

#### New Privileges for the Canadian Niagara Power Company.

A most important announcement in connection with the Niagara power development was made by Secretary William B. Rankine, of the Canadian Niagara Power Company, on Saturday, July 22. It is to the effect that on July 15, an amendatory agreement was executed between the commissioners of the Queen Victoria Niagara Falls Free Park, acting in the matter for the government of the Province of Ontario, and the Canadian Niagara Power Company, under the terms of which the Canadian Niagara Power Company is given until July 1, 1903, to develop 10,000 horse power in the Canadian park. The new franchise is for 110 years, and the rent has been reduced from \$25,000 to \$15,000 per annum. There are also other amendments in regard to the location of the plant and the power house, all the plans for which have been approved. The company on its part has yielded its exclusive right to the use of waters within the Canadian park, and therefore the commissioners of the park are at liberty to deal with other companies for the development of power outside the territory occupied by the Canadian Niagara Power Company. This agreement was authorized by an act of parliament passed in March last.

The Canadian Niagara Power Company is closely allied to the Niagara Falls Power Company. It is understood that the new franchise is far more satisfactory to the power company than the original one was, and it looks as though an exclusive right to develop power on the Canadian side was not now deemed as valuable as in 1892, when the original agreement was made.

Under the provisions of that agreement the Canadian Niagara Power Company was to pay \$25,000 a year rental for ten years, after which time the rent was to increase \$1,000 per annum until it reached \$35,000, and at this it was to remain during the life of the agreement, which might have been extended eighty years, making its total life a century. The company was also to have 10,000 developed horse power by November 1, 1898, and water connections made for 25,000 horse power. Under the new agreement they are given four years more to develop 10,000 horse power, and the rent is reduced to \$15,000 a year.

#### TREE DWELLING IN CALIFORNIA.

Mill Valley is a suburban hamlet near San Francisco and lies at the foot of Mt. Tamalpais, the most prominent elevation on the bay shore and overlooking an extended prospect. It is the home of many of the wealthiest of San Francisco merchants, who here escape the fogs and dust of the city and find in genial surroundings that relaxation which is required after protracted attention to business. A little stream flows through the precipitous valley, which formerly nourished extensive groves of gigantic redwoods. Many of these great trees have escaped destruction at the woodman's hands and remain to form a most effective and attractive feature of the lovely landscape.

Art has been combined with nature most cheerfully. All the necessities of metropolitan life are afforded the dwellers without destroying the primitive charms which have always existed. A friendly rivalry exists among the people as to which shall exhibit the greatest novelty in the architecture of their homes. In no community of its size is there a greater display of eccentricity in this respect manifested. The spurs of the mountains are all adorned by houses of the most peculiar outward appearance, and with interiors which exhibit a rich display of taste and extreme comfort.

The illustration shows one home that has lately been constructed and is regarded as by far the most novel in the valley. It is built around a redwood tree and its floor is 50 feet above the ground. It has four rooms, and communicates with the bluff by a balcony of substantial construction. It is a charming conception and the abode of infinite comfort. There are no destructive beasts of prey or serpents of any kind to escape from in this peaceful valley, and the wild natives that once made this one of their favorite haunts have long ago migrated to the happy hunting

grounds of their ancestors. The suggestion is the fruit of a search for novelty, and in that respect this dwelling surpasses all its neighbors.

#### Rail Exports.

The American mail brings some interesting information supplementary to that already cabled over, bearing upon the contract for 180,000 tons of steel rails which has been secured by the Carnegie Company to the order of the Russian government. It is common knowledge that the Russians had been endeavoring for

no one in either America or Europe would accept the contract at \$25 (which was then offered) for delivery within the time required. At last, however, after eight months of wavering, the order was placed at \$26—an advance of about \$10 a ton, which means an increased cost of \$1,800,000 to Russia. This huge contract will make itself felt in many directions. "It is expected, for one thing," we are told, "to keep up the price of pig iron for the next two years. The Carnegie Company's competitors confidently hope that it will keep their big rival so busy during that time that it will be obliged to turn away business, which will then fall to them." There is an element of humor in this theory of how Russia was made to "pay through the nose" for its endeavor to be smart, but probably Russia itself will not see the funny side of the business in view of the extra cost. The triumph to America is very considerable, notwithstanding the evidence that is afforded of a disinclination on the part of English manufacturers to worry over the securing of the order; and it draws attention incidentally to the fact that our own foreign trade in rails is not progressing, as a result in a large measure, no doubt, of the advance of our very energetic rivals in the United States. Whatever may be the case with some other branches of engineering production, there seems no reason for doubt that in more than one market which might be named, we are suffering by the advance of the Americans. This much in relation to Japan, for example, was shown in the recently published report of our consul at Yokohama. Probably the differential rates of the conference steamers have something to do with the greater cheapness

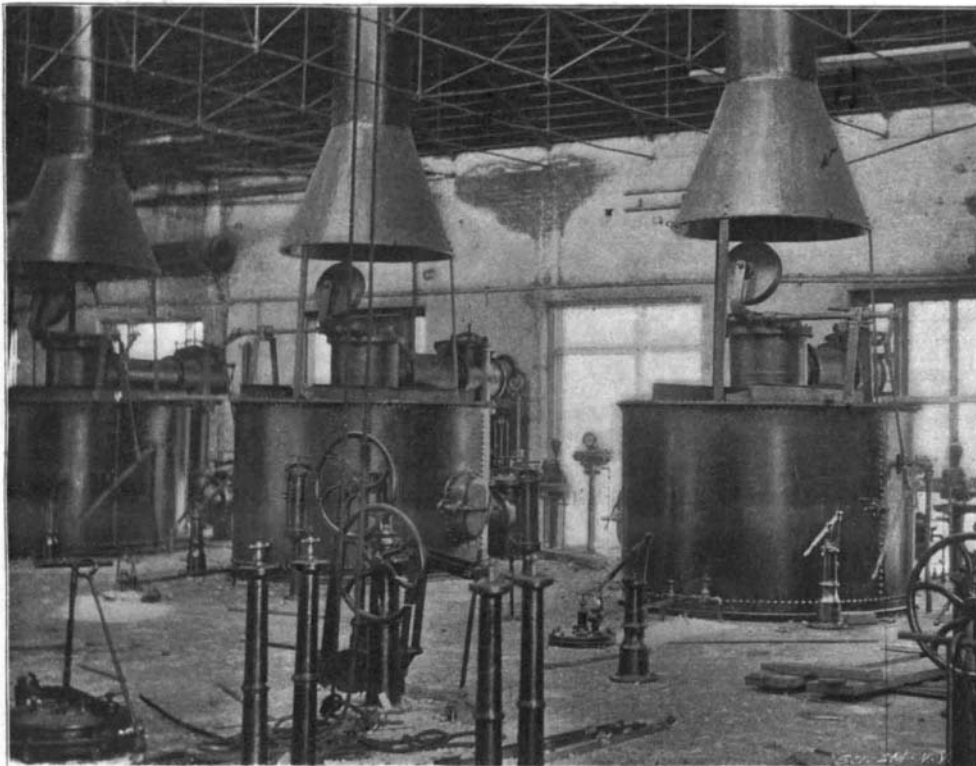
of the American article, but whatever the full explanation, the fact is there to be faced. Our own trade returns afford conclusive evidence that we are not doing extraordinary things in foreign markets in this respect. For last year our exports of "railroad iron of all sorts" were 610,213 tons, against 747,662 tons for 1896, 558,375 tons for 1893, and 1,035,431 tons for 1890. It is true that the 1898 total is in excess of any of the four years 1892-95 inclusive, but we do not base our rate of progress altogether on comparisons with a lean series of years any more than on comparisons with a fat series. The fact is that in the last two years we have gone back considerably, and the decline in the takings of Japan, Mexico, India, and other markets is referable to American progress.—London Engineering.

#### Ship Yards and Docks in Japan.

We have received a most interesting letter from Mr. P. J. McCormick, engineer at Yokohama, Japan, which gives us considerable information regarding the progress of important works in Japan. Baron Iwasaki, in Tokio, is the owner of the principal engineering and shipbuilding works in Japan, which are situated at Nagasaki. The two dry docks are cut out of soft rock, and in addition there is a large shipbuilding yard alongside. Last year this concern turned out several large ships, one being a 6,000-ton twin-screw steamer. The engines and boilers were built at the works, where they have all the best modern machinery and powerful cranes. At Kobe a dry dock is being built in sand at enormous expense.

At Yokohama there is also a dock which was cut out of soft rock about a year ago, and now another dock has just been finished alongside. A large engine and boiler shop are annexed, and all are owned by the same shipbuilding concern. There are a number of other large docks scattered around Japan, and all are owned by Japanese. The government has a number of docks, but no particulars as to their size are obtainable, but a short time ago a large English man-of-war was successfully docked at one of the government docks. The method of construction of most of them is interesting. They are nearly all cut out of soft rock, which can be cut with a pick the same as a piece of chalk.

THE Health Board of New York city states that in the last quarter there were 16,713 deaths, and that of this number four had reached the age of one hundred years or over.



TOPS OF THE GENERATORS.

several months to place this huge order, and that to secure the best possible terms they had been trying to play off the English and German makers against the American, and vice versa. At the end of last year the agent was sent to the United States, when rails were selling at \$16 per ton, but he failed to close the deal. His government hoped to do better by waiting, and for an excuse there was some objection to certain details in the manufacturing process. He was sent back to England, and found on arrival that prices in this country had risen 5 shillings above the American. Rather than pay the equivalent of \$17 per ton, the Russian government agreed to waive its former objection, and, according to the advices, the agent cabled over to America renewing the bid, only to find, however, that quotations were by this time \$20 per ton. So he was sent off to Germany in the hope of getting a better bargain. There he found more trouble in the shape of a further advance to \$23 a ton, with no assurance of early delivery. Then the cable was resorted to again; but by that time the steel mills of the world were so busy that



A NOVEL TREE HOUSE IN CALIFORNIA.

## History of Bells.

Bells are of peculiar interest to almost every one. Their voices to some tell only of daily duty, of trains to catch, of the return of hours of toil, of the ceaseless flight of time: and to others they speak of devotion, and to others still bells are instruments of heart-stirring music. Recent years have seen the publication of not a few books upon the subject; the last newcomer is entitled "A Book About Bells," and is written by the Rev. George S. Tyack, and published in London by William Andrews & Company, from which we glean the following information regarding the history of bells:

There can be little question that the earliest musical instruments were those of percussion. There are frequent mention of bells in the Old Testament, and among Oriental nations bells, or at least tuned pieces of metal, occupy a large part of attention among native musicians, not only in the past, but even at the present time. This primitive and well-spread discovery of tones producible by blows on resonant substances being thus granted, it may readily be seen that something more or less resembling the modern bell in shape would almost certainly be a very early invention. The Book of Exodus gave probably the earliest mention of bells in its illusion to six golden ones which tinkled around the vestments of Levitical High Priest. There is another reason for them in the words of the prophet Zachariah, who speaks of the harness of horses being adorned with them. Turning from sacred to profane literature, we find small bells spoken of by Euripides and by Aristophanes. Plutarch refers to them in his Life of Brutus and Virgil in his Georgics.

The researches of antiquarians have brought to light facts which indisputably prove the early use of bells. Bronze and iron bells were found by Layard in his excavations of Nimroud and very ancient examples have been met with in various places in the far East; while turning to the far West we have instances of copper bells found in ancient Peruvian tombs. Curiously enough there appears to be no proof that bells were used at all in Egypt. There is no trustworthy evidence of the use of really large bells before the dawn of Christianity, and they owe their existence to Christian influences. The credit of the invention has been given to Paulinus, Bishop of Nola in Campania. Paulinus lived about 400 A. D., but it is claimed the distinction is doubtful and a better title for it is made up for Pope Sabianus, who succeeded St. Gregory in the papal chair 604. In any case, from about that date notices of the use of bells, which must have been more or less of the kind and size now seen in turrets, become frequent. By the year 750 in England the church bell became sufficiently common for orders to be issued to have the priests to toll them at an appointed hour. Literature, and specially poetry, illustrate in a striking way the place which bells have for ages filled in the lives of men.

The earliest bells were probably not cast, but were made of metal plates riveted together. One set, which belonged to St. Gall, A. D. 650, is still preserved at St. Gall, Switzerland, and another one, traditionally associated with St. Patrick, is shown at Belfast. These are made of iron, and are only about six inches high.

Other early examples may also be cited. Bells of this kind are not round, but wedge-shaped, being broad and square at the mouth and rising to a ridge at the top. The names of no very early bell founders have come down to us, and probably the bell founder's art, like others which were exercised chiefly for the furnishing and adornment of the church, was originally practiced almost exclusively by the ecclesiastics themselves. As churches and monastic houses increased in number, naturally the art of bell founding drifted into the hands of a professional class and scattered records of some of its members have come down to our time. The chief centers of the art in England were at York, Gloucester, London, and Nottingham. It is probable that many of the early bell founders had no fixed place for working, but traveled through the country, rearing temporary foundries at various convenient places, and casting there such bells as might be wanted throughout the neighboring districts. In many cases it is certain that the bell founder did not devote himself exclusively to that work, but combined with it some other more or less analogous trade. Often the itinerant bell founders cast their bells directly at or in the churches, for doubtless the conditions of the country in early times made the transport of heavy masses of metal a matter of no little difficulty, so that the founders were glad to work as near as possible to the towers to which the bells were to be raised. In 1483 the importation of foreign bells into England was made illegal, a fact which would imply that the bells at that time were brought into the country in sufficient numbers to affect the home industry. On the Continent Louvain was the seat of a famous bell foundry. Deventer, Holland, was another center of the industry. The French bells were made of iron, while brass was commonly employed in Italy and England, and a foundry in Bohemia has recently turned out bells of steel, but the experiment can only be called fairly satisfactory at best. A church in Scotland has a bell of this metal

cast in 1895 by the Vickers, of Sheffield, who have also cast steel bells for a church in Hastings and other places. Glass has been employed for bells of fair size, but the tones of such bells are sweet but not far-reaching. Even wood has been used as a material in bell manufacturing, but the wooden bells which have been found may possibly have only served as patterns for the maker of the bell-frame or for some such purpose.

Bell metal consists of a compound of copper and tin, usually three parts of copper to one of tin in small bells, and four parts of copper to one of tin in large bells. If the amount of tin be increased the bell becomes more brittle, but if the copper be in excess the brilliancy of its tone is damaged. Sometimes small quantities of zinc and iron are added. It is a popular superstition that a bell of specially sweet tone owes its excellence to the presence of a quantity of silver in its composition, but it is asserted by experts that the employment of silver would have precisely the contrary effect on the tone of the bell to that which tradition assigns to it, silver being in its nature too closely allied to lead to permit of use in this case. No less important to the voice of a bell and its material is its shape. Medieval bells were for the most part longer and narrower than those of more modern make. In practice it is found if the bell be too flat the vibrations expel the air from within with an almost explosive force and the sound is loud and harsh. If, however, the opposite error be committed and the height be too great in proportion to the diameter, the air reverberates too much within the bell itself and the sound does not travel satisfactorily.

In casting a church bell the first important work is the construction of the core, which usually consists of a hollow cone of brick erected on a cast iron plate as a foundation, and in diameter somewhat smaller than the interior of the bell. Over this is plastered a specially prepared mixture of clay, intended to bring up the core to the exact size and shape of this interior. The core is baked dry and hard by means of a fire within it. Over this is built up what is called a "thickness," by which name the founders call a second layer of clay of exactly the thickness, shape, and size of the proposed bell. This gives the correct figure of the outside of the bell. This is then dusted over with dry tan, and upon this is constructed the "cope," or outer casing of clay several inches thick. After the cope has become thoroughly dry by means of fire, it is raised with the help of a crane, and the clay which formed the "thickness" is destroyed. The cope is then lowered into its former position, care being taken to make it concentric with the core, then the mold is ready to cast. Where quantities of bells are produced the "thickness" is done away with and a cast iron cope case is substituted. Every part of the bell has a technical name. The hooks for fastening the bell to the wooden stock, which forms the axle on which it revolves in the belfry, are called the "cannons." The loop from which to suspend the clapper has also to be cast. In many modern bells the cannons are dispensed with and the bell is bolted directly on to its stock. This has the advantage of enabling the bell to be turned. The clapper is technically divided into ball or hammer, and the flight or shaft, which is fastened directly into the crown of the bell by an iron staple.

Most ancient and many modern bells bear some motto or device, to which the modern makers add the date and the name of the firm. These, of course, must be impressed in the cope before casting.

In ancient days when the art of bell casting was still retained in the hands of the ecclesiastics, the furnace and the castings were blessed, which must have been a picturesque scene. It usually takes seven or eight hours to heat the metal and it does not take as many minutes to run it into the cope even where the bell is a large one. Then follows a time of keen anxiety in the foundry, specially if the work be one of unusual size and importance. Six days are usually allowed to elapse before the metal is touched. The bell is then put in a temporary frame to undergo the ordeal of testing the tone. It is then carefully finished and tuned. If the notes struck out be too flat a portion of the edge of the bell is cut away, thus reducing the diameter. If it be too sharp, the thickness of the sound-bow is reduced. Nowadays the bell is turned in a specially designed lathe, the bell being secured to the face plate, and the requisite amount of metal can be cut away with the greatest accuracy. Where the bell is to form a part of a chime, it must be tuned so as to accord with the others. The reception and erection of a large bell is frequently the cause of great ceremonies and rejoicing specially where the bell is for a church.

Many of the bells have decorations and inscriptions on them which are very curious. Of this kind was the legend of "Mighty Tom," of Oxford, before its recasting in 1612. The translation of the Latin inscription would be:

"For Thomas' sake  
I cry Bim Bom, and no mistake."

Sometimes where there was a chime each bell had a separate legend. A good deal of the poetry is really doggerel as:

"On Sabbath all  
To church I call."

Another one:

"The sleepy head I raise from bed."

Inscriptions were found on some of the seventeenth century bells. Among them one in Addington, 1658:

"When you hear this mournful sound  
Prepare yourself for underground."

The following lines are met with in a great many places in the different countries:

"I to the church the living call  
And to the grave do summon all."

All the bells do not have such lugubrious inscriptions. Sometimes the inscriptions refer to a wedding.

"When men in Hymen's bond unite  
Our merry peals produce delight."

At times it is used for secular purposes, resulting in the appropriate inscriptions, as

"Lord quench this furious flame,  
Arise, run, help put out the same."

The church of St. Ives has a bell which has the following terse inscription:

"Arise and go about your business."

In addition to the various mottoes, etc., to which we have referred, in many cases we find on the bells the record of ecclesiastical rulers of the parish at the time of their casting which have been of great value to the historian. At Clapham, Bedfordshire, there is a bell in which one word of the inscription is upside down. It reads "God Save the Church," and the word "church" is upside down.

## "COLUMBIA" AND "SHAMROCK"—A COMPARISON.

Now that "Shamrock," the sixth British cutter to cross the Atlantic in quest of the "America" cup since 1885, is well on her way over the Western Ocean, it will be of interest to compare her sailing qualities with those of the boat which is certain to be chosen for the defense. "Genesta," "Galatea," "Thistle," "Valkyrie II." and "Valkyrie III."—it is a right royal line with which this Anglo-Scotch-Irish craft is associated in holding her title of challenger; and with her Irish name, Scotch design, and English construction, she is truly representative of the people to whose fostering care the early growth of the sport of yacht sailing and its present popularity are largely due.

We have already pointed out, in former notices of "Columbia" and "Shamrock," that in the dimensions and construction of their hulls there is great similarity between the two boats. "Columbia," though stronger than "Defender," is yet a remarkably light craft, and in "Shamrock" Thornycroft, with his quarter of a century's experience in torpedo-boat building, has produced a hull and spars that are probably an advance over the American boat in the matter of light scantling and up-to-the-limit construction. The continued secrecy as to "Shamrock's" under-water body is no doubt due to a wish to conceal her excessive draught, and it is not unlikely that she will be found to draw as much as 22 feet. This would mean lower lead, less of it, and a nearer approach to the true fin keel than has been shown in any 90-foot yacht since the construction of our own "Pilgrim" in 1893.

As will be readily seen by a study of the beam views of the two vessels there are notable differences in their sail plans. "Shamrock's" mast appears to be stepped about 2 feet further aft than "Columbia's," and her bowsprit is considerably longer, the distance from mast to outer end of bowsprit being from 5 to 7 feet greater in "Shamrock." Her present boom is about the same length as "Columbia's." The gaff, topmast, and hoist of mainsail, on the other hand, are a few feet less than "Columbia's," so that the sail plan is longer on the base line but not so lofty as that of the American boat. She probably carries a larger spinnaker, larger head sails, and a smaller mainsail, the effect of which, other things being equal, should be to give "Columbia" the advantage in windward work and "Shamrock" in reaching and running. Her owner, Sir Thomas Lipton, and her designer, Fife, have both stated that she is to carry a larger mainsail in the races on this side.

A fairly reliable comparison of the sailing qualities of the two boats is obtained by studying the remarkable series of races sailed by "Britannia" and "Vigilant" in 1894, and comparing the results with the performance in America of "Vigilant" against "Defender," in 1895, and "Defender" against "Columbia," in 1899, and with the recent trials in England of "Britannia" against "Shamrock." Of course the value of such comparisons depends upon the boats "Vigilant" and "Britannia" being as fast in subsequent years as they were in 1894. There is no doubt that they were in as good condition, and possibly better. "Vigilant" was improved in 1895 by the removal of 43,000 pounds of lead from the inside and the addition of 53,000 pounds to the outside of the keel, and "Britannia," in addition to the improvements in trim, sail-plan, etc., due to three years of continuous racing, was recoppered, her topsides replanned and carefully smoothed off, and her wooden boom was replaced by one of steel, before she raced "Shamrock."

The "Vigilant" and "Britannia" sailed seventeen races, of which "Britannia" won eleven and "Vigilant" six. This would appear to denote a decided