to Mr. J. M. Hills, and a modification of it is now used by the New York Gas Light Company.

Professor Chandler remarks of the mixture employed by the latter company that

it was invented by Messrs. St. John and Cartwright, and has been in use nearly two years, giving entire satisfaction. As the bog iron ores of this neighborhood are not sufficiently pulverulent to act promptly on the gas, Messrs. St. John and Cartwright add to the ore a quantity of iron borings or turnings, which they then convert into an artificial hydrated sesquioxide of iron by moistening the whole with ammoniacal liquor and exposing it to the air. The resulting mixture of natural and artificial oxide receives an addition of coarsely pulverized charcoal. This mixture is always sprinkled with ammoniacal water before it is placed in the purifier.

The material now in daily use at the works of the New York Gas Light Company was introduced in April, 1868. Occasional additions of iron borings have been made to it; otherwise the material is the same. When last tested it contained thirty per cent of sulphur. In Germany several varieties of sesquioxide of iron are now in use, prominent among which are "the Oberuseler mixture," an iron ore containing some oxide of manganese; the "Manheim oxide," and "Deicke's oxide," very pure artificial oxides of iron.

The wet-lime process is only used so far as is known in a single establishment in Ireland, where it is preceded by another process which, removing the ammonia, renders the lime, when taken from the purifiers, quite inoffensive. The dry-lime process has also been almost universally abandoned in Europe, the iron process having been found to be not only cheaper, but free from the offensiveness of the lime processes. The iron process has also gained a foothold in America, being used not only by the New York Gas Light Company, but by two or three companies in Massachusetts.

We have not space to follow Professor Chandler through his discussion of the relative merits of the methods enumerated. He, however, effectually disposes of the objections raised against the iron process, and emphatically indorses it as being far superior to any other process of purification known to gas engineers.

The report next reviews the history of the complaints made against the several gas light works of New York, on account of the offensive gases emanating from them, and the proceedings of the Board of Health in the matter. On the 30th April, 1866, a meeting of the Sanitary committee, and a committee of the Citizens' Association was held to consider means for abating the nuisance, the gas companies being also represented. The result of the conference was the prompt institution of experiments on the part of the Manhattan and New York companies, which have resulted in the less objectionable processes above specified, and a great improvement in the purity of the air in their vicinity was at once noticed. On the contrary, the Metropolitan Company refused to heed the demands of the citizens, and obstinately held out against them.

The Board of Health at sundry times attempted to compel this company to adopt a less objectionable process of purification. But while the company refused to accede to the requirements of the Board, they expressed their willingness to adopt a better process than the one employed, if shown that it was better and that it could be advantageously adopted. The conduct of the company has, however, shown that they were indisposed to make any change calculated to improve the sanitary condition of the atmosphere of the neighborhood about their works. Professor Chandler sums up the case against this company in the subjoined extract, which must complete our notice of his able report. Our readers will see that it places the refractory corporation in not a very enviable light in reference to their respect for the rights of citizens, the more so as it is also shown in another part of the report, that the changes necessary to adapt their works to an improved process of purification would be very slight, and inexpensive.

This company has probably spent nearly $10,000 for expert fees, counsel fees, sending to Europe the man whose evidence was suppressed and whose advice was not followed, time of employees, printing 200 pages of evidence, etc., all apparently with the design, not of suppressing the nuisance, but of defeating the honest efforts of the Board of Health in behalf of the citizens of New York. Suppose the officers of this company were really acting in good faith, with a sincere desire to obviate the nuisance, they could at once introduce a better process of purification, a cheaper process, by which they could save $10,000 per annum, or they could retain their present process and ventilate the foul lime. Let them follow the example of either of the neighboring companies, use the iron process of the New York Company or the ventilating process of the Manhattan Company, or they may select any one of the improved iron processes now used in Europe. All that is asked of them is that they manifest the same willingness to direct their efforts to the management of their business in a manner most conducive to the health and comfort of the city, as was so promptly manifested by the other companies.

BENT, STAINED, AND ORNAMENTAL WINDOW GLASS.

Though a great deal of ornamental window glass is used in this country, and the demand is slowly but steadily growing, there are only a few establishments in the country where all kinds of ornamental glass for windows is produced. The largest and most constant demand at the present time is stained glass for churches. As work of this kind can be cheaply done, and as it obviates the necessity for blinds or shades, the cost in the end is but little more than the expense of plain glass.

In going through an establishment where ornamental window glass is produced, one of the first operations to be noticed is the production of what is known to the trade as "plain obscure," or plain ground glass. This is ordinarily done by placing the sheets of glass on the bottom of a large box, fastening them down, and then covering them with sand, gravel, and water to the depth of from one half inch to two inches. The box has a vibrating motion given to it by means of a crank and connecting rod. In about two hours the sand and gravel have cut the face of the glass to the required degree of obscurity. The breakage in this operation varies from five per cent, upward, as the glass is thin and crooked or straight and thick. The effect of obscure may be obtained by covering the glass with a thin coat of white enamel.

"Laying a ground" is one of the most essential of all the operations in producing ornamental glass. It is simply covering the glass with an even coat of the color. The color, which is ground up in proper vehicles like a thin paint, is first spread upon the glass with a broad soft brush; while the color dries, which is at once, it is smoothed and spread about with blenders until perfectly even and uniform. This is a trade by itself, and requires great steadiness of the hand and care in manipulation. The white enamels require the most care, as they are usually in situations at no great distance from the eye, and any imperfection in them shows more plainly than in any other color. The beauty of stained work depends in a great measure upon the care and skill with which the grounds are laid. If the glass is to have no pattern upon it, it goes at once from this room to the kiln where the enamel is burnt in. Usually, however, it passes to a room where the "brushing out" is done. The color is upon the glass—an even coat over the whole surface—the figures are produced by brushing away all the color except where the figures are to be. This is done by putting a stencil plate upon the glass and brushing the color out through it, which of course leaves a figure upon the glass of exactly the same shape as the plate. The stencil plates used for this kind of work are the finest that are made. As they are reversed from those in which the paint or ink is brushed through them, they have the advantage that the lines do not have to be broken but only supported by cross lines or lace work, as it is called. When a design is to be shaded by transparent lines like those used on vestibule doors, the stencil plate has only the leading lines and outline. The details are put in afterward with a fine point that removes the ground; this is called stippling. Almost all patterns on enameled glass are produced by stencil plates or some modification of them. In most elaborate designs the artist has much to do after the glass has been under the stencil plate, the details and shading have to be put in, and, it may be, lines to be erased that were put into the pattern simply to give support to the metal.

The glass is now ready for the fire; for, in its present state, the color is easily rubbed off. The enamels must be melted upon its surface in order to make them stick. When they are once subjected to the action of the fire they become so incorporated with the substance of the glass that they cannot be removed except by grinding.

The kilns in which the colors are burned in, are arranged so that the flame from the [illegible] plays upon the surface of the glass. As [illegible] the colors are melted, the [illegible] of the kiln upon which the glass [illegible] pushed back to a cooler part where another furnace prevents too rapid cooling. The glass is then removed from the slab forming the floor and set up on the edge till the kiln is ready to cool.

For some kinds of work what is known as a box kiln is used. This is a cast iron box, measuring some two and a half feet each way. It is set in fire brick so that the heat from a furnace beneath may play all around it. This is chiefly for small work, such as the borders for church windows, etc. After the box is filled with glass the front is closed except a small hole through which the inside is observed. The fire is then started and the whole brought to nearly a bright red heat after which it is allowed to cool slowly.

The patterns of which mention has been made are an interesting study by themselves. For the more important kinds of work where there are many copies to be made they are of thin sheet brass. Others less often used are of zinc or block tin, while for single orders paper is used. Some of the designs for white enamel for office windows, etc., are so delicate as to seem like lace or woven work rather than a design punched from a sheet of metal. Their number and variety seem almost infinite. Men are constantly employed in producing new ones, and so high a reputation have American designs attained that European manufacturers are constantly copying them as they appear.

The glazing room is one of the most important points in a large establishment of this kind. A church window may consist of hundreds of small bits of glass. These are brought to the glazing room and united by leads when they are ready to be put into the sashes. The cross section of one of these leads is like a letter ⌶ laid upon its side. They are inserted between each bit of glass, in fact each piece, no matter how small, is surrounded by them, and in that way joined to the rest of the window.

The colors and their preparation require more scientific knowledge and skill than any other department of the business. The colors themselves are, as a rule, metallic oxides that remain unchanged by a red heat, or else some preparation which, at a red heat, takes on the proper color.

Iron, cobalt, copper, chromium, silver, gold, and platinum, are the chief sources of color; the more costly metals furnishing the most brilliant tints. These substances will not by themselves, adhere to the glass, it is therefore necessary to mix them with a "flux," that is something which shall act as a cement. In many cases these oxides are so refractory that they will not melt at a red heat; then some substance must be found that will reduce the melting point without changing the color—no very easy thing to do in some instances. Usually the action of the fire produces a change in the enamels; thus black, when it is put upon the glass, is of a dark olive green, the heat turning it to the proper tint. In glass bearing figures in transparent colors, as ruby, blue, green, etc, the glass used is colored, and all but the figure is covered with an opaque enamel.

There is another kind of glass used for vestibule doors, and ornamental work in general, which is very beautiful and extremely costly, namely, etched glass. The glass is covered with a varnish that resists acid, the pattern is then cut through the varnish to the glass. Hydrofluoric acid is then employed to "bite" the design in. Usually, in this kind of work, the ground is obscured so at to leave the figures transparent. The process is dangerous to the workman, and, at the same time, demands a great deal of skill and artistic talent.

Bent glass for windows, carriage fronts, and corner panels is coming more and more in vogue, and, where there is a great number of pieces required to have the same curve, is not very expensive. A piece of boiler plate or heavy sheet iron is bent to the required curve. This is called the mold, and the chief expense is in making it. The glass is laid on this mold, which is rubbed over with calcined plaster to prevent the glass from sticking when it becomes [illegible]. Mold and glass are then put into the kiln. The heat softens the glass till it sinks down and takes the shape of the mold.

One other variety of ornamental glass in general use is that having white figures on a colored ground. This is really cut glass. The colored portion of the glass being very thin, it is only necessary to cut through it to leave a white or transparent mark. The cutting is done with small wheels and stones of various kinds. An examination of a piece of work of this kind will show at once the marks of the wheels and explain the peculiarities of the patterns used.

WHAT IS CHEMISTRY?

If we open a dictionary, an encyclopedia, or a school book, we shall find a definition of chemistry, tracing the word back to the Arabs and utterly confounding us with the profound knowledge of the learned pundits who have endeavored to enlighten the world on the subject. Somehow, after reading all their wisdom we are about as much in the dark as we were before. We therefore propose to let the Arabs alone this time, and also to say nothing about Albertus Magnus, Paracelsus, and the rest of them, but to speak of chemistry as it appears to us in this year of grace 1870. It is a very different science from what it was fifty years ago; it is not the same thing it was ten years ago; and, if it keeps on growing at the same rate for the next fifty years, it appears destined to absorb a host of other sciences and to become master of the situation. The popular notion is that creating a few unsavory smells, producing loud explosions, effecting marvelous changes in color, and amusing small children, is what we call chemistry. Hence in the minds of such people it is unworthy a place in a school of public instruction. It is about time that more correct information on the subject should be promulgated, and on this account we have selected it as a text for a few editorial remarks.

We used to say that it was the business of the chemist to investigate everything under the sun; but this statement no longer holds good, as the sun itself and all of the heavenly bodies, have been brought down to earth by means of the spectroscope and are made objects of study in the chemical laboratory.

We must now amend the saying by stating that everything in the universe is a fair object for the study of the chemist This would appear to afford ample occupation for the most ambitious person, and it would seem at first glance to be a hopeless task. It is not, however, so difficult as it appears upon first presentation. The number of compounds in the world is large, but the number of simple elements composing them is small. There are a great many words in our language, but these are made up of twenty-five letters. If we are instructed how to handle these letters we know how to spell, and as soon as we can spell we try to attach the words together to make sentences, and if we are skillful in forming sentences we may write a book.

The world, to the chemist, is a big book made up of sentences and words written in sixty-five characters which he calls elements. As soon as we are able to recognize these characters on all occasions, we can read the work of nature and understand it. We shall find that certain elements are rarely used—that, in fact, the number of letters in nature's alphabet is not greater than we constantly employ in ours. This view of the case materially lessens our task and we can go courageously to work to study the composition of the globe. What is, therefore, chemistry?

It is the science of forces that act at insensible distances between the atoms of different kinds of matter. All of the forces of chemistry act in contact and the result is a new body. In physics the forces operate at great distances, often without any permanent change in the body acted upon. For instance, a current of electricity around a piece of soft iron converts that iron into a magnet; but the iron weighs no more, nor is it any longer or broader than before; and as soon as the electricity ceases to pass, the iron is no longer a magnet. This is called a physical operation, but if the same bar of iron be heated in contact with sulphur, it unites with the sulphur and produces a body very different from either of its constituents, this is called chemical action. The chemist studies contact forces. He splits up everything into its elements, and then observes the behavior of these elements when they are brought in contact with each other. By exchanging one element for another, a new and different compound is formed, just as moving letters about will give us different words and sentences.

It is only by experiment that we can derive any knowledge of the kind of compound the bringing together of elements will produce, and hence chemistry is an experimental science. The more we study the behavior of elementary bodies, the more we are struck with the fact that nearly all of the phe nomena of nature can be traced to chemical forces. When atoms are brought in contact we always have heat, frequently light, and probably generally electricity, and thus the forces we call physical really belong to chemistry. This is what we meant when we said that chemistry was destined to absorb many other sciences.

It is a common habit to speak of mathematics as an exact science, or to intimate that chemistry has no claims to a similar honor, but recent investigations have gone far to place chemistry among the exact sciences. The forces acting in it are well understood, the results are constant, the laws capable of precise statement—and of late years higher mathematics have been made to play a conspicuous part in chemical investigations. The faculties of the mind are admirably trained by a science that requires the closest observation, quick perception, accurate reasoning, and sound judgment. These faculties were less cultivated by the ancients, and hence the small number of discoveries made by them.

As the laws of chemistry become better known, we are enabled to explain many geological phenomena and to understand the constitution of minerals. Medicine and physiology and all the laws of life are better interpreted since chemistry has taken a part in their study. It is somewhat remarkable that a science which affords us nearly all the comforts we enjoy in our households, that has given us our glass, our paper, our food, our wealth, and, in fact, our civilization, should play such a small part in the instruction in our schools. But notwithstanding the disadvantage of such neglect, it makes a path for itself by its importance to the progress of society. The remark is often made that the child of the present age is the same as the child of two thousand years ago; and those who assert it mean that the school-boy now-a-days must begin as low down in the scale of knowledge as the Roman lad of the Augustan age. There is great fallacy in such a statement. When we meet a boy of the present time wending his way to school, with his books strapped into a bundle, if we stop him and examine his pack, we shall find in the most elementary treatise he carries, scientific information that was only known to the most learned philosophers among the Greeks or Romans. What was then acquired as the highest degree of knowledge, is now in every school-book, and thus our boys begin where Plato and Aristotle left off, and Pliny is only quoted for the droll mistakes he makes in his natural history. The new rector of the University of Vienna recently called attention, in an address, to the backwardness of the ancients in the sciences. This backwardness he ascribes, firstly, to an actual want of the power of accurate observation; and, secondly, to a restless spirit of speculation. He illustrates his remarks by referring to the observations of the ancients on the stars. The highest number recorded by them as visible to the naked eye was 1,600, whereas our school-boys can easily point out 3,000; and there is the same extraordinary discrepancy in the enumeration of the nebulæ, and the number of stars in the constellations.

It is an interesting question how far we inherit a schooled eye from ancestors trained in the observation of external objects, and how early science may be taught to children. A writer in *Nature* takes the ground that it is proper to begin at 8 or 9 years. On this point he speaks as follows:

"An ordinarily intelligent boy or girl of 8 or 9 years is perfectly capable of understanding the broad differences between the animal, vegetable, and mineral kingdoms; that there are more gases than one in the world; that some of them are colorless, while others are brown or green; that some burn, and others do not; that some plants grow from the inside, while others grow from the outside; that some animals have jointed back bones, that others have their bones outside their bodies, while others have none at all. Facts such as these are perfectly comprehensible to children even younger than those I have named. During the first two years of a child's school life, after he has learned to read and write, he should be carried through the whole range of physical science in a systematic manner. The fundamental truths of chemistry and physics should be first taught him; all theoretical considerations being left aside. As few definitions as possible should be given; the whole task of the teacher at the commencement being to cultivate the child's powers of observation to the utmost. Gradually the powers of induction and deduction may be developed; facts and phenomena should be compared, and conclusions drawn from them. There is nothing a child likes so much as investigation, or 'finding out all about things,' as he himself would phrase it. The boy in the nursery rhyme, who cut the bellows open to see where the wind came from, is a type of his class."

More mistakes are made by inventors, mechanics, and practical men, from a want of a knowledge of the elementary principles of chemistry and physics, which ought to have been taught them in childhood, than from ignorance of the higher principles of science. Chemistry is really a very easy and simple study. It only requires that the pupil shall have eyes and use them—and where a boy can see and won't see, he ought to be made to see.

It is a great mistake to try to commit to memory the names of everything in creation; the true plan is, to acquire a knowledge of the principles on which the combinations are founded, and let details take care of themselves; and the time to acquire this knowledge is in childhood, when the memory is fresh and the intellect quick to grasp information, and the eye readily observes what is passing in the world around us.

Chemistry is at the foundation of our prosperity; let us have more of it taught in our schools.

IT is intended to introduce steel rails on the Grand Trunk (Canada) railroad. Some 15,000 tuns will be laid this year.

CURIOUS ICE FORMATIONS.

Our readers have doubtless read with much interest the communications upon this subject recently published in this journal, with illustrations of singular ice-spurs shooting from the surface of water frozen in ordinary open vessels, as also the accounts given of sudden formations of ice in dams and rivers. The study of these formations has an eminently practical bearing, and as we have received a somewhat extensive correspondence upon the subject, we will in the present article sum up such additional facts as have been communicated.

The theory of Mr. Wiegand has received a striking confirmation from a St. Louis correspondent, who writes us that in December, 1868, remaining in his office until very late at night, and the fire having gone out, so that the room became very cold, his attention was attracted by a singular crackling sound which he found to originate in the freezing of some water standing in a cold room adjoining.

Upon examination he found that an irregular hole had formed in the top of the layer of ice which rested upon the surface of the water, and that water was welling up through the hole. The water which issued from this embryo crater, spread about to a short distance, and almost instantly changed to ice. His curiosity having become excited, our correspondent continued to watch the phenomenon at intervals, until finally the walls of the crater had attained a considrable hight. The following morning he found it to be two and a half inches high, and three inches in diameter at the base, external measurement.

A correspondent from Lexington, Va., has made a mathematical calculation of the amount of water displaced during the freezing of a stratum of water one inch thick, in a pail ten inches in diameter, and finds that the displacement is not less than 7·85 cubic inches, or sufficient to form a cylindrical column more than six inches high, and one and one fourth inches in diameter. This correspondent, who is evidently a gentleman of much information upon this and similar subjects, indorses in substance the theory of Mr. Wiegand, in regard to the formation of ice in the dam at Week's Mills, Me., described by the Rev. W. H. Littlefield, in the correspondence above referred to. Its adherence to the wheel and gate, he ascribes to what is known as "regelation," a subject most ably discussed in Tyndall's lectures on heat. This term—regelation—may be defined as the adherence of fragments of ice to other fragments, when they are brought in contact with moistened surfaces, and also the freezing of ice to certain solids, such as wool, flannel, hair, cotton, etc., which freeze to ice even in a warm atmosphere. No adequate explanation of this phenomenon has yet been made, and it is spoken of by Miller as needing further elucidation.

Mr. Stanley G. Wight, formerly a member of the Board of Water Commissioners of the city of Detroit, has put us in possession of some interesting facts in regard to the formation and accumulation of ice in the strainer over the inlet pipe to the pump well in that city.

This strainer is nine feet in diameter, and is placed over and around the mouth end of the inlet pipe to the pump well. The inlet pipe extends into the river one hundred and fifty feet from the wharf, and its entire length is two hundred and twenty feet. On the river end of the pipe there is a bell-shaped mouth-elbow, covered by the strainer, and this was formerly surrounded by piles, driven to protect it from injury from the anchors of vessels.

Both pipe and strainer are made of half-inch boiler plate. Above the end of the pipe the strainer is perforated with half-inch holes, one hundred and forty-four to the square foot; and surrounding the mouth of the pipe, inside the strainer, there is a diaphragm plate similarly perforated. Below the diaphragm plate the strainer is perforated with four-inch holes, to allow the escape of sand. The piles surrounding the strainer are thirty in number, and the pipe is similarly protected by piles driven along its sides with masonry intervening.

The sixteenth annual report of the Water Commissioners sets forth that "under certain circumstances, during extreme cold weather, it is with difficulty a supply of water can be obtained, in consequence of the accumulation of ice on the strainer, frequently requiring the speed of the engine to be reduced, and at times to stop it for several hours together, no water passing through the pipe into the well, notwithstanding the bottom of the well is twelve feet below the surface of the river. The size of the well is about forty feet long, eighteen feet wide, and twelve feet deep. The circumstances under which the difficulty occurs are, when the weather is cold and ice is forming in the lake above and on the shores of the river, and the river is free from ice over the strainer. But when the river is covered with ice over the strainer, the difficulty does not occur at any degree of cold. The greatest difficulty occurs when the thermometer ranges from seven or eight degrees to eighteen or twenty degrees above zero, but when the mercury rises above twenty degrees the difficulty soon ceases. The greatest number of detentions, it has been observed, occur at night, and when the sun is obscured by clouds; but when the sun is unclouded, no difficulty is ever experienced. This peculiar stoppage to the flow of water to the pump well has been encountered for many years—first on the strainer of the inlet pipe laid in 1840, again on the one laid in 1850; both of which were located so near the wharf that the ice which formed on them was removed by means of long poles kept at hand for the purpose."

The report further sets forth, in substance, that with the pipe laid in 1858, which extends out further into the river than the former ones, the ice could not be removed as above stated, and all that was done up to 1866, was to wait for the ice to loosen without artificial appliances. The Board of Commissioners meanwhile were subjected to great anxiety, and at last it was referred to the Committee on the Supply of Water, consisting of Mr. S. G. Wight and Mr. J. Owen, who set about investigations into the causes of the difficulty, and the application, if possible, of some adequate remedy.

Every possible means was tried to gain information. A voluminous correspondence with scientific men and scientific associations failed to discover any complete remedy. With a view to test whether the trouble arose from anchor ice, as commonly supposed, a self-acting door was placed on the down-stream side of the strainer, which under similar circumstances had formerly afforded a limited supply of water. Certain unforseen causes forced the abandonment of this door.

It having been observed that no trouble arose when the river was covered with ice, booms were so placed that a sheet of ice should form over, and extend to some distance from the strainer, when the rest of the river was not so covered; this plan entirely failed. A platform of plank submerged immediately over the strainer on the supposition that it would act as a non-radiator, only increased the difficulty, the ice forming at higher temperatures than before.

On the 29th of December, 1867, while only a small amount of water was supplied to the pump well, a diver was sent down, who found the strainer one mass of ice, the particles being collected into a mound ten feet high and fifteen feet in diameter, and rapidly growing by the accumulation of minute ice crystals. Specimens of this ice brought to the surface showed it to be "*in sheets and particles as thin as paper, translucent, with sharp pointed edges.*" Further, it was found that all the water entering the pipe was through the down-stream side of the strainer.

It was now supposed that to inclose the strainer with a canvas screen on all sides of the surrounding piles except the down-stream side, would remedy the difficulty. This was only just accomplished when the weather became colder, and before daylight the next morning the engine stopped altogether. At 11½ o'clock the same morning, another descent was made by the diver, and it was ascertained that "with the temperature of atmosphere at *twenty-nine degrees*, the the water at the surface was *thirty-three degrees*, while at the bottom of the river it was *thirty-five degrees*. At this descent much less ice was found on the strainer and its surroundings than the first time. The lower side was clear, but on the upper side the action of the current had worn the ice into elongated cones, pointing up stream. At this time the pump was receiving a full supply of water."

The observations of the committee have established the fact that the ice particles described are constantly present in the river under certain circumstances, and that they collect upon any obstruction they meet with in their passage.

These facts are of great practical interest, and the conclusion is legitimate that much in regard to the formation of ice under peculiar circumstances remains yet to be explained. The subject is one on which a great deal can be said, and many curious facts can be elicited; and it is to be hoped that some scientist competent to grapple with it, will ere long penetrate deeper into the mysteries of ice formations than any one has yet done.

AWARD OF OUR CASH PRIZES.

We announced in our annual prospectus, for 1870, that we would distribute $1,500 in cash prizes in competition for the fifteen largest lists of subscribers sent in on or before the 10th of February. We also announced the offering of a splendid steel engraving, as a certain reward for clubs of ten names and upward, obtained at our published rates. The interest manifested in the engraving has been spirited and satisfactory. Already hundreds of copies have been sent to those entitled to receive them, and many recipients have written to us in praise of the picture as a work of artistic merit.

This has been a pleasant, and, on the whole, a very agreeable feature of our programme; but in reference to the matter of the cash prizes, which to many, doubtless, appeared to be more difficult to obtain, only eight persons announced themselves as competitors, and as a matter of course each has won a prize. The result is not so agreeable to us in a financial point of view as the prize picture. Still we shall cheerfully respond to and honor the drafts drawn upon us by the following named gentlemen for the sums set opposite to their names, and at the same time we congratulate each of them upon his success.

To J. W. Briggs, West Macedon, N. Y.	$300
" M. Moody, Dennison, Ohio	250
" James C. Wells, Warren, Pa.	200
" W. A. Knight, East St. Louis, Ill.	150
" G. F. Merriam, Fitchburg, Mass.	100
" P. H. Wait, Sandy Hill, N. Y.	90
" G. W. Rose, New Bloomington, Ohio	80
" W. C. Rusheneker, Atchison, Kansas	70

With the above result before us, we announce our retirement from the cash prize business, but shall continue to award the engraving as a premium to clubs, as per our published rates. As a work of art it has received unqualified praise.

M. GAUDIN has lately exhibited some excellent imitations of precious stones, the basis of which is alumina fused with silica by means of the oxy-hydrogen blowpipe. He uses metallic oxide to give them the proper color. It is also stated that a pupil of Liebig has made some discoveries in the same direction; but as yet his method is not definitely given.

THE Superintendent of the Brooklyn Bridge Company thinks it will take five years to complete the bridge. The machinery for the construction of the towers will cost $150,000.