

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XLI., No. 13. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, SEPTEMBER 27, 1879.

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(Illustrated articles are marked with an asterisk.)

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For the Week ending September 27, 1879.

Price 10 cents. For sale by all newsdealers.

Detailed table of contents for the supplement, including sections like 'I. ENGINEERING AND MECHANICS', 'II. TECHNOLOGY', 'III. ELECTRICITY, LIGHT, ETC.', 'IV. CHEMISTRY', 'V. NATURAL HISTORY, ETC.', 'VI. ARCHITECTURE', 'VII. ASTRONOMY, METEOROLOGY, ETC.', 'VIII. MEDICINE AND HYGIENE', 'IX. GEOLOGY, GEOGRAPHY, ETC.', 'X. THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE', 'XI. THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE'.

TECHNICAL SCIENCE IN NEW ZEALAND.

The SCIENTIFIC AMERICAN has been asked to solicit the kind offices of American inventors, manufacturers, and other friends of industrial education, on behalf of a worthy institution in far away New Zealand.

To provide "all classes and denominations" of the New Zealand population with facilities for pursuing a regular and liberal course of education, Canterbury College has been established at Christchurch, the principal town of the province of Canterbury, and is now in good working condition. In connection with this college there has been founded a scientific museum, housed in a handsome stone building erected at a cost of upward of \$100,000, and comprising a valuable collection of specimens of natural history, and type collections of minerals and fossils.

An effort is being made to establish in this museum a department of technical science, for which contributions of models of machinery, implements, and the like, are now solicited. The reception of such contributions, and their shipment to New Zealand (freight charges to be paid there), will be undertaken by the publishers of this paper.

So much for the message committed to us. A word or two with respect to the reasons why the request should be cheerfully and abundantly met. New Zealand is one of the most worthy and promising of the younger members of the Greater Britain made up of all the English speaking countries of the globe.

As the youngest, too, among the rising nations allied to us by blood, and bound to us by rapidly strengthening commercial ties, New Zealand is in every way deserving of all the educational assistance we can give her; and it can be safely promised that her people will be duly grateful for anything we may do in this way.

There is a lower (possibly to some a more cogent) reason why this request should be granted: it will pay commercially. Already New Zealand is one of the most inviting of foreign markets for American manufactured products; and there is no way by which American manufacturers can place their machines, implements, and other wares more effectually before the New Zealanders than by having them thus favorably placed on perpetual exhibition at the chief center of intelligence in the colony.

It is not yet forty years since the first white settlers landed in New Zealand, and already the population numbers something like half a million of wide awake, active, and intelligent English people. The islands have an area of over 100,000 square miles; a trifle less than that of Great Britain and Ireland, and something more than twice that of the State of New York. About 12,000,000 acres are fit for agriculture; 50,000,000 acres are suitable for pasturage; 20,000,000 are forest lands. The climate is much like that of England, but more equable. There is more sunshine and a smaller range of temperature. The annual mean for the North Island is 57°, that of the South Island is 52°. The mean annual temperature of London and New York is 51°. The country is rich in minerals, and its resources are being developed rapidly. In 1876 the foreign commerce of New Zealand was equal to that of Norway. It was more than that of any of the South American states except Brazil; more than that of any African states except Egypt and Algeria; greater than that of Japan; and was exceeded in Asia only by China, Java, and the Straits Settlements. It was exceeded in Australasia only by Victoria and New South Wales. In 1875 its trade with the United States exceeded \$10,000,000. In 1876 the colony had 600 miles of railway, and in 1878 something like 1,000 miles. In 1875 there were in operation over 3,000 miles of telegraph lines, with a mileage of telegraph wire exceeding 7,000 miles. These are the latest statistics at hand; and the rate of progress is such that they must be largely increased to bring them up to the probable figures required to indicate the present condition of the colony.

It is to a country possessing such notable capacities for commercial developments, and offering so many inducements for the cultivation of friendly relations, that the asked for models and specimens of machinery and industrial appliances are to go, to be placed on view, as already said, under the most favorable conditions possible.

In very many instances, doubtless, the most efficient as well as most economical representation to send will be a perfect machine or implement of regular make. The photographs of the museum rooms—which may be seen at this office by any one who is interested—show an abundance of space for the proper display of contributions; and as the museum is a place of popular resort not only for the people of Christchurch, but for all visitors to that capital, a more attractive mode of exhibiting matters suitable for the markets of the colony could not be devised. We sincerely trust that our energetic, generous, and far-seeing manufacturers will take the matter in hand earnestly, and that while Canterbury College is enriched by specimens of high educational value, the industries of the United States will have in them a full and honorable presentation before the students of the institution and the public at large.

It may properly be suggested here that contributors should affix to each specimen a special tablet bearing the inscription: "Presented to the Technological Collection of Canterbury College Museum, Christchurch, New Zealand, by, etc.," giving the donor's name and post office address.

An Amendment of the New South Wales Patent Law.

The conditions of the patent law of New South Wales have been amended (June 19, 1879) so that exhibitors of unpatented inventions at any International Exhibition within

the colony, or any other agricultural or industrial exhibition declared to be such by the governor with the advice of the executive council, shall not prejudice the right of the exhibitor, if he be the author or designer of the invention, to apply for letters of registration for such invention under the patents act. Neither will the publication of any description of the invention during the holding of the Exhibition, nor the user of the invention elsewhere without the privity or consent of the inventor, prejudice his right to a patent on application.

THE BESSEMER STEEL INTEREST.

A correspondent calls attention to the present workings of the Bessemer steel industry in the United States, with the remark that the patent Bessemer process is owned by eleven steel plants, who have an association for mutual protection, which prevents the establishment of any more plants in the United States. The agreement of this association is also that the same uniform scale of prices shall be maintained to the public; that any plant from necessity or choice remaining idle shall receive a bounty of \$5 upon each ton produced by the plants in operation. If two plants were idle the tax would be \$10 per ton; if five were idle the tax on product would be \$25 per ton.

But one plant is now idle, the Vulcan Iron and Steel Company of St. Louis, whose capital is about \$1,500,000 (?). The product of the ten plants in operation is 700,000 tons per annum. A tax of \$5 per ton would give the Vulcan Works an income of \$3,500,000.

The price of rails in the United States is \$45. The price of rails in England is \$25, and 15,000 tons were recently sold to go to Canada at \$22.50 per ton. If the Vulcan Works were running the product would probably be increased by 100,000 tons, as these works have two of the largest converters in the world, and as they were the last built in the United States they have all the improvements in the process.

The cost of steel rails in America is less than \$20 per ton. Is it not time that there were more converters, or a lower duty on steel rails? Are not these steel plants standing in their own light and inviting opposition to the present high duty? Is it strange that large railroad men should seek to punish these companies by purchasing in England?

It is reported that the present plants are driven to their utmost double turn to supply the demand, and that there is less attention paid to the character of the product, and that many rails break in laying. This is our correspondent's complaint; how far it can be contradicted we shall be happy to be informed.

INVENTIONS IN CHINA.

For a long period the Chinese Government directly discouraged invention and all other innovations upon established conditions and customs. The result was a fixedness in social and industrial affairs which has made China proverbial. That the stimulus of western civilization has made great inroads upon this particular phase of Chinese character, is apparent on all sides. We are inclined to think, however, that nothing quite so significant has appeared in this connection as the following imperial decree published in the Pekin Gazette, and bearing date June 13, 1879. It reads as follows:

The Censorate has memorialized us to the effect that Tung Yü-ch'i, an expectant sub-prefect in the province of Anhwei, proposes to construct a steamboat to be impelled by steam generated without the use of fire, which shall be so superior as to supplant the one using fire. Its construction is already well nigh completed, and it is estimated that 3,000 taels will suffice to finish it. A diagram with illustrations of the invention has been presented to the memorialists for their inspection. Should the steamer invented by the officer in question be found capable of quick motion and adapted to practical use, it will, of course, be proper to adopt it. We, therefore, command Shên Pao-chên to devise means for providing the 3,000 taels required to carry the invention into execution. He is further commanded, in conjunction with Li Hung-chang and Ting Jih ch'ang, to examine the diagram and the illustrations, and to give the matter his most careful consideration. As soon as the invention has been carried to completion it will be the duty of Shên Pao-chên and the high officials associated with him to put it to the test of an experiment and to report in a memorial to us whether it has been found, after all, to be adapted to practical use. We have this same day commanded the Censorate to instruct Tung Yü-ch'i to accompany Shên Pao-chên to Nanking. We have also commanded the Censorate to hand the diagram and illustrations to Shên Pao-chên for his perusal, and to communicate this decree to the several officials concerned.

The Cincinnati Exhibition.

The Cincinnati Industrial Exhibition was formally opened Sept. 10, with an address by President Hayes. The Governors of Ohio, Kentucky, and Indiana, with their staffs and a number of military organizations, also participated. President Hayes said:

"The seventh Cincinnati Industrial Exhibition is held at a most auspicious period in the commercial history of our country. The great business depression which followed the financial crisis of 1873, after five long and anxious years of distress, embarrassment, and bankruptcy, has at last been succeeded by a revival of prosperity, which is surely and rapidly extending to every branch of useful industry, with all values measured and made steadier by a currency which

is worth its face in the markets of the world; with business no longer perplexed and crippled by an uncertain and fluctuating standard; with credit which, according to Daniel Webster, is 'the vital air of modern commerce,' upon a sound and stable basis; with restored hopefulness and confidence, shared alike by the capitalist, the business man, and by the laborer; with agricultural crops and products abundant and readily salable at fair prices; with our manufactures seeking and finding a market in foreign countries to an extent never known before; with our natural burdens of debt and taxation becoming every year less difficult to manage and carry; with our country maintaining honorable and peaceful relations with all mankind; the merchants, the manufacturers, and the working men of Cincinnati may well be congratulated that at such a time their countrymen have assembled from far and near to enjoy and be instructed by this great Exhibition. We thank you for the invitation which we in such countless numbers have accepted; for your hospitality, and for your welcome to Cincinnati, a city which, standing, as it does, nearer than any other great city to the center of the population of the United States, may be rightfully called the 'Central City of America.'

COPYRIGHTING FRUIT.

One of our contemporaries published a long account the other day of an Illinois nurseryman who claims to have secured a copyright on the propagation of certain varieties of cherries.

Our newspaper neighbor copied from the nurseryman's catalogue a description of his new cherries as follows: "Please take notice that the names, description, and numbers of these cherries are copyrighted, and therefore my individual and exclusive property, and any one infringing on my rights under the copyright laws of the United States, will be prosecuted," after which follows a list of his copyrighted cherries, which he offers to sell the trees of, to nurserymen in different states after they have purchased the copyright to grow them. He describes some forty-five new varieties, and says he shall produce some twenty more next year. The advertised price of the trees is 50 cents each, but he seems to be in more doubt about the value of his copyright, for he asks fruit growers to make a bid for the latter, but adds that no offer of less than \$50 for a State will be accepted. Not crediting the advertiser's statement of having a copyright on his cherries we have caused search to be made in the Library of Congress and also at the Patent Office, and we learn that no such copyright has been granted from either bureau. For many years the subject of protection to horticulturists and others for new varieties of fruits and flowers has been discussed, but the difficulty of defining such discoveries, they being gradually brought to their perfection by the experiments of different gardeners, has prevented the possibility of legislation on the subject, and there seems no practical way of affording protection to such discoveries.

Sounding Niagara River.

The United States Corps of Engineers has recently had the Niagara river sounded, a task never before accomplished, owing to the bungling and unscientific means employed by those who attempted it. Bars of railroad iron, pails of stones, and all unreasonable bulky and awkward instruments had been attached to long lines, and cast off the railway bridge and elsewhere, but positively refused to sink. The very bulk of the instruments was sufficient, no matter what their weight, to give the powerful under-current a way to buoy them up upon the surface, or near it. By means of a small lead weighing twelve pounds, however, and a slender cord, the depths from the falls to the lower bridge were easily obtained. One of the sounding party says that the approach to the falls in a small boat was made with great difficulty. Great jets of water were thrown out from the falls far into the stream, and the roar was so terrible that no other sound could be heard. The leadman cast the line, which passed rapidly down and told off 83 feet. This was quite near the shore. Passing out of the friendly eddy which had aided them in approaching the falls, they shot rapidly down stream. The next cast of the lead told off 100 feet, deepening to 192 feet at the inclined railway. The average depth to the Swift Drift, where the river suddenly becomes narrow, with a velocity too great to be measured, was 153 feet. Just under the lower bridge the whirlpool rapids set in, and so violently are the waters moved that they rise like ocean waves to the height of twenty feet. Here the depth was computed to be 210 feet.

THE SOCIAL SCIENCE ASSOCIATION.

The annual meeting of the American Social Science Association began in Saratoga, September 9, with a fair attendance of members. F. B. Sanborn, the acting Secretary, read a report giving an account of the origin, aim, and scope of the organization, which now has members in thirty-eight States and Territories. Touching the definition of social science, Mr. Sanborn said: "By strict rules it must be admitted that the term 'science' cannot be applied to our pursuits in the same sense that it describes the researches of the geologist, the chemist, or astronomer. There is a margin, however, in social science for much besides the close inductive or deductive processes by which Newton, Agassiz, or Faraday arrived at their splendid results. The methods of acquiring all human knowledge are essentially the same. The conduct of a nation in a grave political crisis is not to be calculated like the elements in an eclipse, yet it may be foreseen within certain limits. Many problems

in social science are in their nature both scientific and philanthropic. What can be more prosaic than to be inspecting the entries and drains of tenement houses, the condition of sewers and water pipes, or inquiring about the rent of dirty rooms, the cost of pauper relief, the labor or idleness of a population hanging on the verge of pauperism? Yet this is exactly what the Social Science Associations of England and America, the only ones in the world, have been doing."

The second day, President Barnard, of Columbia College, read a paper on "International Coinage," and also presented his paper on "Monometallism, Bimetallism, and International Coinage," prepared for the Association for the Reform and Codification of the Law of Nations, at the August meeting in London. Mr. Barnard proposes to make one gramme of gold the standard of value, and to have the smallest international coin of ten grammes, equal to \$6 less two cents.

President Porter, of Yale College, presented an able paper on "Modern Education, its Opportunities and Perils," which was read in his absence. One of the great perils was found in the circumstance that in aiming to be too scientific in form, modern education often fails to be scientific in fact—due very largely, we apprehend, to the antecedent circumstance that the text book makers and teachers lack an adequate training in genuine scientific methods.

The regulation and control of the degree-conferring power in American colleges formed the subject of another paper by President Barnard, who thought that if the multitude of superfluous collegiate institutions were deprived of the degree-conferring power, they would do no harm, and might, perhaps, do some good. France, Germany, Italy, and other countries of Continental Europe, are full of lycées, gymnasia, and colleges, where instruction in all branches is as extensive as in the average American college, and generally a great deal more thorough, but which are without power to confer degrees. The British colleges cannot confer degrees, not even those which form a part of the great Universities of Oxford and Cambridge themselves. All England, with a population of 23,000,000, has only four universities; the State of Ohio, with 3,000,000 population, has thirty-seven. All France, with a population of 36,000,000, has only fifteen universities, which, moreover, are actually branches of a single one. Germany, with a population of 42,000,000, has only twenty-two universities, or one to 2,000,000 of inhabitants. All Europe, with a population of 300,000,000, has only 101 universities, or one to 3,000,000 people. Our own country, with a population of 45,000,000, has 425 universities, or one to every 100,000 people. Further on, he spoke of the general weakness of our over numerous degree-conferring institutions, and remarked that a university, in a proper sense of the word, is a costly establishment. It cannot be created by a mere act of legislature. A fiat university is worth no more than a fiat dollar. We have some universities in this country whose resources are in some degree correspondent to their responsibilities; but we have not one whose power of usefulness is not constantly held in check by insufficiency of means.

Professor A. P. Peabody, of Harvard, read a paper on female suffrage in connection with school elections, in which he urged that women should vote and hold office in school matters, because they in general far surpass men in educational ability, tact, experience, knowledge, and wisdom. The work is proper for women, and they ought to do it. This point was put in a decidedly novel way. He said: "When our public schools came into being they were not meant for girls, the education of women being regarded as of little consequence. The schools were then properly, necessarily, under the charge of men. Now that women are men's peers, and more, as to culture, and receive this culture chiefly at the public charge, there remains no reason why they should not render to the public the reciprocal service of control, care, and government in the educational system of which they have become the most favored beneficiaries."

Chinese immigration was discussed in a long paper by Professor S. Wells Williams, of Yale, who advocated the admission of the Chinese to citizenship when they desire it. He claimed that the Chinese here are under the strongest national sanction of any race, and ought to be protected. They came here at the invitation of our own people, and brought with them industrious and quiet habits, and have added largely to the resources and wealth of this country.

George T. Angell, of Boston, President of the Massachusetts Society for the Prevention of Cruelty to Animals, presented the results of his investigations into the manufacture and sale of poisonous and dangerously adulterated articles. At the close of the paper, Mr. Henry C. Meyer, of this city, said that he had investigated Mr. Angell's previous statements in regard to adulterations, and had tests made, and could discover no such general system of adulteration as Mr. Angell reported.

In the evening the President of the Association, Professor Gilman, of the Johns Hopkins University, Baltimore, delivered the annual address. His subject was "American Education during the last Decade." He took the ground that the American public school system never stood so firm, or worked so well, as now. The most noteworthy administrative change of the decade has been the admission of women to the local school boards of Massachusetts, and the opportunity afforded them in the same State to vote for school officers. The most noteworthy pedagogical movement has been in the introduction of kindergartens, and in the attention bestowed upon drawing and vocal music.

The subjects considered September 11 covered a wide range, embracing questions of public health, law, the protection of workmen in mills, the treatment of criminals, and the like. Resolutions were adopted favoring the metric system and a system of international coinage based on the unit proposed by President Barnard—the gramme weight of gold nine tenths fine. The sewerage of village cities was presented by Colonel George E. Waring, Jr., and discussed by several members. It was also commented on at considerable length by Professor Acland, of the University of Oxford, England. The history of the tenement house system of New York was presented in a paper on the sanitary condition of tenement houses, by Dr. Charles P. Russell, of this city.

Professor William Watson, of Boston, read a report on the "Protection of Life from Casualties in the Use of Machinery," in which he reviewed what has been done in this country and abroad toward the prevention of such accidents, and described various devices for covering dangerous machinery.

President Anderson, of Rochester, discussed the relations of Christianity and the common law; Dr. Wharton, of Cambridge, the various theories of punishment for crime; Frederick H. Betts, of New York, the policy of the patent laws; and Professor Woolsey, of New Haven, read a paper on the United States and the Declaration of Paris in 1856. All the principles of the Declaration of Paris were declared to be in accord with the spirit and policy of our government.

RECENT INVESTIGATION INTO THE ACTION OF ANÆSTHETICS.

The third report on the action of anæsthetics to the Scientific Grants Committee of the British Medical Association has been made recently, the report embracing the results of investigating the condition of the blood pressure in animals under the influence of chloroform, ethidine, and ether. The experiments were made upon rabbits and dogs, and seem to have been performed with great care. The facts obtained from the observations, says the *Medical Record*, warranted the committee in reaching the following conclusions: Ether, when administered to animals, has no appreciable effect in reducing blood pressure; chloroform and ethidine have a decided effect in that direction.

Chloroform has sometimes an unexpected and apparently capricious effect on the heart's action. The occurrence of these sudden and unlooked for effects are a source of serious danger, because the blood pressure is with great rapidity reduced to almost zero, while the pulsations are greatly retarded or even stopped.

By ethidine the reduction of blood pressure is not, so far as has been observed, through sudden and unexpected depressions. Chloroform may cause death by primarily paralyzing either the heart or the respiration. Although not free from danger on the side of the heart and the respiration, ethidine is, in a very high degree, safer than chloroform, inasmuch as the former does not compromise the heart as does the latter.

A legitimate deduction from the facts given is that ether is by far the safest of the three anæsthetics used, and that ethidine is much safer than chloroform, and equally efficient.

A Notable Feature in the Iron Trade.

Some of the features of the present advance in iron, remarks the *Iron Age*, are worthy of note. It will be found upon inquiry, that in the case of most mills the increase in the volume of business has not come from gaining new customers, but from increase in the orders of the old. There may be some exceptions to this statement, but it will hold true generally. This indicates that there has been a decided increase in consumptive demand, and that both consumers and jobbers believe that this is a good time to stock up and to place orders for future consumption. Another feature of interest is that the increase has come without much drumming for trade; that is, the buyers have sought the sellers—a most healthy indication. It will be further found that, so far as price is concerned, the sellers are more conservative than the buyers. This is a somewhat paradoxical statement, but manufacturers are holding back, and are more fearful of the effect of a too rapid advance than the consumers. The true secret of many of the advances that have taken place during the past six weeks, will be found in the offers that buyers have made for iron for immediate delivery. We have mentioned a case where 2:20 cents was offered when 2 cents was the usual selling price, for a lot of iron that was needed in ten days.

Glass Shoe Patterns.

The question sometimes arises whether a patent can be obtained for the mere substitution of a special material for another in the manufacture of a well known article. In reply, we may state that if the Patent Office is satisfied that in consequence of the substitution a new and important result is obtained, a patent will be allowed. A recent case in point is that of an applicant who asked for a patent for making shoe patterns of glass. It was alleged against the applicant that glass patterns had been previously used for cutting out photo print ovals; also that sheet metal shoe patterns were in common use; and that there could be no invention in merely substituting therefor such a well known substance as sheet glass. But the Commissioner decided that the use of glass shoe patterns was a useful novelty, sufficient to support a patent, because such patterns enabled the cutter to see any defects in the leather and move the pattern to avoid them, which he could not do with the ordinary patterns. So the patent for glass shoe patterns was allowed.