger cars, which are turned out from the company's own magnificently appointed shops at Omaha, are equal in every respect to any that I have ever seen in the course of many years' active traveling. These shops, by the way, cover eight acres of ground, and are manned by about one thousand intelligent artisans, who have all the advantages that the most perfect tools and machinery can give them.

The perfect, almost military discipline, which pervades all the vast operations of the company, is noticeable and pleasurable. Especially is this apparent at the end of the track, where four hundred men are engaged in the track-laying, where every man knows so exactly his place in the grand human machinery, and so promptly and energetically fills it, that no possible improvement can suggest itself. It would take more words than you have space to print, to adequately describe this wonderful march to the western sea.

But I must stop. The theme is inspiring; but there remain all the future ages in which to recount the worth to the country of the Union Pacific Railroad, and the honor due to those men of brains and energy, and indomitable pluck, who have conceived and are so grandly executing this national undertaking.

Let me close with another quotation, this one from the practical, unimpulsive Baltimore *American:*

"It is proper to say, just here, that the rumors which have been put afloat at the east, that the company is a party of speculators putting down a rude and poorly constructed road, that will be useless, or nearly so, when completed, are falsehoods which could have only been concocted and put in circulation for purposes that would scarcely bear examination. The road is a good one, well and solidly laid, with heavy rail, and twenty-six hundred cross-ties to the mile, over which the cars travel with remarkable smoothness; and the equipments, station-houses, and work shops, all show that it is being built for use and not for speculation."

S. D. P.

Algebra—Mathematics for Mechanics.

MESSRS. EDITORS:—In your issue of the 5th inst., I was quite surprised at the remark of Mr. Horace Greeley on the study of algebra, and quite indorsed your opinions on the subject. Any one who knows anything of the study of mechanics, must know that a previous knowledge of geometry and algebra is indispensable to acquire its principles. But, laying aside the question of its after utility, to say its study will clog the brains, is an assertion, which, I think, the writer would retract after mature consideration; for the more one studies, the more is the capacity of the brain for storing