

regarded in the light of industrial speculation, it has been thought expedient to include in this volume a showing of the situation viewed solely from a business point, in order that the public may be able to decide whether they are not pecuniarily, if not otherwise, benefited by these so-called monopolies. This introduction applies specially to PROSPECT PARK. It is an indisputable fact that the world does not contain a more faithful *epitome* of the greatest of Nature's works than that offered to our sight at this point. It includes the cliffs, ravines, rapids and torrents, as well as the mists and rainbows of the universe. It invades the realms of fairyland in its

"Forms we can't discover,  
For the tears that drip all over,"

as well as in the winter scenery, which surpasses all the efforts of the imagination. It is, however, with the summer aspect of the Falls that we have to deal, and more especially with those views of them which are to be obtained from PROSPECT PARK. In detail, these are as follows: Passing the wicket gate, one finds himself within a veritable park, containing fine old trees, miniature streams, summer-houses and pavilions, and many added attractions more minutely described below. Proceeding at once to PROSPECT POINT, where it is possible to stand on the very brink of that tremendous Fall, one is held spell-bound at the spectacle of a mighty river draining Lake Erie, and pouring in a vast cataract over the verge of a perpendicular cliff! In all the world there is not a more fitting emblem of Death and Eternity than that sudden stop and fall in the mad career of the waters. This is the point to which all those who have a mind capable of communing with the secrets of Nature return again and again to witness that mighty flood, and when the view is contemplated through the colored plates of glass provided for that purpose, it must be admitted that the effect is curiously varied.

To turn abruptly from this masterpiece of God's work to the masterpiece of human ingenuity which spans from cliff to cliff the river below the Falls, is to create a curious sensation. From this point the faces of the Canadian Falls are presented in full line, and it is interesting to mark the beautiful effect of the blending of the colors as they mingle and change, in the descent of water, at that distance. Passing along the cliff-top, one notices a fine and well-stocked bazaar, in which the largest assortment of views of the vicinity can be obtained. Here, also, is a well-equipped photographic gallery, and it is a favorite custom of visitors to have their portraits taken as on Prospect Point, with the Falls in the background. This makes, perhaps, the most interesting and unique picture to be obtained in the world. From the top of the cliff to the foot of the inclined railway, which is next in order, is 340 feet. The ascent and descent is made in 1½ minutes, there being two fine cars, capable of carrying 40 persons each, which move upwards and downwards simultaneously. This railway has been in operation 40 years, and is driven by a 35-horse-power Lessner turbine wheel. It lands its passengers at the edge of the river, from whence, if required, passage can be taken to Canada by boat.

Below the Falls are 23 dressing-rooms, with guides and attendants, to enable visitors to prepare, by means of water-proof dresses, for the journey *behind* the waterfall, a way having been opened by which one can pass between the cliff and the fall proper, and it is with an indescribable sensation of terror that one finds himself for the first time in the very "grasp of the giant." Yet an escape is invariably made without any further inconvenience than a slight scare and face-washing from the spray. It is, however, possible to view the magnificent spectacle of the Falls from below, without going any nearer to them than the interior of a covered house, from which, through various colored glasses, the effect is weirdly or pleasantly intensified, according to the color selected. To stand close to the cataract upon the hurricane bridges built for that purpose, is a joy near akin to that of the mariner who breasts the billows and fights the gale with a perfect ship and a full faith in his ability to manage her in safety; and it is with a sentiment of inferiority that one turns away to cogitate upon the powerlessness of humanity as compared with these forces of nature.

To turn at once from the natural to the artificial attractions of the park, it is to be noted that its proprietors have taken it into consideration that there are a number of visitors who do not, during their short stay, fully appreciate the beauties of old Niagara, it being an indisputable fact that it requires months of intimacy with them in all their changeable moods, and in all the seasons of the year, to become alive to their power. Hence these men have placed on the grounds some of the greatest triumphs of art, to amuse and instruct those who otherwise might become weary of the scene, and fail to appreciate it. Chief amongst these attractions is the Electric Light, which is the invention of Charles F. Brush, M. E., of Cleveland, O., and was manufactured by the Telegraph Supply Company, of that city. The machine in use is known as size No. 8, the largest machine made, and believed to be the largest in use, and is a splendid piece of mechanism. It is a 20-light machine of 4,000 candle-power each incandescent point. It requires 40 horse-power to keep it running at speed, a Lessner Turbine being used for the purpose of fully developing its capabilities. As the shaft runs at the rate of 700 revolutions per minute, and as there is always the possibility of sudden stoppage in the electric force, a governor has been introduced to stop the water-power simultaneously with the cessation of electricity, thus obviating any danger. The motive power both for the light and for the railway is derived from a canal running through the park.

There are also 6 artificial fountains of unique and excellent design in the center of the place. During the summer season these are made to work in a variety of ways, and upon the rising and descending sprays are thrown colored lights made by passing the concentrated rays of 3 of the electric lights through colored prisms upon the fountains. The effect is magical and almost indescribable.

In the Concert Hall, which resembles a *bijou* theatre, 600 persons can be comfortably seated, and the concerts and plays which are here produced in the evenings, are certainly of the most enjoyable character.

Although recognizing the necessity, in the nature of the case, of a sumptuous bar in the concert-room, the good taste of the proprietors has caused it to be located out of sight, under the stage, thus obviating the most objectionable feature usually pertaining to similar places of amusement. The dimensions of the theater are 45 feet by 100 feet, and are fully utilized.

An elegant Art Gallery also grades the grounds, and contains 100 *scopes* or magnified chromo-lithographs, this part of the gallery alone being worth the price of admission to the park. Besides these views there are 600 stereoscopic views of cities, and scores of rural, domestic and civic life, in the countries of England, Ireland, France, Germany, Italy, Switzerland, Egypt, Africa, the Holy Land, Yosemite Valley, and other noteworthy scenic localities, the collection being completed by a series of splendid French colored views and the new German Megaletoscope just imported, with a number of new protean and opaque views, whereby the scenes change from day to night effects, and *vice versa*.

Thus visitors to this park can see in reality the grandest natural scenery of the world, and, by pictorial representation, visit all the four quarters of the globe; and the price of admission is, to residents, 75 cents per annum, with 10 cents added for evening admission; or to day visitors 25 cents for a safe inspection of the wonders of Niagara!

When it is remembered that it was absolutely unsafe, before the present company assumed possession, to attempt to view the Falls from this locality, as the river banks were in such a state that it was impossible to assure one's self where the foothold could be secured, the cavilings of those who decry the work of this company will be set down at their true value, while the efforts of these men to cater to the pleasure of the public, will be proportionately appreciated. The officers of the organization are—Hans Nielson, president; D. J. Townsend, treasurer; George F. Athearn, accountant.

#### NIAGARA FALLS PAPER MFG. CO., Bath Island.

Although the Village of Niagara Falls has hitherto been regarded mainly as a resort for rest and recreation, as well as one of Natures' most extraordinary phenomena, whose grandeur and scenic effects compel travelers from all portions of the globe to come to this point, yet there is another side to the picture, which, if less sublime, is superior in its relations with regard to its bearings on the requirements of the people. This is the utility of the water-power of the Falls in manufacturing, and, it must be admitted here, that the past decade has witnessed such a reaction in the course of progress in this respect, as it relates to this village, as to lead to the belief that a few succeeding years will place it amongst the chief centers of the United States. Already a number of manufacturing establishments have been located here which rank amongst the foremost in their respective lines of business. Prominent amongst these is the "Niagara Falls Paper Manufacturing Company." The mills of this organization are on Bath

Island, in the American channel of the Niagara River, midway between Goat Island and the shore. This concern had its inception in 1825, when a frame paper mill was erected by Albert H. Porter and H. W. Clark, and succeeded well until 1855, but succumbed to the ravages of fire in August, 1858. It was at once rebuilt on a larger scale and transacted a prosperous and increasing business until May, 1881, when its progress was again interrupted by a fire which reduced the whole fabric to ashes. By this time the business of the concern was so firmly established as to demand reliable resources of supply. The immediate result was the building of the present substantial fabric, which the treasurer points to with pride as a mill essentially indestructible by fire, the entire edifice being founded on the solid rock, and composed solely of brick, stone, iron and slate, with the single exception of the window-sash and some doors. All these points were duly noted and investigated on the 10th of April, 1882. Mr. Pettebone, Treasurer, is fully alive to the interesting nature of his own and his mills' position amongst the waters. There, in the midst of the rapids, his life-work stands—having conquered the ravages of fire and the shocks of industrial life, more solid than ever as a reward to his never-ceasing care for enterprise. It is generally and rightly supposed that the cares of commercial life wear a man down to less than two-thirds of his natural life, and that a succession of industrial *shocks*, such as a man must meet in the pursuit of industry, tends to cause premature decease. Yet Mr. Pettebone, Sr., is 70 years of age, hale as the average man of business at 35 and apparently likely to last so for many years to come.

Apart from all social considerations, which were very pleasant to the compiler of this book, and which will be extended to all society men traveling for paper dealers, the establishment in question can be briefly reported statistically as follows: It has been conceded to be the most compact, perfect and reliable mill of the kind west of New York City. It is *compact* as the result of the life experience of its treasurer, more *perfect* than any heretofore inspected by the writer, who has reported and described a number of paper mills in other States, and *reliable* for the reason that the quality of its product cannot be excelled at the price charged by any other mill in this country. The motive power is derived from three Turbine wheels, two of the first "*American*" pattern, each of 54 inches in diameter under an 11-foot head of water, giving to each a nominal 68 horse-power. The third wheel is one of the "*New American*" design, and is registered at 275 horse-power. The latter has 14 feet of perpendicular pressure of water, the whole power having been obtained by blasting away the solid rocks.

A prominent feature of the mill is the dusting-machine, which is the invention of the treasurer. It consists of a circular barrel of wire screen, fashioned to include a spiral rejecting front, in such a manner that the cut rags received from the ground floor pass around inside the cylinder several times after reception before delivery, and are finally deposited at the mouth of the machine perfectly dusted. As this has not yet been patented, and as it has never been shown to the

public, excepting as inevitably to business men traveling, it is understood that the invention is virtually withheld from public examination.

The elevators used for carrying up the rags from the cutters below to the second floor are similar to grain elevators. These rags are derived from all parts of this State, as well as from Chicago and adjacent territory. They are first softened and afterwards converted into a species of pulp by means of caustic liquors and chemical beaters or fans, the pulp, technically termed stock, being transformed into paper in the most expeditious manner.

The hydraulic elevator, capable of lifting one ton, is operated by power derived from the Rapids, and is perfect in its mechanism, while the shafting, which is moved by the same force, includes amongst shorter lengths one continuous line 104 feet long by 6½ inches in diameter, called the *main line*, which runs the rag engines and the greater portion of the mill. There are five of these rag engines (or mixing tubs), 22½ feet by 9 feet each, having each 1,200 lbs. capacity, as well as 9 bleaching vats, the coloring matter of the rags being removed by chlorine before descending to these vats. As it is necessary to have pure clear water, this is obtained from a spring at the east end of the mill, the turbulence of the river making it impossible to obtain water sufficiently clear from it. The two revolving boilers, which are of heavy boiler iron, used for boiling the rags, are each 20 ft. in length by 6 ft. in diameter, and are kept heated by steam, 2,000 tons of coal being used annually for the purpose of boiling the rags, and drying the paper passing around the cylinders. This steam is generated in two large boilers in a separate building intact from the mill.

The speed of producing paper averages 125 ft. (of 7 ft. width) per minute, or 12,000 lbs. per day. The mill runs continually from 12 midnight on Sunday, till 12 Saturday, P. M. The buildings include the main structure, which is 164 ft. by 104 ft. and 2 floors in height, as well as boiler-house, stores, sheds, wings, out-building, yards and a handsome detached brick office, the entire plant covering 3¼ acres. The machine is one of the Rice, Barton & Fales pattern, and was made in Worcester, Mass., in 1881, and weighs 100 tons. It has a 92-inch Four-driner 40-ft. wire, and is mainly composed of gun metal, pressed, rolled and countered. It has 10 36-in. steam-heated cylinders, not placed in a row as in the old pattern, but having 4 cylinders above the remaining six, making the apparatus more compact and easier to keep under control. A raised platform makes it easy to manage the upper cylinders and obviates the only heretofore existing objection to their use. This improvement was introduced by the treasurer, as the result of his researches into the progressive methods of the manufactures of the eastern cities, and is regarded as a valuable innovation. By a complicated system of stops, pulleys and brakes placed in the rear of the machine the speed of the machine can be perfectly regulated, the entire works, as above minutely described, not requiring more than from 45 to 50 men, besides the machinery, to produce the quantity of paper stated, a result that cannot be quoted by any other paper mill in the United States.

Recently in the "Mechanical News," a writer gave a pen picture of 2 views of Niagara Falls, the first was a description of the *locale* as it was in a state of nature unadorned, and as it is to-day as a *hotel center*:

"Niagara as a spectacle of natural grandeur is a theme to the dignity of which neither poet nor artist can do more than feebly aspire. Niagara as a water-power is a mere matter of figures. The water-power at the Falls, in actual use or available condition, is about 7,000 horse-power; by an enlargement of the canal now in use to a width of 100 feet, and its extension northward, following the course of the river, for a distance of two miles or more, an aggregate of 100,000 horse-power could easily be obtained. Between the radical economists who seek to utilize Niagara still further and the reactionary æsthetes who protest that it is quite too utterly utilized already, we do not feel called upon to decide. It is probable, however, that the industries will eventually have their own way."

From the preceding facts the above quotation seems to be already verified. This mill is located, as one might say, on the very edge of the Cataract, and is placidly "*having its own way*" now, with the current of the waters, as its products will undoubtedly do with the vaster affairs of the concerns of men. The officers are; Lauren C. Woodruff, prest., Stoughton Pettebone, treas., and Lauren W. Pettebone, secy. and general manager. There is a project on foot relating to the possibility of obtaining power from the *locus standi* of Bath Island, which promises at no very distant date to rival the facilities of the Niagara Falls Hydraulic Power and Manufacturing Company, herein fully reported, and which owes its origin to Mr. S. M. Allen, of Mass., who was virtually the originator of the Canal Company.

#### WHIRLPOOL RAPIDS AND PARK CO., Canada Side.



To all who take real pleasure in a study of the beautiful in nature, Niagara presents many enjoyable scenes, and his must be a sordid soul indeed that cannot expand in admiration of the masterpieces of the works of the Great Creator here displayed. One of the chief amongst these, is the Whirlpool Rapid, this being that portion of the river

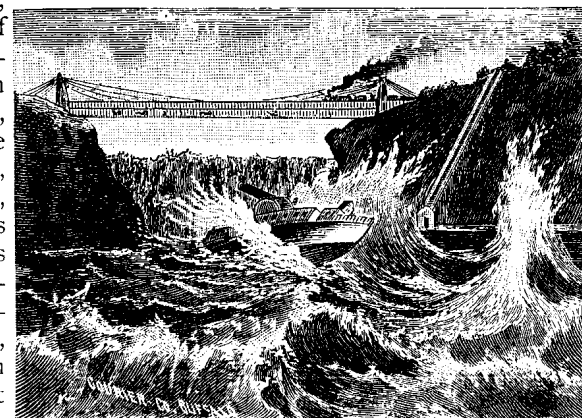
immediately preceding the final exit of the waters into the Whirlpool proper. From the American side a good view of this Race can be obtained, although on that side the observer is confined to one point

of observation; whereas, on the Canada side, this company has prepared a most enjoyable river-side walk, extending about a half-mile along the water's edge. This walk and the upland of the river bank, which is about 200 feet high, and well wooded with trees, shrubbery and undergrowth, has been styled, very appropriately, the "Whirlpool Rapids Park (Canada Side)."

In all the locality of Niagara, there is not a more pleasant or refreshing promenade during the heated term than this walk, which has been excavated from the cliff-side. During any portion of the day it is gratefully cool, the rush of so large a body of water in its immediate presence making it impossible to be otherwise; while, during the long summer afternoons, when the rays of old Sol are expending their fury on the opposite bank, the high cliff spoken of here keeps and forms a delightful shade, in the which many visitors take pleasure in rambling through the park, and others in climbing the steep declivity of the banks, which, by the aid of the undergrowth, is not a very difficult task, while it is the most healthful and invigorating exercise. The moment one reaches the water's edge the grandeur of the Race (for at this point the river becomes a veritable Race) appears as the most enlivening scene in this locality. Other parts of the scenery hereabouts are grand, but here is something which seems to carry the thoughts and feelings with it at the headlong rate at which it is going. As we walk along with the direction of the stream, we observe the green and translucent waters lashed into foam, dashing and whirling through the narrow passes of the gorge, until it reaches its climax at the limit of the park, where there is a bend in the river, causing what would be, under other circumstances, an eddy; here,

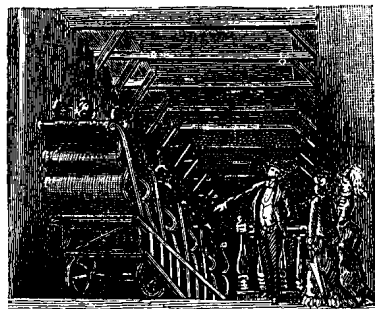
however, the power of the back-water, ceaselessly coming down from the Falls in a volume, compressed into a space much too small for it, wide as the gorge is, and meeting with this resistance, gathers its mighty force in one supreme effort, and mounting higher and higher, dashes past the bend in one continuous but changing surge of water,

resembling nothing so much as the roll of the ocean on a lea shore, and the back-wash from the conflict on the Canadian side assists the resemblance to a seashore scene. In no other part of the river can so good an idea of the volume of water passing over the Falls be obtained, and in no other place of amusement can so pleasant a time be passed in the warm days of summer as in this park. Those who



desire to cross the Railroad Suspension Bridge, which is in near proximity with this park, can do so with little expense, the superintendent, Mr. G. Swan, being always ready to treat applicants courteously, and to extend to them any privilege in his power.

The Whirlpool Rapids Park Company is an association of three of our most popular, pushing, and enterprising business men, who, having been engaged in the work of catering to the pleasure of visitors during their entire life-time, are eminently fitted to carry through, in the most satisfactory manner, any enterprise of this nature to which they turn their attention. These are Mr. J. T. Brundage, livery-keeper, lessee Shadow of the Rock, etc.; Mr. J. W. Trott, of the Cataract House Co., and Mr. P. W. Jerauld, also of the last-named firm.



These men have but lately taken the lease of the park, but have spared no expense in equipping it with every available accessory calculated to add to the pleasure of those who may patronize it. They have established a handsome bazaar at the entrance to the park, where all kinds of mementos of the visit may be secured. Also they have replaced the old means of descent to the water's edge by two new and elegant cars, running on an inclined railroad, in a manner similar to that of the inclined railways at Pittsburg, Pa.

The *modus operandi* of operating these cars is one of the most ingenious arrangements for conveyance of passengers in use. The cars have tanks below the seats; these tanks are filled with water from a spring, at the back of the entrance building, by means of a pipe leading into the tank. 50 lbs. weight of water is sufficient to overcome the balance of the cars, and to carry the loaded car to the foot of the railway, the light one being simultaneously drawn to the top by the same power. Formerly these cars were operated by steam-power, but the present is by far the safest and most economical plan, there being no machinery to get out of order, no danger of damage from bursting of boiler, etc., the entire apparatus necessary being the check or governor, by which the person in charge can regulate or stop the speed of the car with perfect ease.

These cars take 12 passengers each, the tanks are capable of containing 2,800 lbs. of water. As they reach the foot of the incline, a bolt or pin removes the fastening to the discharge pipe and discharges the water, thus leaving the car in readiness for its next ascent, which is made in about one and a half minutes. The total length of the railroad is 285 feet, and is entirely composed of new T rails, from Pittsburg, these having been put in at great expense by the present proprietors, as also the new building, covering entirely the descent.

At the water's edge, and at the most interesting point in the Race, an excellent photographic studio is located, thus giving to all an opportunity of being portrayed with the Whirlpool Rapids in the backgrounds. This makes one of the most valuable scenic portraits to be had in any part of the globe, and is much patronized by visitors, who, as a rule, are gratified to be able to take away at slight expense so pleasing a *souvenir* of this locality.

### Niagara Falls and Clifton Suspension Bridge Co.'s, Niagara Falls.

At its inception, the idea of spanning the chasm at this point seemed wild and visionary. Results, however, have shown in this instance that there is nothing too great for combined human effort and intellect. This bridge is practically indestructible, every part being so inserted that it can be taken out and replaced by new, the moment it shows preliminary sign of weakness or decay. Yet many doubt the fact; and for the benefit of these we here include the following statistics relative to the bridge. It was completed January 4, 1869; is located 300 yds. below the American Fall; the distance from the summits of cliffs is 1,190 ft.; from bank to bank of river at the water's edge below is 850 ft. The Canadian cliff, where the bridge crosses, is 175 ft. high. The American cliff opposite is 180 ft. high. The river immediately under the bridge is 180 ft. deep; the current flows at the rate of from 4 to 5 miles an hour; the space between the points of suspension is 1,268 ft. 4 in.; the deflection of the cables at greatest depression below the horizontal line, varies from 89 ft. in winter to 92 ft. in summer; the difference of 3 ft. is owing to the effects produced upon them by changes of temperature, ranging through 100 deg. Fahr.; the roadway is suspended 183 ft. above the water on Canada side, and 188 ft. on New York side; the center, according to the season, varies from 190 to 193 ft., there being a rise of 4 ft. in the curvature of the bridge in summer, and 7 ft. in winter. The tops of the towers, being in the same horizontal plane, are 105 ft. high on the left bank, and 100 ft. high on the right. The length of the cables, at medium temperature, is 1,286 ft. between the centers of towers, 1,828 ft. between the anchor pins, and 1,888 ft. in all between the anchors imbedded in the masonry on either side. The prolongation of the chains under ground is effected by anchor chains of Lowmoor iron 30 ft. in length, in links of 10 ft. each, firmly built in hydraulic masonry.

The weight of the suspended portion of the bridge between the towers, including everything, is 2,63 tons of 2000 lbs. The maximum and minimum of the weight passing over fluctuates during the busy hours of the day between 50 and 100 tons. This is equivalent to the ordinary weight of 1,300 persons, or of one man to every square yard of the platform, or to a load of 30 carriages and 300 persons.

Thus the permanent and transitory loads never exceed a tensile strain equal to 363 tons on the cables and anchors. These cables are 2 in number, one on each side of the bridge, and they descend from the tower-tops, where they are 42 ft. apart, to the level of the road-

way, in the middle of the bridge, at which point they are 12 feet apart. The deflection from the perpendicular on either side is 15 ft. Each cable is composed of 7 ropes, each rope of 7 strands, and each strand of 19 wires 0.155 in. in diameter, this size being between No. 8 and No. 9 of the Birmingham wire gauge. These wires are each made in one piece, without a splice or joint; there are 133 wires in each rope, 931 wires in each cable, and the ropes are  $2\frac{1}{4}$  in. in diameter,  $7\frac{1}{4}$  in. in circumference, and weigh 54 lbs. to the fathom.

The estimated breaking strain of these cables is 121 tons net to each cable, while the guaranteed strain was 100 gross tons=112 net tons, and they bore the test of 108 tons net without fracture—the fastenings having given way under that strain. The central strand is of softer wire than the other strands. At the anchorage the ropes are connected with the underground anchor chains by means of adjusting links. The solid sectional area of the cable is 37.8 sq. in.; that of the anchor chains 84 sq. in. The ultimate strength of both cables,  $121 \times 14 = 1,694$  tons; that of Lowmoor anchor chains,  $84 \times 32 = 2,688$  tons net.

The stays form two powerful brackets, extending from either shore half-way to the center, and carry one-half the weight and one-half the load; while they relieve the cables of half their duty, the two systems are, nevertheless, so arranged as to work in harmony—the primary object of the construction being so to combine the two independent systems as to make them act in concert the moment a load comes upon the bridge. There are 12 stays on each quarter, 48 in all. They are carried back to the anchorage, and secured there to the same anchors and in the same manner as the cables, save as regards the method of adjustment, which, for the stays, is effected at the other end by means of the nut and screw. The 3 outermost stays are made of  $4\frac{1}{4}$  in. rope of 45 tons ultimate strength; the next six of  $3\frac{1}{4}$  in. of 25 tons strength; and the last 3 of 3 in. of 18 tons strength. The aggregate strength of the whole assemblage of stays, 48 in number, is 1,344 tons net. By the resolution of forces this affords 628½ tons of vertical lifting power.

One hundred and twenty tons of wire rope were employed in the fabrication of the cables and only 25 tons in making the stays. Four stay braces of 3 in. rope are placed horizontally between the cables, binding them together above the roadway; and 4 bridle stays are attached to the cables reaching from the rock at the base of the towers to a distance of 110 ft. out upon the cables, and serving to check vibration caused by the wind or by a moving load. The suspenders are made of wire rope  $\frac{5}{8}$ -in. diameter, 2 in. in circumference, and 10 tons ultimate strength. Being placed 5 ft. apart, there are 480 suspenders of 4,800 tons ultimate strength, or more than 13 times the load they have to sustain. The number of guys attached is 54, 28 on the up-stream, and 26 on the down-stream side—the wind being stronger down than up the river. They contain a reserve power of 540 tons, and offer a resistance of 260 tons to the wind.

The twin towers are constructed of white pine. Each tower pre-

sents the outline of a truncated pyramid, 28 ft. sq. at the base, and 4 ft. sq. at the top. They are 13 ft. apart at the base, and the roadway passes between them. They are 105 ft. high on the Canada side and 100 ft. on the other, built up of 4 timbers  $12 \times 12$  in. in each corner of the pyramid, leaving a space of 1 in. between them for ventilation, through which connecting bolts pass; the crushing weight of white pine being about 5,000 lbs. to the sq. in. or  $2\frac{1}{2}$  tons net, the weight required to crush down one of the towers will be 10,560 tons, or 40 times the weight of the permanent load.

At the center, the curve of the roadway rises 4 ft. above its chord in summer and 7 ft. in winter, a rise and fall of 3 ft. due to the changes of temperature. The chord line is not a horizontal plane; the end resting on the right bank being 5 ft. highest. The 2 ends of the roadway are fixed to the rock on either side, but the middle must rise and fall 3 ft. The framing is adapted to this variation; and is sufficiently rigid to resist the influence of a moving load and distribute it over 100 feet of the platform. The platform is stiffened by a light truss on either side, 6 ft. deep, going down 2 ft. below the road, and rising 4 ft. above it, forming at the same time a strong parapet for the protection of foot passengers.

The anchors are of cast-iron, weighing upwards of a ton each; pierced for the reception of the anchor bars, and having deep flanges on the back against which they are secured by steel pins. They are placed 17 ft. below the surface of the ground.

The entire weight of the bridge, 263 tons, produces a strain in the line of the ropes, forming cables and stays, of  $507\frac{1}{2}$  tons, which is, as nearly as possible, *one-sixth* their breaking strength of 3,038 tons—equal to 20 tons on each rope of 121 tons strength. This leaves a safe margin for the effects of the wind, the moving loads, and sudden accumulations of ice and snow.

The expansion of the cables for 100 degrees range of temperature is 1.20 ft. in the whole length.

The bridge is undisturbed by ordinary winds; but winds that are but gentle breezes on the land strike the bridge with the force of a brisk gale, and a gale on land becomes a storm on the water. The winds press through the gorge as through a funnel. Even in calm weather, puffs of wind come up from the Falls, surcharged with spray, and then there may be seen, in sunshine, the new phenomenon of a rainbow, both over and under the platform, describing a complete circle round about the bridge.

In 1876, the wooden chords of the bridge trusses were replaced by iron, making the bridge, proper, a permanent structure. It is the intention of the company to replace the wooden towers with iron as soon as they show any preliminary sign of decay or weakness.

As it is supposed that the bridge is liable to gradual decay, it may prevent a large number of visitors to this locality from passing over and seeing from the bridge, and from the Canada side, the finest views of the Falls, it will not be considered inappropriate if we point out the absurdity of this conclusion. In the first place,

the only really permanent works of human art are those which are so composed that any portion can be renewed at any time without disturbing the strength of the structure, as is the case with this bridge; secondly, the real strength of the bridge is several times greater than it is at all necessary that it should be, and consequently no possibility of it falling exists even if some portion should weaken.

It is safe to say that any sailor, who has been in the habit of trusting his life, in the swinging tops of a storm-tossed ship, to lines not much larger than whip-cords, would view with wonder such strands as these iron cables. Such a man would give it as his opinion, that the entire Village of Niagara Falls could safely be suspended on those cables; and he would, probably, be as near the truth as those who predict that they will break!

No visitor to the Falls has truly seen and appreciated their grandeur till he has passed over the New Suspension Bridge, and viewed them from the Canadian shore. It is from there only that the entire cataract is presented to the view in full line, and the rainbows and changing colors of the Falls simultaneously made apparent. About 150,000 persons annually cross over mainly for this purpose, some of them coming from the Canada side to the "*Prospect Park*" for a nearer view.

In addition to this, persons can ascend by the elevator to the top of the tower, Canada side, for 25c., and from thence obtain the most elevated and enjoyable view of this phenomenon, which, from that altitude, resembles a view from the car of a balloon. The price of admission to the tower on the American side is 10c., passage over the bridge, 25c., special tickets for a number of trips, bring the price down to 10c. While all residents are allowed to pass at 10c. each.

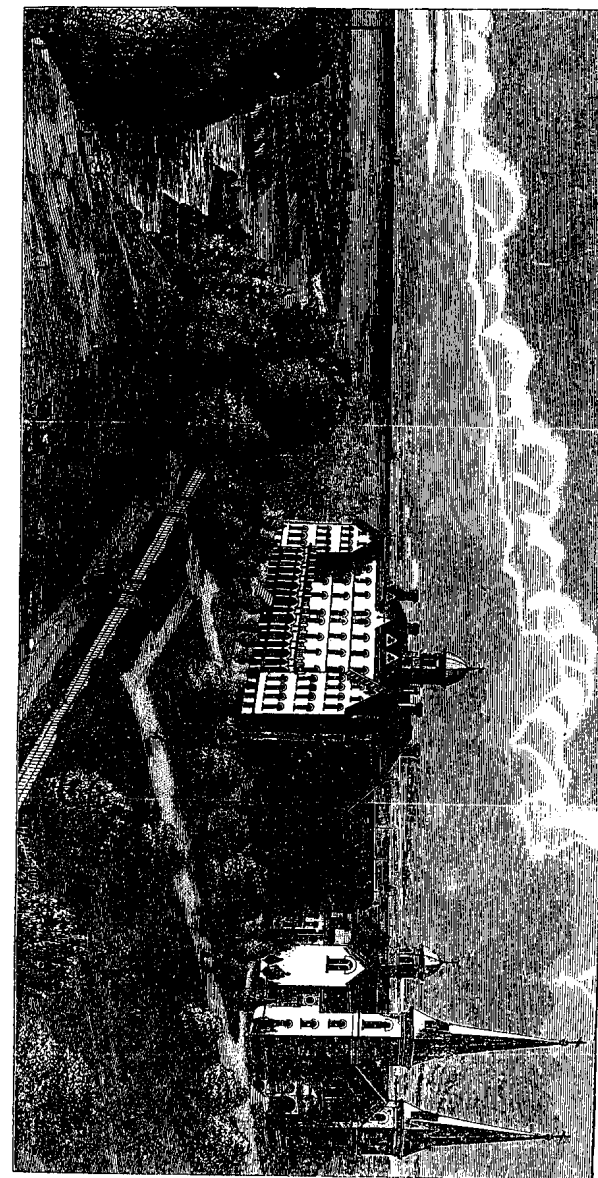
This being an international structure it was necessary, in order that the International laws should be conformed with, that two companies, one Canadian and the other American, should be interested. Mr. J. M. Hutchinson, of Buffalo, is prest. of the Canadian Company. The officers of the American organization are, Delos De Wolf, of Oswego, prest.; C. H. Smythe, of Clinton, N. Y., treas. and secy.; J. M. Bostwick, of Oswego, asst. treas.; and Benjamin Rhodes, of Niagara Falls, supt.

### College and Seminary of Our Lady of Angels, Susp. Bridge, N. Y.

Conducted by the Priests of the Congregation of the Mission, was founded Nov. 21st, 1856, and by an Act of the State Legislature, was chartered with power to confer degrees.

Around Niagara Falls there are many scenes which recall recollections of Europe by the appearance of architectural structures surrounded by evidences of extraordinary care in the keeping of their grounds. The appointments of the college noted in this article certainly compel those remembrances. This college is situated on the most elevated point of "*Mont Eagle*" Ridge, about 2 miles north of Suspension Bridge, and is a very fine stone building. It receives the

SEMINARY OF OUR LADY OF ANGELS,  
SUSPENSION BRIDGE, N. Y.



full benefit of the pure, invigorating breezes sweeping over the country from the lakes. As the name indicates, the "Seminary of Our Lady of Angels" is an ecclesiastical institution intended for the education of aspirants to the priesthood. The course of studies embraces everything required to prepare the youthful candidate for the sacred ministry, and unites the studies proper to a seminary with those of college courses, because, in this country, a priest requires a knowledge of things which especially pertain; not only to the sacred ministry, but also to other branches of education; and, because many young men entering a seminary think they have a vocation for the priesthood, but, after due consideration, ascertain that such is not their calling. In this case the studies pursued in a purely seminary course are inadequate to fit them for secular pursuits; hence, a student may pursue his studies in this institution, and, if it be God's will that he become a minister of the altar, he has all the advantages of a two-fold education; but if God require his services in a secular avocation, he, by the same system, is qualified for any social position.

The scholastic year, consisting of two sessions, begins on the first Wednesday of September, and terminates on the last Wednesday of June. The first session ends on the first of February; the second ends on the last Wednesday of June. A semi-annual report of each student's progress and conduct is sent to parents or guardians. In order to secure propriety of bearing and neatness of person, *military drill and inspection of attire* are required three times a week.

Following are the names and objects of the various societies of the college:

**SODALITY OF THE B. V. M.** was established in the collegiate department of the seminary on the feast of the Immaculate Conception, 1870. Its organization is in accordance with the requirements of the sodality approved by Pope Gregory XIII, in 1584.

**ST. VINCENT DE PAUL.**—The object of this association is to inculcate a love for virtue, and a faithful observance of the rules of the seminary, by the aid of devout and impressive admonition and exercises.

**R. E. V. R. LITERARY**, organized September 20, 1866, is composed solely of the students of the rhetorical division. Its object is to afford them, by means of debates, orations, and essays, practical exercises in elocution and dialectics.

**S. O. L. A. LITERARY**, organized Oct. 26, 1869, is composed of a number of students belonging chiefly to the rhetorical division. Its great object is to instruct its members in the correct management of like associations, and to furnish them with practical exercises in all the English branches.

**BASILIAN LITERARY**, organized Nov. 20, 1869.—Its object is to improve its members in elocution, and to enable them to acquire a facility in extemporaneous delivery. Meetings are held weekly on Wednesdays.

**NIAGARA CECILIAN**, organized Nov. 20, 1867.—This association was organized with the approbation of the Rev. President. Its aim is

to impart a thorough knowledge of music, and to grace and enliven, by its performances, every public exhibition connected with the institution.

**GEOPONICS.**—This association has for its object the study of botany and floral agriculture, practically as well as theoretically. The ornamental grounds of the seminary have been placed under its care.

**S. O. L. A. B. B. ASSOCIATION** was organized March 25, 1877, for the purpose of affording pleasure and exercise. Membership is open to all. Its object is to conciliate and unite all the students, in order that a first-class representative nine of the institution may be sustained.

**NIAGARA ATHLETIC ASSOCIATION** was organized May 1, 1879, and has for its object the development of the physical powers and the consequent invigoration and strengthening of the youthful mind, which is too often impaired by close application to studies.

**NIAGARA LACROSSE CLUB**, organized March 4, 1882, has for its object the development of the physical man, by affording to its members frequent opportunities for indulging in the popular games which it advocates. The regulations of the clubs are such as are calculated to make recreation days at the college pass pleasantly for the members and the spectators.

From the foregoing notes on the various societies and sodalities of the college, it will be seen that this is one of the most complete conceivable institutions of its kind, and the following *data*, collected on the spot, showing its facilities, will be appreciated by all who value a reliable seminary or college for the education of their sons.

The cost of board, tuition, washing, mending, and all the multifarious requirements of a boy at school, is here \$250.00 per annum. Extra charges include the use of a first-class piano for one year with instructions, \$40.00; organ, the same, \$40.00; violin, \$40.00; flute, \$40.00; clarinet, \$40.00. It is to be assumed that no more commendable institution exists for the acquirement of a classical, scientific, commercial and ecclesiastical education for boys, than that afforded by this college, and for this reason, we have been thus minute in describing its accessories.

At the present time, it has 200 collegians, but could accommodate 300. All who may be wishful to place their children in the path of knowledge should take cognizance of the special advantages of this establishment. Connected with the college, are 300 acres of land mostly under cultivation by laborers in the hire of the administration, their perfect system of farming forming one of the special proofs of the keen perception of the value of industrial ideas inculcated by the managers of the college, as well as 16 acres set apart for use as recreation grounds. Scientifically, this institution in its various departments very nearly reaches perfection, all the most approved modern aids to science in telegraphy, chemistry and other advanced branches of education being represented by perfect apparatus for the use of students. Magic lanterns, stone-fossil and other relics in the museum; telephones and other electric appliances, enter into the appointments of the department; while photography and other less necessary accomplishments

are taught. Taking it as a whole, it must be admitted that this establishment is one in which all students ought to progress rapidly, and it is safe to state, that if they do not do so, themselves are to blame.

We add the list of names of officers, faculty, etc., which has been corrected to date, July 1, 1882.

**Board of Trustees.**—Rt. Rev. S. V. Ryan, C. M., D. D., President; Rev. P. V. Kavanagh, C. M., Vice-president; Rev. M. J. Kircher, C. M., Secretary; Rev. M. Rubi, C. M.; Rev. J. T. Landry, C. M.; Rev. N. M. Redmond, C. M., Treasurer.

**Officers and Faculty.**—Rev. P. V. Kavanagh, C. M., President; Rev. M. J. Kircher, C. M., Vice-pres., Director of Seminarians, Librarian, Prof. of Church History, Exegesis, Sacred Hermeneutics, Canon Law, Homiletics, Rubrics, Gregorian Chant and Greek; Rev. M. Rubi, C. M., Prof. of Dogmatic and Moral Theology; Rev. J. T. Landry, C. M., Prefect of Studies, Prof. of Mental Philosophy, Mathematics, French and Reading; Rev. C. Wotruba, C. M., Prof. of Natural Philosophy, Chemistry and German; Rev. C. J. Eckles, C. M., Prof. of Latin, English Grammar, Orthography, Mathematics, Geography and Catechism; Rev. N. M. Redmond, C. M., Treasurer; Rev. E. A. Antill, C. M., Prof. of Latin, History, English Grammar, Penmanship, Bookkeeping, Arithmetic and Geography; Rev. W. McCormick, C. M., Prof. of English Grammar, Orthography, Arithmetic, Dictation and Catechism; Rev. L. A. Grace, C. M., Prof. of Latin, French, Rhetoric. History, Mathematics, Reading and Catechism; Rev. R. F. Walters, C. M., Assistant Prefect of Discipline, Prof. of Arithmetic and Catechism; Rev. J. M. Barry, C. M., Prefect of Discipline, Prof. of Latin, Rhetoric, History and Mathematics; Mr. G. Agler, Prof. of German; Mr. J. O'Neill, Prof. of Music.

### NIAGARA FLOURING MILLS, Niagara Falls.

Taking the lead in the revival of industry at Niagara Falls, which had its inception at the time when Mr. J. F. Schoellkopf assumed the management of the canal, as shown in the article devoted to that enterprise, the business of milling has already contributed largely towards the development of the resources of this village, and promises to still further operate in that direction. And as a showing of the possibilities to be expected from this class of industry here, it will not be foreign to the purpose of this volume to set forth somewhat in detail the business advantages of the firm whose name heads this page. Messrs. Schoellkopf & Mathews' mill is located a little to the north of the Gaskill mill, and is locally known as the "Big" mill (it being the next largest in size and capacity of any mills in the United States), although its proper appellation is the "Niagara Falls and Frontier Mills." These were erected in 1877 and '78 by their present owners, the main building being of stone, six stories in height, with basement and attic, and with a base measurement of 64 ft. by 126 ft. This has a two-story addition, 36 by 100 ft. on its north side which is used for purposes of storage. Adjoining the main building, and connected with it, above the first floor, is another, 50 by 130 ft. in size, and having an altitude of 4 floors, the first of which is of squared