torium Building, which has just been opened with a season of grand opera, is unique in many ways. It is noted for three features which have never before been undertaken in reinforced concrete construction—a concrete roof construction, a great balcony overhang, and cement girders carrying extraordinary loads. The balcony was loaded with a test load of 680 pounds to the square foot and, as the overhang is 31 feet, it was expected that the deflection would be considerable. As a matter of fact, it was only one-twelfth of an inch on the front. Great trusses were used in this building, 112 feet in height, with a depth in the center of 11 feet. When the false work was removed, they showed so little deflection that it was hardly measurable. With an applied load of 100 pounds to the foot, they showed a deflection of only an eighth of an inch. The girders make a span of 42 feet and have a depth of 63 inches. They carry a concentrated load of 100 pounds to the foot, the center load being a concrete column running through five stories and an attic. While greater spans for bridge work have been executed in reinforced concrete, no roof construction has ever been attempted before that approaches this in magnitude. It suggests the wide range of application of reinforced concrete construction, which, although it is extending so rapidly, is still in its infancy.

THE ODORS OF METALS.

The statement found in most treatises, that metals are inodorous, is contradicted by the most elementary daily observation.

According to experiments recently made by Herr C. Gruhn, of Berlin, the mechanism of smell, at least in the case of metals, is, however, entirely different. The following account of these researches will even show the very general interest attaching to this problem. He found that a piece of old metal (copper, aluminium, tin, zinc, iron, lead, etc.) at ordinary temperatures possesses a slight smell which many persons are unable to detect. The same piece of metal having been heated above a lamp to a moderate temperature is found to give out a very strong smell, which is readily distinguished by any one. From experiments so far made, it would seem that the condition (either pure or oxidized) of the surface of the metal does not exert any influence on the quality or intensity of this smell.

If a piece of metal be heated during some length of time (about an hour), its temperature being kept constant, it at first gives out a very strong smell, which, however, gradually decreases in intensity, until it is just equivalent to the smell given out in the cold state. If, however, the heating be discontinued and the metal cooled, it no longer shows the least trace of smell. Another heating effected immediately afterward will produce only a feeble smell; the metal thus appears to have become well-nigh exhausted.

If the same increase in temperature be imparted to another sample of the same metal, the stronger effects of the fresh metal become specially striking. These phenomena always occur in exactly the same manner.

Gruhn infers that the matter vaporized during the heating is not identical with the metal itself. In fact, it would be difficult to understand why the vaporization of the metal should eventually cease in the case of a prolonged heating. It certainly could be objected that a prolonged heating would result in the production of an oxide layer at the surface of the metal, putting an end to vaporization. The experiments described, however, show that a layer of oxide in no way interferes with the emission of smell from a heated metal.

The phenomena described in the following experiment afford a very striking evidence of Herr Gruhn's hypothesis. A piece of metal having been deprived of its smell and kept in the cold state during two to three hours, is heated anew. It is then found to have been restored to its previous power, smelling as strongly as a fresh piece of metal. This experiment can be repeated over again with the same success any number of times.

It should be remembered that the temperatures involved are by no means excessive, a temperature of 122 deg. F. being quite sufficient. In fact, a fresh piece of metal will give out a rather strong smell even on being heated through 40 to 50 deg. F.

From these experiments Herr Gruhn draws the conclusion that the metal continually gives out an emanation of gaseous matter, composed, not of atoms of the metal, but rather of a product of transformation from these atoms. The metal possesses the power of storing this odorous matter in the same way as carbonic acid is stored in water. To each given temperature corresponds a maximum amount of odorous matter which the metal is capable of retaining. The metal thus becomes saturated. A voluntary prolonged cooling should accordingly result in a more copious accumulation of odorous matter in the metal. This is really borne out by Herr Gruhn's experiments.

The experimenter has finally succeeded in separating and isolating in a vessel the odor given out from a metal, which thus behaves in exactly the same way as the emanations of radioactive bodies.

The odoriferous phenomena described are probably not characteristic of metals only, but are shared by all bodies, and being perfectly analogous to radioactive phenomena, point to the existence of some universal law.

Radioactive salts are known likewise to give out spontaneously and continually an emanation of gaseous matter that in a similar way is driven out by heat, only to be incessantly reformed during a prolonged rest in the cold state. While the radioactive emanation is gaged by the ionization of air, the odorous emanation of metals is gaged by the nose. The various radioactive emanations have been found on the other hand to undergo multiple conversions, eventually passing into a stable condition, as illustrated by the chain of conversions leading from radium to helium. In view of the universal analogies exhibited by the laws of nature, the odors of metals are likely to pass through a similar series of transformations as radioactive emanations. There is no reason for supposing that the electroscope, which has rendered such excellent service in detecting radioactive substances, will suffice for perceiving all emanations that may be discovered in the future. It will rather be the task of science to look for ever-new reagents enlarging our perceptive faculties. Such a means of extending the scope of our senses is for instance the torsional balance, by means of which Herr Gruhn has been able to ascertain the existence of peculiar emanations in the atmosphere.

AERIAL NAVIGATION PRIZES.

Of a somewhat sensational nature is the announcement of a $50,000 aeronautic prize offered at Paris. The prize in question is to be awarded for an aerial flight from Paris to London, and the largest part of the sum is subscribed by one of the leading daily journals, Le Matin, which offers $20,000. The remainder is subscribed in equal portions of $10,000 by Marquis de Dion, M. Clement, and M. Charley, all three of whom figure prominently in the automobile world. According to the rules which have already appeared regarding the contest, the event will take place in 1908 and there are two essential points, first, that all possible kinds of aerial craft are admitted to the contest, and second, that the motors employed on all the flying machines must be of French construction. The aeronauts themselves may, however, be of any nationality. In any event, not regarding the state of the atmosphere, the start will take place from Paris on the 14th of July (the national holiday), 1908. Should the $50,000 prize not be won at that time, other starts will be fixed for the second Sundays of August, September, and October so as to have the event closed in the year 1908 if possible. The distance is 212 miles.

The amount of the prize will be awarded directly by the donors to the proprietor of the winning flyer who arrives the first within a maximum period of twenty-four hours exclusively through the air and using only the power contained within such apparatus. For the start a point will be fixed in or near the city at a later date. The finish will be noted by the dropping of a marked bag from the flyer, which is to fall within a circle of 25 meters (82 feet) radius about the finish point. Ten o'clock in the morning is the hour fixed for the start. It is to be noted that stops *en route* are to be allowed for taking on fuel and other supplies. All the motors are to be of French make. Closing of the engagement lists will take place thirty days before each start. No competitors will be allowed to enter who have not made a good performance beforehand with their aerial flyers, according to the testimony of reliable persons. Questions which are not settled by the regulations may be brought before the committee for decision, and this will be final. The announcement of such a large prize has awakened a great interest, as may be naturally expected, in aeronautic circles in Paris and elsewhere, and it will go far toward stimulating the activity of aeronauts, especially in France.

When the Daily Mail offered the sum of £10,000 ($50,000) on certain conditions for an aeroplane flight from London to Manchester, The Car, a London automobile paper, offered through the medium of the Daily Mail £5 ($25) per mile with the low minimum of twenty-five miles to be covered, and a challenge trophy value of 500 guineas ($2,500) for the longest flight taken in Great Britain in any one year.

The Brooklands Automobile Racing Club, of England, offers a money prize of £2,500 ($12,500) for any aeronaut who wins a race in the air by covering the prescribed course once. The date of the race will probably be in June or July next, so as to give plenty of time for construction and experiments. The prize will be given to the owner of any aeroplane, heavier than air, which completes the circuit of the Brooklands motor course (a three-mile track 100 feet wide) without touching ground from start to finish, at an altitude of between 30 and 50 feet, or thereabout, from the surface of the track. This offer is open from the day of the public opening of the motor course until December 31, 1907. A condition is that Edwin Rodakowski, a member of the club, must be given three weeks' notice of an intended attempt to compete, and that the date selected must not clash with any date of racing fixtures. Accommodations for aeroplanes wishing to compete will be provided free of charge.

It has been decided in addition to the above stipulations that the airship must cover the three miles of the course in not less than eighteen minutes, or at the minimum speed of ten miles per hour.

The track, or a portion of it, will be placed by the club at the disposal of those who wish to experiment on certain days in each month, beginning probably in May next.

Prizes for model aeroplanes weighing not over 50 pounds have been offered by the Aero Club of Great Britain for a competition to be held the first part of April. These machines must be able to fly a short distance under their own power. The first prize is $750, and there are two other prizes of $500 and $250 each.

Among the prizes offered for aeroplane flights abroad is a new $40,000 prize for a flight or race from Ostend to Paris. This prize was recently offered by the manager of the Ostend Kursaal, and it is open to both aeroplanes and dirigible balloons. Sunday, the 10th of August, is the date set, and all Sundays in succeeding Augusts till the prize is won. The distance is about 175 miles, and it must be covered within twenty-four hours.

SCIENCE NOTES.

The soapberry tree, *Sapindus marginatus utilis*, has been quite extensively cultivated in Algeria for its berries, which are rich in saponin, and are sent to Germany for use in the manufacture of soap. Similar qualities are possessed by the Florida soap tree, *Sapindus manatensis utilis*, commonly known as the China soap tree, from the fact that it was originally introduced from China. Mr. E. Moulie, of Jacksonville, Fla., has recently been engaged in promoting the cultivation of this tree in the Southern States by a free distribution of seeds. The tree grows to a height of forty or fifty feet and begins to bear fruit in the sixth year. The berries are about the size of cherries and consist of a hard, yellow-brown wax-like shell, inclosing a large black seed. The shell is rich in saponin, and if bits of it are agitated in water a lather will at once begin to form. By grinding the shells a brownsh soap powder is obtained which possesses valuable cleansing properties. The hard, black seeds of the soapberry tree have been used in the manufacture of beads; they also yield a fine oil useful in soap manufacture, as well as in other industries.

As the London Exhibition of 1851 was the time in the middle of the century when technical education began, so the World's Columbian Exposition at Chicago in 1893 marks the beginning of that educational technical movement of which we are now a part. During the last decade advancement has been phenomenal and the demand for technical education never was so great as at the present time. Never has greater attention been given to the subject. England is thoroughly alarmed at the possibility of losing her commercial supremacy. At the organization of the Municipal Technical School of Manchester a committee was sent to the Continent and another to this country to investigate the subject of technical education. Besides individual educators and members of Parliament who have come here, the Mosely delegation of thirty British workmen made an exhaustive study of the industrial situation and technical education. Educators from Norway, Sweden, Russia, France, Switzerland, and Germany have also been attracted to the United States by the remarkable progress we have made. While the presidents of literary colleges are spending much of their time in "stumping" the country, like so many politicians, advertising the advantages of their colleges and making frantic efforts to increase their attendance, the enrollment of the technical schools has been steadily increasing, without pomp or bluster, more rapidly proportionately than the enrollment in high schools, colleges, or universities, and even faster than population. In the South there is clearly apparent an awakening sense of the necessity of more technical skill to develop her resources. The introduction of textile schools, and the application of technical arts in the education of the negro are only forerunners of a great movement for more extended work in other lines. The farmer in the West has learned that the agricultural schools and experimental stations connected with the State universities are of an economic advantage to him and his sons. Mining industries have found that schools of mining engineering, located at convenient centers, are beneficial in supplying their need of trained engineers and metallurgists. The increase of manual training schools in all parts of the country is so rapid that it is difficult to find a supply of well qualified instructors. During the past decade the technical school in the United States which has not largely increased its enrollment, its equipment, and buildings, is decidely the exception. This tendency toward technical education is full of meaning to those who are studying the industrial development only in the educational aspect of the movement.