[For the Scientific American.]

CHEMICALS AT THE CENTENNIAL.

It is generally admitted that the German section at the Centennial Exposition is far inferior to what it ought to be, and does not adequately represent the present state of manufacture and industry in that empire. Be this true or not, it certainly does not apply to the chemicals, for in this department Germany is *facile princeps*. She supasses France, is far beyond England, and finds a worthy competitor only on this side of the ocean. In quantity, Philadelphia chemists far excel; but in rare chemicals, new compounds, and interesting preparations, Germany leads. Entering by the main entrance on Elm Avenue, and passing up the center cross nave, we have on our right the magnificent display of Powers & Weightman, Rosengarten, and Pease; on our left the smaller black show cases of the German exhibitors, Brohme, Trommsdroff, and others.

THE GERMAN EXHIBIT.

This department has an advantage over all others in having a complete and instructive catalogue, which enables the visitor to examine with greater ease and understand more readily what is to be seen here. An intelligent attendant is also ready at all times to explain more fully whatever is of interest The chemicals in this department may, for our convenience, be arranged under three heads, namely, chemicals largely employed in the arts, rare and curious chemicals chiefly of theoretical interest at present, and coal tar products, including the aniline colors. This division is, of course, very imperfect, because new substances are so rapidly passing from the second to the first class, while the third class belongs to both the others.

The most interesting of the commercial exhibits, because the newest, are the samples of carbonate and bicarbonate of soda made by Moritz Honigmann at Aix la Chapelle, by the ammonia soda process of Solvay (see SCIENTIFIC AMERICAN, June 24, 1876). This establishment employs 35 men and 3 steam engines of 25 horse power in the aggregate, producing 6,600 lbs. of soda ash per diem. The operations are performed in large wrought iron vessels at a pressure of $\frac{1}{4}$ to $\frac{1}{2}$ atmosphere. Chloride of sodium obtained from the saltpeter works (SCIENTIFIC AMERICAN, January 22, 1876) is decomposed, at a temperature of 95° Fah., by carbonic acid and ammonia, into bicarbonate of soda and chloride of ammonium. The ammonia is recovered from the latter by means of unslaked lime, at a temperature of 212° Fah.; the lime is obtained by burning mountain limestone with coke, and the carbonic acid utilized for converting the salt into a bicarbonate of soda in the presence of ammonia, as above stated. No use has yet been found for the waste chloride of calcium. The calcined soda ash contains 98 to 99 per cent of the carbonate; and,being free from iron, sulphur, and sulphuric acid, is largely employed in dye works and glass houses. This process will attract our notice again in the chemical sections of France and Belgium.

Vorster and Grueneberg, of Kalk, exhibit potash and saltpeter made from the Stassfurt salts.

There are several exhibitors of glue, gelatin, and phosphates from animal refuse.

Xanthate and sulpho-carbonate of potassium, the new insect destroyer, is exhibited by J. F. Hayl & Co., the well known manufacturers of oisulphide of carbon. This establishment, which covers over 7 acres and employs 12 men, is chiefly occupied in the extraction of fatty oils by means of bisulphide of carbon. They exhibit oil cake and oils. They claim for the oil cake that it contains 6 to 15 per cent less oil than those which have been pressed, but are better as fodder because the nitrogenous principles remain in the residues.

Paraffin and paraffin candles made from peat are exhibited by two stock companies, one at Rehmsdroff, the other at Halle.

The Nuremberg Ultramarine Works have a pyramid over ten feet high, around and on which their products are arranged. Green, blue,and violet ultramarines are exhibited. Several smaller exhibits of ultramarine,both blue and green, were also noticed.

The exhibition of mineral colors, although varied and pleasing to look at, requires but little to be said about them Zinc and cadmium yellows, umbers, ochers, siennas, lampblacks, etc., filled the list.

Brohme & Co., Bergen, exhibit soda and potash water glass in solid and liquid form, composition for artificial stone, water glass whetstones, etc.

Oxalic acid and oxalate of potash are exhibited by R Koepp & Co. and Kunkeim & Co. The latter also exhibit the rarer substances, tungstate of soda, naphthaline yellow, and phthalic acid.

The largest exhibit of alkaloids is by Fried. Jobst, Stuttgart, and includes also opium grown in Würtemberg and Silesia. Here we notice a dozen different salts of quinine, including the anetholate, and several salts of other cinchona alkaloids. The new preparations made since the Vienna Exposition of 1873, and never before exhibited, are the muriate, sulphate, and salicylate of phenyl-quinine, sulphate of phenyl-cinchonidine, oxalates of cinchonicine and of quinicine, santoninic acid, cotoine, echicerine, chinamine, echitine, and echi eine.

The exhibit of alcoholic preparations, by C. A. F. Kahlbaum, Berlin, is deserving of special notice, showing as it does how soon chemical compounds pass from the class of rare and curious chemicals to commercial articles. These works, which are under the direction of Drs. G. Krämer and Bannow, were the first to manufacture artificial mustard oil (from allyle alcohol) on a large scale, and now it is capable, by excellence and cheapness, of competing with the natural oil. The other staple productions are methyl, ethyl, and amyl alcohols, iodoform, acetone, aldehyde, ether, acetic acid, and acetates The most interesting portion of this exhibit is, however, a series of scientific preparations, made in the laboratory connected with these works, and in many cases from waste products. A list of these curious and new compounds would exceed our present limits, and we may only mention a few, such as metaldehyd, a white solid crystaline substance having the same percentage composition as common aldehyde, and convertible into it by heat at 112° to 115° in a closed tube. Paraldehyd, a liquid isomer of aldehyd, which boils at 124° and crystalizes below 10°, is also exhibited. Resorcin, phenylacetic acid, phloron, phthalic acid, azobenzol, methyl and ethyl iodides, zinc methyl and ethyl, sulpho-butylates, methylates, propylates, and vinates are among the things seldom, if ever, seen before in America.

In the case adjoining Kahlbaum's exhibit is the far smaller but equally interesting one of Dr. Wilhelm Haarmann, Holzminden on the Weser. Here is exhibited the new artificial vanillin, discovered by Drs. Haarmann and Tiemann; also a glass of coniferine, a glucoside contained in the cambium of coniferous woods, and from this the vanillin is made. The latter is identical in composition, melting point, flavor, and all other properties with vanillic acid from the vanilla bean. Vanillinic acid (a by-product), vanillinic sugar, vanillinic alcohol, and vanillinic glycerin are also exhibited. These works were established in 1875, and employ in the summer months about 46 workmen.

Next to this is the exhibit of the Berlin Stock Company, formerly E. Schering. The exhibit is large and handsome, including salycilic acid in large quantities, salicylates of ammonium, quinine, sodium, and zinc, also chloral hydrate, both in cake and crystals. Just around the corner is the curious little exhibit of Dr. F. Wilhelm, Reudnitz-Leipsic. He exhibits the artificial bitter almond oil (not, he says, nitrobenzol), of which he claims to be the inventor and only manufacturer. He also exhibits benzoic acid, Niobe essence (?), benzyl chloride, and some manganese salts.

The well known house of H. Trommsdorff, Erfürt, makes a very large and interesting show. It includes 50 different alkaloids, glucocides, and bitter principles, 30 organic acids, various physiological preparations, such as glycocoll, allantoine, cholestrine, taurine, etc. Among the rare metals and metallic salts, we noticed selenous, tellurous, and vanadic acids, sulphate of beryllium, cæsium, and rubidium alums, sulphates of cerium, lanthanum, and didymium, biehromate of rubidium, bivanadate of ammonium, and metallic tellurium, thallium, titanium, tungsten, molybdenum, etc.

Another fine display, in close competition with Trommsdorff and Kahlbaum, is that of Dr. Theodor Schuchart, Görlitz. There are 110 preparations of purely scientific interest, and 20 for technical purposes. Among the former are included nearly all the rare metals and their salts. One of the most beautiful things here is the double cyanide of yttrium and platinum, which consists of dichroitic (red and green) crystals. We also noticed some handsome crystals of boron, also specimens of nitrate of roseo-cobalt, chloride of purpureo-cobalt, sulphate of xantho-cobalt, crystals of nitrate of uranium, metallic chromium, nickel salts, sesquichloride of titanium, chloride of niobium (columbium), and blue oxide of tungsten. A few organic preparations, thymol, anthracene, alizarin, etc., completed the list.

Salicylic acid and its derivatives are exhibited in large quantities by Dr. F. von Heyden, Dresden, who manufactures, under Professor Kolbe's patent, from the best English carbolic acid. The collection contains wintergreen oil, pure and crude salicylic acid, crude and pure salicylicate of soda, and sodium phenylate.

Dr. L. C. Marquart, Bonn, has a very good display, including salicylic acid, cæsium, and rubidium alums, ethyl sulphate of lithium, ethyl benzol, bibrom-benzol, and dichlorhydrine, the curious chlorine derivative of glycerin.

Chloral hydrate is the specialty of Saame & Co., Ludwigshafen. The works cover 17 acres, and originally were devoted to the production of chloral hydrate only; but since the fall in price of that article, they have begun the manufacture of themineralacids,of which they produce 13,200,000 lbs. annually. They also manufacture and exhibit chloroform, made from chloral and absolutely free from other chlorine compounds, chloral alcoholate, chloride of sulphur, bisulphite of soda, used in making the new reducing agent hydrosulphurous acid, chlorate of potash, etc.

The third class of chemicals, coal tar products, form the most beautiful and interesting part of the chemical section. (See SCIENTIFIC AMERICAN SUPPLEMENT, page 496, volume I.) There are several exhibitors of these goods, the largest and best being those of Fried, Bayer & Co., at Barmen and Elberfeld, and the *Actien Gesellschaft für Anilin-Fabrikation* at Berlin. The former is especially interesting, as showing all the steps of the process, and all the intermediate products from the coal to the finished dye, all numbered and labeled, the formulas being given, too, in most cases. Among the rarer substances, we noticed the new and beautiful cosine and silks dyed with it, also fluorescin, resorcin, phthalic acid, benzyl chloride, cumol, xylol, rosolic acid, iodide of ethyl and methyl, coralline, and a full series of anthracene derivatives, bibrom-anthracene, anthraquinone, sulphanthroquinonic acid and its barium and sodium and sodium salts, alizarates of sodium, potassium, barium, and aluminum, alizarine itself, and samples of dyeing. The Actien-Gesellschaft present even a better show of the aniline dyes and dyed specimens, many of the dyes being in much larger quantity, and the whole well mounted and catalogued. The Frankfurt Anilin Color Works exhibit 25 specimens, including cosine, phosphine, indigotine, phenyl-yellow, indigo carmine, aniline blue, green, and violet. Taken as a whole, the exhibit of German chemicals does credit to the manufacturers and to the committee who organized and executed this difficult work. E. J. H.

[For the Scientific American.]

BOILER NOTES.

We have just received the last annual report of the Hartford Steam Boiler and Insurance Company, and, in accordance with our usual custom, proceed to present a synopsis of it to our readers.

The present report is one of unusual interest, as the President, in honor of the completion of the first decade of the company's existence, gives a review of the work done since the organization. The task undertaken by the company, as most of our readers doubtless know, is to institute such a system of inspection of the boilers under their charge as to render them reasonably secure against explosion, agreeing to pay the owners the amounts of insurance stated in the policies, in case explosions do occur. The company's record for two years shows a list of 848 boiler explosions in the United States, by which 1,768 persons were killed, and 1,904 injured. Of these boilers that exploded, 18 were insured by the company, and a careful examination of the causes shows them to have generally been such as no inspection could have prevented. Thus, in one instance, a boiler being under repairs, the workman drove a plug into the steam pipe, and neglected to remove it when the work was completed. As might naturally be expected, in getting up steam in the boiler, it exploded. Several other cases of explosion occurred with long boilers, supported only at three points of their length, and fired by the waste gases from iron furnaces. The President states that it cost the company $10,000 to learn that such boilers should have supports not more than 10 feet apart—though, if we mistake not, considerable attention has been paid to this subject in England in former years, resulting in the adoption of a method of supporting long boilers which seems to give good results. During the period covered by this last report, from August 31, 1874, to December 31, 1875, the company have made 44,763 inspections, discovering 24,040 defects, of which 5,149 were classed as dangerous, requiring immediate attention. Some of these defects may be briefly recounted and discussed. Their nature is clearly illustrated in the report, by a series of well executed engravings.

Furnaces become distorted, and plates are fractured, chiefly by bad management, such as suddenly introducing cold water into an overheated boiler. These distortions and fractures are frequently hastened by the method of construction, the plates being overstrained by using drift pins to bring the rivet holes in line. A sheet may be nearly fractured by this mal-construction, and yet appear to be uninjured, when viewed from the outside.

Plates become burned from forcing the fire too fiercely, or on account of the deposition of scale or sediment. Comparatively few manufacturers seem to realize the danger of using a boiler that is too small for the work, and forcing it to the utmost extent. When a blister forms on a plate, it is generally due to the uneven character of the iron, and the whole plate should be renewed, the application of a patch being only a temporary expedient. Sheets may be corroded on the outside by leaks at the seams, in places which are not readily accessible for examination. Such defects can only be discovered by careful inspection. The use of impure water frequently causes the rapid destruction of a boiler by internal corrosion; and unless this is discovered by internal inspection, a so-called mysterious explosion may be the result.

Careless engineers allow water gages to become clogged, blow valves to leak, and safety valves to stick fast. The following simple rules should be observed by every one in charge of a boiler.

Blow through the water gage at least once a day, and several times, if the water is dirty.

Before starting the fire in the morning, always try the water in the boiler, and do not raise steam until assured that it is at the proper level.

Raise the safety valve, at least once a day, and observe whether it works freely. Attach a stop to the lever, so that the ball cannot possibly be moved out beyond the proper position; and never hang any additional weight on the lever.

Among the steam gages examined by the company, 649 were found to be dangerously defective, having errors ranging from —45 to + 70 with inoperative safely valves. What splendid chances for "mysterious explosions" were presented!

A number of boilers were found without gages, and 19 of these were considered dangerous, because a high pressure was carried.

Several boilers were examined, in which there were no hand holes for removing the sediment, and in many boilers the bracing was very insufficient. When such boilers explode, there ought to be little difficulty in finding the cause. The experience of the company, with boilers in which some of the sheets were made of Bessemer steel, seems to show that this metal is quite as reliable as iron, all cases of distortion or fraction of steel plates being traced to overheating or sediment.

During the time covered by the last report, 139 boiler explosions were reported in the United States, by which 191 persons were killed, and 267 injured. An investigation of a number of these by the company has served to clear up all mystery in reference to their causes.

In the above brief synopsis of this interesting report, we have endeavored to give prominence to such matters as will be of especial interest to those in charge of steam machinery. We think the operations of this company show clearly that safety from boiler explosions can be obtained by careful inspection at frequent intervals, and careful management at all times, neither plan by itself constituting a sure preventive. Not the least among the results of the company's work is the clear demonstration of the fact that the hydraulic test alone will not reveal all the defects of a boiler; and, as we have frequently pointed out, when it is made with cold water it sometimes produces defects which did not formerly exist.

[For the Scientific American.]

OCCUPATION AND THE DEATH RATE IN ENGLAND.

A comparative study of the death rate in seventy-three of the principal employments in England and Wales has lately been made in the British Registrar-General's office, based on the mortality returns of three years. The results show, among other matters of interest, the mortality among all the males aged fifteen years and upwards, in each of the specified employments, and also the relative mortality in each, the mean death rate of the whole being taken as one hundred.

For example, in the three years under examination, the deaths among grocers amounted to three thousand one hundred and sixty. Had their death rate been equal to the mean death rate for all the employments during those years, as many as four thousand one hundred and seventy-three grocers would have died. The relative death rate of that class, therefore, in comparison with the whole, was only seventy-six.

But the grocers were surpassed in healthfulness by the members of two learned professions, the lawyers and the clergymen. The barristers head the list, with a death rate of only sixty-three; the clergy of the Established Church follow, with a death rate of seventy-one, while the independent Protestant denominations stand at seventy-five.

It is scarcely probable that the immunity of the barristers is altogether due to the lightness or wholesomeness of their work. That counts for much, but we must not forget to allow for the fact that in England a large number of independent gentlemen adopt that calling, not to make a living out of it by hard work, indeed not to work at all in it; but simply for the nominal professional rank it gives. If the working barristers only were counted, it is doubtful whether the class would stand so high in the sanitary list. Perhaps the refuge which the Established Church affords for many men of culture and leisurely regular life may similarly help to account for its lower death rate as compared with that of other Protestant clergy.

Next after the barristers and the Protestant clergy come the grocers, already mentioned, followed by men of the combined occupation of grocer and shopkeeper, with a death rate of seventy-seven. After these we find gamekeepers, with a death rate of eighty; farmers, one of eighty-five; civil engineers, eighty-six; booksellers and publishers, eighty-seven; wheelwrights, eighty-eight; silk manufacturers, eighty-nine; carpenters and joiners, and common laborers, stand together in the list, at ninety-one; bankers at ninety-two; domestic servants, ninety-three; sawyers at ninety-five; musical instrument makers, paper manufacturers, and brass workers, at ninety-six; blacksmiths and gunsmiths at ninety-seven; tanners and curriers, shoemakers, and workers in iron and steel, ninety-eight; and bakers at ninety-nine, completing the group of occupations in which the death rate is below the mean.

Machinists and woolen workers die at the mean rate for all, one hundred. Then follow half a hundred employments, more and more destructive to life. Manufacturers in iron, copper, tin, and lead, with bakers and confectioners—probably what would be classed as fancy bakers here—exceed the mean mortality by one. The schoolmaster's calling, and the solicitor's, rank next in unhealthiness, their death rate being one hundred and two. Millers and Roman Catholic priests stand next, with a death rate three above the mean, and thirty-two above that of the clergy of the church of England: a notable circumstance, to say the least.

Why should the mortality among the Roman Catholic priesthood exceed so largely—nearly fifty per cent—that of the English clergy? Are celibacy and asceticism the unsanitary conditions? Or shall we attribute their higher death rate to a more arduous and exposed life among the sick and squalid poor?

After the priests come watchmakers, one hundred and four; tobacconists, one hundred and five; physicians and shipbuilders, one hundred and six; messengers and porters, coach makers and rope makers, one hundred and seven; drapers, one hundred and eight; tailors, one hundred and nine; and workers in cotton, flax, and silk, the same. Chemists, druggists, and commercial travelers exceed the mean death rate by ten; clerks, insurance men, and butchers, by eleven; carvers and gilders, by twelve; farriers, by thirteen; miners, printers, and manufacturers of cotton and flax, by fifteen. It will be noticed that weavers and workers in silk are much the most healthy of all who have to do with textile fabrics, their death rate being eleven below the mean. Those that handle wool exhibit an average vitality, compared with all grades of working men. With the addition of cotton and flax to the fiber used the death rate rises to one hundred and nine; while those who handle flax and cotton without silk or wool die at the rate of one hundred and fifteen. Which is the more destructive to life in its working, cotton or flax, the statistics do not show.

Bookbinding is a degree more unhealthy than printing, the death rate of this class of workers being one hundred and sixteen. In glass manufacturers and fishmongers it rises to one hundred and nineteen; and in printers and plumbers to one hundred and twenty. Quite a number of callings show a death rate of one hundred and twenty one; namely, railway employees, dock laborers, tool makers, file makers, and saw makers. For the diverse causes of high mortality in their occupations, it is not needful to enquire. In hatters, coppersmiths, and needle makers, the rate rises to one hundred and twenty-three; and in manufacturing chemists, and dye and color manufactories, to one hundred and twenty-four. In hair dressers the mortality is more than double what it is in the legal profession, that is, one hundred and twenty-seven. Bargemen die at the rate of one hundred and twenty-nine, or twenty-nine above the standard death rate. The employments of carmen, dray men, horse-keepers, and grooms are still more fatal, the death rate being one hundred and thirty-one. In the next group, embracing potters, innkeepers, licensed victuallers, the mortality is thirty-eight above the standard; while in cabmen and coachmen (not domestic), the death rate rises to its highest, one hundred and forty-three, or twice that of the English clergy.

These figures show with practical accuracy the comparative mortality of the men engaged in these various employments. To considerable extent also, they represent the comparative healthfulness of the several callings; but the reader will readily see that many outside conditions conspire to affect the death rate in each. An easy and healthful calling may show a high death rate, simply because it is easy and comparatively favorable to life, and consequently attracts to itself the feeble and disabled. For example, the statistics of the Medical Department of the Provost Marshal General's Bureau, during our late war, shows that proportionally more watchmen were rejected for physical unfitness than men of any other employment. Yet the watchman's work is easy and not specially unhealthful: so easy, in fact, that the worn-out and crippled and diseased naturally gravitate to it.

That cabmen should show excessive mortality is rather to be expected. Their working hours are long and irregular; and they are exposed to all weathers under unfavorable conditions. It is not so apparent why the unexposed innkeepers and victuallers should die almost as rapidly. The clever author of "Diseases of Modern Life" charges their high death rate to drink. No doubt excessive indulgence does cut short the lives of very many. But we are inclined to think that the selective action of the business has much to answer for. A large proportion of the English innkeepers are men whose working days are past: men who have earned a little money as butlers, stable keepers, small traders, and the like, and find the inn, or "saloon," as we would call it, a sort of hospital for the physical incapacity.

Again, the mortality of hair dressers is relatively high, thirty per cent higher than that of blacksmiths. It can hardly be that their business is in itself so much more killing, notwithstanding the hot and ill ventilated rooms they usually occupy. It is another case, we think, of natural selection. Out of a hundred boys fated to be blacksmiths and barbers, there is little doubt that the majority of the sturdy ones will gravitate to the blacksmith shop, the majority of the undersized and feeble ones to the barber's.

In another article we propose to examine the relative healthfulness of the different employments of men in this country. The results are in many respects curiously unlike those derived from the English statistics. R.

The Meeting of the American Association for the Advancement of Science.

The annual meeting of this association convened at Buffalo, N, Y., on August 23. There is a remarkably large attendance, not only of American scientists, but of scientific men from Europe, who are on a visit over here to the Centennial. The proceedings were formally opened in the Common Council Chamber of the City Hall by a speech by the retiring president, Professor G. S. Hilgard. This was followed by a brief address by the new president, Professor William B. Rogers, after which a formal welcome was extended to the Association by the Mayor of Buffalo and influential citizens. These proceedings, together with the work of electing a standing committee and the reading of a few papers, which will be referred to in the abstracts which we shall publish next week, occupied the attention of the scientists for the first day. On the ensuing morning Professor Huxley arrived, and after receiving an enthusiastic welcome, addressed the assembly substantially as follows. After gracefully returning thanks for the reception accorded him, he stated that he had no scientific matter to communicate, and in that respect was unprepared, but that, to satisfy a curiosity which he had noticed to be especially developed among us, he would state briefly his impressions of the country.

PROFESSOR HUXLEY'S ADDRESS.

"Since my arrival," he continued, "I have learned a great many things, more, I think, than ever before in an equal space of time in my life. In England, we have always taken a lively interest in America; but I think no Englishman who has not had the good fortune to visit America has any real conception of the activity of the population, the enormous distances which separate the great centers; and least of all do Englishmen understand how identical is the great basis of character on both sides of the Atlantic. An Englishman with whom I have been talking since my arrival says: "I cannot find that I am abroad." The great features of your country are all such as I am familiar with in parts of England and Scotland. Your beautiful Hudson reminds me of a Scotch lake. The marks of glaciation in your hills remind me of those in Scottish highlands.

"I had heard of the degeneration of your stock from the English type. I have not perceived it. Some years ago one of your most distinguished men of letters, equally loved and admired in England and America, expressed an opinion which touched English feeling somewhat keenly—that there was a difference between your women and ours after reaching a certain age. He said our English women were "beefy." That is his word, not mine. Well, I have studied the aspect of the people that I have met here in steamboats and railway carriages, and I meet with just the same faces, the main difference as to the men being in the way of shaving. Though I should be sorry to use the word which Hawthorne did, yet, in respect to stature for fine portly women, I think the average here fully as great as on the other side. Some people talk of the injurious influence of climate. I have seen no trace of the "North American type." You have among you the virtue which is most notable among savages, that of hospitality. You take us to a bountiful dinner and are not quite satisfied unless we take away with us the plates and spoons. Another feature has impressed itself upon me. I have visited some of your great universities and meet men as well known in the old world as in the new. I find certain differences here. The English universities are the product of Government, yours of private, munificence. That among us is almost unknown. The general notion of an Englishman when he gets rich is to found an estate and benefit his family. The general notion of an American when fortunate is to do something for the good of the people and from which benefits shall continue to flow. The latter is the nobler ambition.

"It is popularly said abroad that you have no antiquities in America. If you talk about the trumpery of three or four thousand years of history, it is true. But, in the large sense, as referring to times before man made his momentary appearance, America is the place to study the antiquities of the globe. The reality of the enormous amount of material here has far surpassed my anticipation. I have studied the collection gathered by Professor Marsh, at New Haven. There is none like it in Europe, not only in extent of time covered, but by reason of its bearing on the problem of evolution; whereas before this collection was made, evolution was a matter of speculative reasoning, it is now a matter of fact and history, as much as the monuments of Egypt. In that collection are the facts of succession of forms and the history of their evolution. All that remains to be asked is how, and that is a subordinate question. With such matters as this before my mind, you will excuse me if I cannot find thoughts appropriate to this occasion. I would that I might have offered something more worthy; but I hope that your association may do what the British Association is doing—may sow the seeds of scientific inquiry in your cities and villages, whence shall arise a process of natural selection by which those minds best fitted for the task may be led to help on the work in which we are interested. Again I thank you for your excessive courtesy and, I may almost say, affectionate reception."

The Traveler Ropes of the Brooklyn Bridge.

The joining of the two ends of the first traveler rope, whereby the material for constructing the East River Bridge is to be transported over the river, was recently accomplished. The endless chain is now complete, passing over grooved pulleys on the towers. It is operated by the engine formerly used to elevate stone during the process of erection of the piers. At the time we write, the first section of the second traveling rope is about to be carried over the river. This is made fast to the rope now in position and run over by it. It is lashed to the first rope at regular distances of 50 or 60 feet, as it leaves the Brooklyn anchor pier; and when it is across, these fastenings will have to be cut. This is done by a man sent over in a "buggy," which is a small platform hung upon the traveler rope by deeply grooved wheels. It is surrounded by a railing, inside of which the workman will stand, cutting the lashings as he rides across. The ride down to the center of the traveler rope will be controlled with a hempen rope, and the "buggy" will be hauled up the opposite incline with another. There will be nothing perilous in the process if the workman can keep from dizziness, nor more danger than in a great many other stages of the work.

In order to inspire confidence in the men who are to perform the undertaking, Mr. E. F. Farrington, master mechanic of the bridge, recently crossed from the Brooklyn anchorage to the New York pier, seated on a boatswain's chair, or swing, attached to the moving rope. The trip was rapidly and safely accomplished in the presence of a large and enthusiastic crowd. Mr. Farrington, now the first man who has crossed the bridge, was also the first who traversed the spans at Cincinnati and Niagara.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVEMENT IN FEEDING PULVERIZED FUEL TO FURNACES.

Allin Cockrell, Lamar, Mo.—This consists of a fan blower combined with a furnace in such manner as to feed it with a constant and regular supply of fnel, and having a conveyer for supplying the fuel to it from a mill in which it is ground, or from a feeding hopper to be supplied with previously pulverized culm, tan bark, sawdust, or the like.

IMPROVED EXPANDING METAL DRILL.

Patrick Duffy, New Bedford, Mass., assignor to himself and James F. Powers, same place.—Two cutters, fixed in the stock to slide forward and backward transversely, are slotted obliquely and reversely to each other. The fastening bolt by which they are secured to the stock is fitted in said slots, and also fitted in a vertical slot in the stock, so that, by shifting the bolt along the slots in one direction, the cutters will be adjusted onward; by shifting the bolt the other way, they will be adjusted inward.