

desired order of opening and closing the valve so as to give the signal. The officially designated fog signal for this ship has been a 12 inch steam whistle, with blasts of five seconds duration, followed by fifty-five seconds of silence.

The engines' air compressors and storage tanks are exact duplicates of each other and are interconnected so as to allow the fullest possible degree of interconnection. It is quite improbable that any total breakdown should occur. The oil is stowed away as received in five gallon cans. The engine supply is taken from a tank below the engines, into which the cans are emptied by hand.

The plant was built by the De la Vergne Refrigerating Machine Company at their works in One Hundred and Thirty-eighth Street, on the East River, in this city. The work was superintended by Mr. Wilfrid Sylven, superintending engineer United States lighthouse service. Our thanks are due to him and to Mr. George Richmond, of the De la Vergne Company, for courtesies extended in connection with this subject.

The plant is the second of its kind in the world and is in advance in every way on its predecessor, especially in power. The working unit in the new ship is taken at 15 horse power, in place of 3 1/2 horse power in the first one.

One illustration shows the ship at anchor. The whistle is seen projecting from the reheater above the deckhouse. The other view shows the ship in cross section. One of the gas engines is shown, the other is by its side and parallel with it. The retort of the engine is cased within a hood shown to the left of the cylinder, and beneath it are the oil burners for starting it. To right and left, near the under side of the deck, are seen the compressed air tanks. Rising from the engine, the large exhaust pipe is shown entering the reheater to warm the air. On the right of the deckhouse is shown the cylinder and piston which operate the whistle valve.

An Ingenious Comparison.

Dr. Arnott has compared the human body with the steam engine, and the resemblance is very striking. Below is a copy of the comparison, as given in his "Treatise on Warmth and Ventilation":

Table comparing THE STEAM ENGINE IN ACTION TAKES and THE ANIMAL BODY IN LIFE TAKES. Columns include: 1. Fuel, 2. Water, 3. Air, 4. Steady boiling heat, 5. Smoke from the chimney, 6. Ashes, 7. Motive force, 8. A deficiency of fuel, 9. Local hurt from violence. Corresponding animal body actions include: 1. Food, 2. Drink, 3. Breath, 4. Steady animal heat, 5. Foul breath, 6. Animal refuse, 7. Motive force, 8. A deficiency of food, 9. Local hurt or disease in a living body.

Eggs in Therapeutics.

A mustard plaster made with the white of an egg will not leave a blister. A raw egg taken immediately will carry down a fish bone that cannot be got up from the throat. The white skin that lines the shell of an egg is a useful application for a boil. White of egg beaten with loaf sugar and lemon relieves hoarseness—a teaspoonful taken once every hour. An egg added to the morning cup of coffee makes a good tonic. A raw egg with the yolk unbroken taken in a glass of wine is beneficial for convalescents.—Medical Record.

Scientific American.

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THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders and all who contemplate building this work is invaluable. Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 a year.

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(Established 1878)

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NEW YORK, SATURDAY, JULY 4, 1896.

Contents.

(Illustrated articles are marked with an asterisk.)

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For the Week Ending July 4, 1896.

Price 10 cents. For sale by all newsdealers.

Table listing contents of the main journal with page numbers. Includes: I. ARCHAEOLOGY, II. CIVIL ENGINEERING, III. ECONOMIC GEOLOGY, IV. ELECTRICITY, V. GEOLOGY, VI. METEOROLOGY, VII. MISCELLANEOUS, VIII. NAVAL ENGINEERING, IX. PHYSICS, X. TECHNOLOGY.

THE APPRENTICESHIP SYSTEM UNDER MODERN CONDITIONS.

On another page will be found a timely letter from a correspondent of Providence, Rhode Island, relative to the decadence of the apprenticeship system, of which subject we spoke editorially in our issue of May 23, and we are certainly "pleased to learn that the old system"—or, more strictly speaking, a judicious modification of it—"is still common in Providence," and that "apprentices are taken by almost every important machine shop and foundry" in that city.

Limitations of space prevent our giving more than an outline of the "terms of apprenticeship" of the Brown & Sharpe Company; but they appear to be just and reasonable, a conclusion which is warranted by the large number of boys (eighty-one) now serving in the shops, and by the fact that many former apprentices have remained after their apprenticeship had expired, and risen to become "foremen and heads of departments." Briefly stated, the "terms" are as follows: The apprenticeship lasts three years, each of which consists of two hundred and ninety-five working days of ten hours each. The first forty days constitute a term of trial, at the close of which, if he prove "deficient in capacity or unsatisfactory in department," the apprentice is paid four cents an hour for the time he has worked, and the contract becomes void. If he "prove industrious and of good capacity," the apprenticeship continues for the three years. Before the expiration of the time of trial the apprentice must "execute, together with some responsible surety, an agreement," by which the firm, in consideration of the sum of one hundred dollars, pledges itself "to faithfully instruct the apprentice in the machinist's art and trade." If the apprentice violate the terms of the contract, one hundred dollars is forfeited; but if the apprentice complies with the provisions of the contract for the three years, the sum of one hundred dollars is returned by the firm to the surety in consideration of the "faithful service on the part of said apprentice." The "terms" conclude with the statement that "the company reserves to itself the right in its sole discretion to terminate the agreement and discharge an apprentice from further service for any unfaithfulness, non-conformity with such rules and regulations, want of diligence, indifference to his business, or improper conduct in or out of the shop." During their apprenticeship the boys are paid for the first year four cents an hour, for the second year seven cents, and for the third year ten cents an hour.

While admitting that, as far as they go, the terms of apprenticeship outlined above are admirable, and that in the present case they have certainly given excellent results, we think that, for general use in the various trades, it would be advisable to add a clause specially covering the interests of the apprentice, and giving the surety the power to annul the contract, if, upon investigation, he should be convinced that the apprentice was not receiving "thorough instruction" according to the "prescribed routine."

With such a clause inserted, we think that this modification of the old apprenticeship system would be in every way adapted to modern industrial and social conditions. It is free from the old flavor of servitude, which would be obnoxious to modern ideas and sentiment, and the payment of a weekly wage, increasing with each year of service, is a step in the right direction.

With regard to the relation of the trade school to the apprenticeship system, although it was the decline of the latter that brought the schools into existence, we think that the revival of apprenticeship would not lessen the usefulness of the schools. They both have the same end in view—the systematic training of the mechanic and the abolition from the trades of the "botch" workmen. Each system of training has its strong points in which the other is relatively weak. The pupil in the trade school, for instance, has a larger opportunity to discover in which direction his tastes and aptitudes really lie than has the apprentice in the machine shop. The former has a chance to test himself in several different trades, the latter in but one. This fact to some degree, no doubt, accounts for the forty days' trial clause in the terms of apprenticeship. It frequently happens that the "fancy" of a boy for some particular trade is quickly killed when he makes its acquaintance; and many of the most successful men of our day have, in their early days, tried their hands at various trades before they fell into the particular line of work for which they were qualified by nature.

On the other hand, one cannot too strongly indorse the opinion of our correspondent that the apprenticeship system turns out a better practical mechanic than the trade school, for the reason that "greater skill is obtained under the system which gives the greater number of hours to actual shop practice, especially in the trade of a machinist." It is for this reason that the two systems should be regarded as complementary to one another: the school serving to direct the boy into his proper trade, and furnishing him with the rudiments of its theory and practice; the subsequent

apprenticeship in the shops giving him the speed, execution and broader knowledge which qualify him to pass as a skilled workman.

THE GEOLOGICAL SOCIETY OF AMERICA.

The announcement of the eighth summer meeting of the Geological Society of America has just appeared, and it shows a radical change from the policy of the society heretofore. The usual plan has been to hold the sessions of its summer meeting during the two or three days immediately preceding the annual convention of the American Association for the Advancement of Science. The effect of this has been to draw away from "Section E" of the association many valuable papers which would otherwise have been presented there, thus reducing the number of papers to be delivered in Section E, until last year and year before there were not enough to make more than half a programme, while the society's time was fully taken up. Not wishing to be a detriment to the parent association, the Geological Society has decided this summer to throw the reading of all its papers into Section E's programme and to devote the week from August 17 to 22 inclusive, preceding the meeting of general association at Buffalo, to a study of the geology of New York State, in four parties, under the guidance of able directors.

The first party will be conducted by Prof. Charles S. Prosser, of Union College, Schenectady, and will devote its attention particularly to the stratigraphy and paleontology of a section across the strata of the central part of the State. The party will spend the first day (August 17) in the vicinity of Syracuse and then proceed to Rochester, where a four days study of the Genesee Valley will be begun, which will include the inspection of typical exposures of all the strata from the Medina sandstone, at the base of the Upper Silurian era, in the ravine below the Lower Fall at Rochester, to the Chemung beds at the top of the Devonian era, near Portageville. Saturday will be spent in going to Buffalo, stopping en route at several places of geological interest.

The second party will give its time to pleistocene geology, under the leadership of Prof. H. L. Fairchild, of Rochester, and Mr. Frank Leverett, of the United States Geological Survey. The first three days will be spent in studying the phenomena of the glacial lake Iroquois and other beaches, kames, etc., in and near Rochester; the beaches of Lake Warren (also glacial) and the enormous glacial hills near Victor, Miller's Corners and Avon, and the glacial remains of the Genesee Valley, Kishawa Gorge and Nunda Valley. The last three days of the week will be devoted to the raised beach phenomena of the glacial lakes Warren and Iroquois, near Alden, Akron, Medina and other places in the western part of the State.

Persons interested in petrography will take the excursions to be conducted by Prof. J. F. Kemp, of Columbia University, New York City, and Prof. C. H. Smyth, of Hamilton College, Clinton. During the first three days of the week the former will take the party, beginning with a day in the vicinity of Port Henry, spending Tuesday in a trip to Plattsburg, with stops at several points of interest on the way, and using Wednesday for getting across the northern Adirondacks to Lake Placid, whence the party will go by rail to Gouverneur. The last three days of the week will be spent in the district about this famous mineral locality under the guidance of Prof. Smyth, who will show the party the relations of the granites and gneisses there to each other and to the crystalline limestones, as well as other phenomena of interest.

The fourth party will devote its time to economic geology, with Dr. F. J. H. Merrill, of Albany, as conductor. The party will first examine the salt works near Syracuse, and the Solvay Process Company's plant, and the next day go to Le Roy and to Lehigh to see the salt mine. A day will be devoted to the gypsum mines at Garbutt, another to the extensive quarries of Medina sandstone at Albion and Medina, and a third to the marble quarries at Lockport. Saturday will be given up to visiting the hydraulic cement quarries and works in Buffalo and the brick and tile works at Angola.

The formal summer meeting of the society will then be held Saturday evening, August 22, at which administrative business will be transacted and papers will be read by title only. The excursions which have been described are freely open, not only to fellows of the Geological Society and all members of the American Association, but also to any persons, men or women, who desire to take advantage of them. No fee is required, and the only expenses are those for transportation and subsistence. Persons desiring to join any one of these parties should notify the conductor of it at the earliest possible date. Further information regarding the excursions may be obtained by writing to any of the gentlemen named.

DR. NATHANIEL L. BRITTON, Professor of Botany at Columbia College, has been appointed director of the new Botanical Garden which is to be established in Bronx Park, New York City.

Scientific Meetings to be Held at Buffalo.

BY H. C. HOVEY.

Owing to the asperities of war, the American Association for the Advancement of Science was in a state of suspended animation for five years; from which it was happily revived in 1866, by the activity of the citizens of Buffalo, who invited it to meet in that place in the year mentioned. In recognition of this kindly service the association has met there with the return of each decade since that date, and will meet there this year to hold its forty-fifth anniversary. Several affiliated scientific societies will also avail themselves of the hospitality of Buffalo, preceding and following the sessions of the parent society. The official time thus occupied will be from August 19 to September 2, inclusive.

An important change should be noted as to the time of assembling. Heretofore the custom has been to meet in the middle of the week and hold over till the week ensuing. But it is now thought best for the council to meet on Saturday to perfect its arrangements; and for the first general session of the Association to be on Monday morning, August 24, in the high school chapel. At that time the retiring president, Prof. E. W. Morley, will introduce the president-elect, Prof. E. D. Cope, of Philadelphia. An invocation will be offered by the Right Rev. A. C. Coxe, Bishop of Western New York: the address of welcome will follow, by his Honor Mayor Edgar B. Jewett, to which President Cope will reply. On the adjournment of the general session the nine different sections will organize in their respective halls; and in the afternoon their vice presidents will deliver the annual addresses on various topics suitable to their departments of scientific research. Monday evening President Morley will deliver the public address before the general session, followed by a reception given by the ladies of the city. The way will thus be cleared for four days of solid work; and Tuesday, Wednesday, Thursday and Friday will be entirely devoted to the reading of papers in the sections. Saturday will be given up to excursions, with which the annual meeting of the A. A. S. will close.

Another important modification is the new rule requiring all abstracts of papers to be sent to the secretaries of the sections previous to July 1, to enable the publication of a preliminary programme which will be issued in advance of the meetings.

Concerning the affiliated societies it is announced that the Geological Society of America will meet Saturday evening, August 22, in the library building, for administrative business and to prepare a list of the papers to be presented and discussed in the section of geology and geography during the ensuing week. This society has arranged for a number of fine excursions throughout the rock formations of Western New York, to which all members and friends of the A. A. S. are invited. The excursions will be under competent conductors, and a descriptive circular can be had by applying to the secretary, Prof. H. L. Fairchild, Rochester, New York. The study of Niagara Gorge and its related features will be left until the close of the association meeting, and will be conducted by Prof. G. K. Gilbert, of the United States Geological Survey, and will require two or three days.

The American Chemical Society will meet in the high school building, August 21 and 22. The Society for the Promotion of Agricultural Science, the Association of Economic Entomologists, the Botanical Society of America, will all meet at the same date as above. The Society for the Promotion of Engineering Education will meet in the library building, August 20, 21, and 22. And the American Mathematical Society will meet in the lecture hall of the Society of Natural Sciences, on August 31 and September 1.

The grand excursion of the A. A. S. will be to Niagara Falls, on Saturday, August 29, and will give the members an opportunity to see what has been done by the investment of many million dollars in opening the wonders of the great cataract and its environs for enjoyment and sightseeing, as well as harnessing its gigantic energy for utilitarian purposes.

The local secretary, Prof. Eben P. Dorr, of the Buffalo Society of Natural Sciences, will give any additional information desired, as to railroad rates, hotel accommodations, entertainments and excursions. Every effort will be put forth to make this one of the most delightful meetings ever held by the scientists of America.

The Kelvin Jubilee.

The Kelvin jubilee began June 15 with a conversation in one of the buildings of Glasgow University. About 2,500 persons were present. Telegraphic congratulations were received from all over the world. On June 16 Lord Kelvin was presented with addresses from various universities of the world by representatives from these institutions of learning. In the evening the municipal banquet was held. The university conferred honorary degrees on MM. Mascart and Lippman and on Profs. Newcomb and Cleveland Abbe.

The Second Volume of the Year 1896.

We draw the attention of our readers to the fact that the present issue opens the second volume of the year 1896, and would suggest to those who are readers only that this would be a fitting time to place their names upon our list of subscribers. One of the earliest numbers of the volume (July 25) will be a special semi-centennial issue, commemorating the foundation of the house, which we are sparing neither time nor expense to make one of the best things of its kind published in recent years. It will consist of a review of the progress of the United States during the past fifty years in the leading arts and sciences, with copious illustrations showing the various stages of development. It will also contain the prize essay on the progress of invention during the past fifty years and an illustrated history of the SCIENTIFIC AMERICAN.

We think that such a compendium, showing the world's progress then and now, will prove a valuable mile stone for future reference; and those who place their names upon our list at the present time will be entitled to this number and will be enabled to include it within the early pages of their first volume. The special front page sheet for binding will be furnished with the current issue upon application to the editor.

Sir Joseph Prestwich.

Sir Joseph Prestwich, one of the founders of the modern science of geology, is dead. He was born near London, on March 12, 1812, and was educated in Paris and at University College, London. He was president of the Geological Society in 1870-72 and vice president of the Royal Society in 1870-71. In 1874 the Institution of Civil Engineers gave him a medal for his paper on the construction of a tunnel between England and France. He was appointed professor of geology at Oxford in 1874, and two years later published an exhaustive treatise on the water supply of that city. In 1885 he was elected a corresponding member of the French Academy of Sciences. The first volume of his work on geology was published in the following year. He received many honors from various scientific societies in Europe and the degree of D.C.L. from Oxford, and he was elected president of the International Geological Congress which was held in Paris in 1888. One of his later treatises was written to prove the probability of western Europe having been submerged at the close of the quaternary period, which might have given rise to the tradition of the flood.

Substances Sensitive to Radiant Heat.

Dr. Liesegang gives a list of some of the most important cases of sensitiveness to weak radiations of heat. Paper saturated with cupric bromide or a mixture of sulphate of copper and potassium bromide has a faint greenish tint, which becomes olive brown under radiant heat, and if a wooden fretwork is used as a screen a brown image can be obtained in a minute by exposing to the radiations from a gas stove, and on treatment with silver nitrate this image becomes black by reason of the reduction of the silver. Bichromated paper is affected by radiant heat as by light, and paper impregnated simply with sulphate of copper yields a feeble image, which becomes nearly black when treated with silver nitrate. A mixture of sulphate of copper and oxalic acid gives a paper which becomes brown on exposure, and chlorate of copper is very sensitive to faint blue, becoming deep green. Similarly used, bromide of tin behaves as if exposed to light; the unexposed parts becoming very black when treated with silver nitrate. Nitrate of silver is slightly browned, and the tint is deepened by acid hydroquinone or gallic acid. Nitrate of lead gives a yellow image, which is reddened on treatment with silver nitrate.

African Grass Fires.

In a recent number of Science Progress Mr. Scott-Elliott tells how African grass fires change the aspect of the vegetation of the region. These annual fires prevent the accumulation of leaf mould that would improve the soil. One curious effect of the annual fires is to cause many herbaceous plants to send up bare stems, except for the flowers, often several feet in height, immediately after the first shower of the rainy season, the stems only beginning to bear leaves after the rains have well set in. The flowering time of many trees, shrubs and herbs is entirely changed. Another curious fact is the manner in which certain trees manage to protect themselves against the fires. The most remarkable of these are tree Euphorbias, which come out of the fires with apparently no injury, except, perchance, a few slightly charred branches. Mr. Scott-Elliott procured the barks of several kinds that withstand the fiery ordeal, and an examination of them by Professor Farmer shows that they all have a certain amount of gummy degeneration of the bark cells, together with no inconsiderable amount of sclerotic cells. Professor Farmer concludes that "it seems not impossible that these two facts may be connected with the resistance of the plants to the fire."