a straw. During the forty-eight hours which follow the taking of the salt, the appetite should be satisfied with chicken or beef broth only; it is especially necessary at the time to observe a severe diet, and to avoid taking cold. The author asserts that during the eighteen years that he has used this method of treatment, he has never been unsuccessful. The remedy is certainly harmless, and perhaps worthy of a trial.

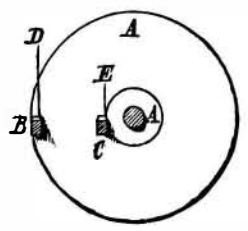
HOW TO TEST A LATHE.

To test if the cone spindle is parallel with the ways or shears, bore a long hole in a piece of cast iron, using a stout tool holder and a short stiff tool, taking a fine cut with a tool having its cutting edge slightly rounded, with a feed of 16 to an inch, at a speed of 25 feet per minute. Let the tool feed through the hole and back again, so that it may be definitely known that the tool does not spring away from the work. Then, without moving the tool from the cut, wind the tool to the entrance of the hole, and let it stand there while the lathe runs forty or fifty revolutions. Traverse the tool to the other end of the hole, and let it stand while the lathe runs again. Then stop the lathe and traverse the tool (without taking it from the cut) along the hole, and if it marks a line stronger at one end of the hole than at the other, the tool has sprung and another fine cut must be taken as before, but if not, and the hole is parallel, the spindle is true.

To avoid the wear of the tool it must be made as hard as possible. If the cut was started at the front and the hole bored is smallest at the back, another cut should be taken, commencing at the back and feeding toward the front. If the hole is still smallest at the back, the lathe cone spindle is not parallel with the ways.

To determine whether the cross slide is at a right angle with the ways or shears, take a fine cut over a radial face, such, for example, as the largest face plate, and test the finished plate with a straight edge. If the face plate runs true and shows true with a straight edge, so that it is unnecessary to take a cut over it, grind a piece of steel a little rounding on its end, and fasten it in the tool post or clamp, with the rounded end next to the face plate. Let the rounded end be about ¼ inch away from the face plate, and then put the feed motion into gear, and, with the steel near the periphery of the face plate, let the carriage feed up until the rounded steel end will just grip a piece of thin paper against the face plate tight enough to cause a slight strain in pulling the paper out, then wind the tool in toward the lathe center and try the friction of the paper there; if equal, the cross slide is true.

In taking a cut down a radial face, to test the truth of the cross slide of the rest, the cut should be started from the periphery, for the following reasons: It is obvious that to some degree (however slight it may, under careful manipulation, be) the tool will become dulled as the cut proceeds. Now with an equal depth of cut, and under equal conditions, there is more strain and wear upon the tool edge when cutting the larger than when cutting the smaller diameter. Suppose, for example, that in the figure we have the radial face, A A, and that the tools, B and *c*, are each taking off a cut of $\frac{1}{16}$ inch deep having an equal feed; then from the lines, D E, we may perceive that the metal in the act of being severed by the tool, B, is much better supported by the metal behind it than is the metal being severed by *c*, and it follows that by beginning the cut at the outer diameter the strain upon it will get less, while the tool edge becomes duller, hence better results will be obtained than if the duty increased as the tool edge dulled.



To test the workmanship of the back head or tailstock, place the forefinger on the spindle close to the hub whence it emerges, and observe how much the hand wheel can be moved without moving the spindle; this will show how much, if any, lost motion there is between the screw and the nut in the spindle. Next wind the back spindle as far as it will go, take hold of the dead center and pull it back and forth, when an imperfect fit between the spindle and the hole in which it slides will be shown by the lateral motion of the dead center. Wind the dead center in again, and tighten and loosen the spindle clamp, and see if doing so moves the spindle in the socket. Wind the dead center out again and slide the tailstock up the lathe bed until the dead center nearly touches the live one, and after bolting the tailstock to the lathe bed, bring the center points close together and see if they coincide. If the tailstock sets over for turning tapers, the setting screws may be operated to adjust the centers.

In any event, the lathe centers should be of equal height, or the lathe will not turn true. It is as well to turn the back center partly in its socket while making this test, so as not to be deceived by any want of truth in the back or dead center.

To examine the slide rest, move the screw handles back and forth to find how much they may be moved without giving motion to the slides; this will determine the amount of lost motion between the collars of the screws and between the screws themselves and the nuts in which they operate. To try the fit of the movable slides in the stationary sliding ways or Vs, remove the screws and move the slide so that only about one half inch is in contact with the Vs, then move the slide back and forth laterally to see if there is any play. Move the slide to the other end of the Vs, and make a similar test, adjusting the slide to take up any play at either end. Then clean the bearing surfaces and move the slide back and forth on the Vs, and the marks will show the fit, while the power required to move the slide will show the parallelism of the Vs.

If the lathe carriage has a rack feed, operate it slowly by hand, to ascertain if it can be fed slowly and regularly by hand, which is of great importance. Then put the automatic feed in gear, and operate the feed gear back and forth, to determine how much it can be moved without moving the slide rest. To test the fit of the feed screw to the feed nut, put the latter in gear and operate the rack motion back and forth. It has been assumed in this method of testing that means of adjustment are provided whereby any play in the cone spindle bearings may be taken up. J. R.

THE STYLOGRAPHIC PEN.

For several years past Mr. A. T. Cross, a pen and pencil manufacturer of New England, has been engaged in perfecting a fountain pen, or more properly an ink pencil, which as now given to the public is certainly very useful and perfect. The holder or case, of vulcanized rubber, ornamented and beautifully mounted, contains the ink, which is conveyed by capillary attraction to the point, whence it flows easily and freely, in uniform and unshaded lines, over the paper.

For the past few weeks we have had some of these pens in practical use in the SCIENTIFIC AMERICAN office, and their working has so far proved very satisfactory. They write more smoothly and easily than a lead pencil, and can be used with facility upon any kind of paper. For long continued writing it is certainly a great convenience to take up one of these pens and be able to write page after page, for a whole day at a time, without being obliged to lift the hand from the paper, or resort to the inkstand, or change a pen, or sharpen a pencil. Our cut shows the exact size and form of the pen. Further information may be obtained from the New York general agent, Mr. C. W. Robinson, No. 107 Duane street, New York, or Mr. M. R. Warren, No. 21 Milk street, Boston, Mass.

An Accident on the Mt. Washington Railroad.

The machinery for arresting the motion of a train in case of accident on the Mount Washington Railroad was happily tested, not long since. While a train was ascending the mountain the rear driving wheel of the engine broke, whereupon the ratchet brake on the forward driving shaft of the engine was instantly applied, stopping the train so quickly and firmly that its movement backward down the slope was less than four inches. There were about seventy passengers on the train, and but few of them suspected that an accident had occurred before the train was stopped. No one was hurt.

London Lichens.

Hitherto the discoloration of London buildings has been chiefly attributed to the prevalent smoke and soot of the atmosphere of the city. It has been noticed, however, that other towns, with an atmosphere equally vile, and using the same sort of stone for building purposes, did not suffer in the same way; while, on the other hand, in places entirely out of the range of London smoke and soot, certain walls became as black as those of St. Paul's. These contrary conditions led Professor Paley to suspect that the discoloration might be of organic origin; accordingly he has made a careful study of the matter, resulting in the conviction that the mischief maker was in reality a minute lichen, irregular in shape and extremely low in organization. It thrives best on certain oolitic limestones much used in London, in warm shady places. The problem now is to find some means for killing and preventing the return of the lugubrious nuisance.

A Promising Western Town.

A correspondent of the *Daily Bulletin* prefaces a long account of the growing industries of Minneapolis, Minn., with the remark that Horace Greeley said, ten years ago, that the child was then living who would see the day when mills at the Falls of St. Anthony would produce more cotton goods than the mills of Manchester, and more woolen goods than the mills of Leeds. This was a big prophecy indeed, but as at that time Minneapolis and the village of St. Anthony, surrounding those falls, contained only about 15,000 inhabitants, and was a small manufacturing town, and has since swelled into a city of 47,000 inhabitants and become the largest flour milling city in the United States, and is still rapidly increasing its prominence in every respect, the prophecy was not so wild as it might seem; and its truth may yet be realized. It is not alone, however, the milling interest that has made Minneapolis. The one hundred thousand available horse power that has not yet been utilized is left after over 8,000 horse power of water has been used by nineteen flouring mills with 214 run of stone; a large woolen mill, manufacturing some of the finest blankets and cassimeres in America; a cotton mill making seamless bags, yarn, etc.; three iron works, a railroad machine shop, a mill machinery works, several planing mills, sash factories, two paper mills, two machine shops, a carding mill, a 300,000 bushel grain elevator, the city water works, twenty saw mills, many with immense gang saws, double circulars, etc.

Where Our Hardware Goes.

A correspondent of the British *Ironmonger* has been examining the monthly reports of our Treasury Department to see what becomes of exported hardware. He finds the destination of some of the principal articles to be as follows:

Nails are sent chiefly to Great Britain, Germany, France, Danish West Indies, British West Indies, Porto Rico, Cuba, Africa, British Guiana, Hayti, Columbia, Brazil, Mexico, Australia, New Zealand, and Canada.

Cutlery is sent chiefly to Great Britain, France, Cuba, Honduras, British Guiana, Columbia, Brazil, Mexico, Venezuela, and Australia.

Pumps are sent chiefly to Germany, Great Britain, France, Cuba, Columbia, Brazil, Venezuela, Australia, Mexico, New Zealand, Sandwich Islands, the East and West Indies, China, Japan, and many other countries.

Machinery is sent to Great Britain, Germany, France, Cuba, Hayti, San Domingo, all the South American States, Mexico, Central America, all parts of Europe, Africa, Australia, China, Japan, and elsewhere.

Articles classed as general hardware go to Great Britain, Norway, Sweden, Denmark, France, Germany, Spain, Italy, Russia, British North America, West Indies, East Indies, British colonies in Africa, British Guiana, China, Japan, all the South and Central American States, Australia, New Zealand, and many other countries.

Agricultural implements, clocks and watches, firearms, and many other manufactures, seem to go in greater or less amounts to nearly every country of the world.

Filtration of Sea Water through Sandstone.

Mr. Isaac Roberts, at a recent meeting of the British Association, stated that he was led to investigate the effects produced on sea water by filtration, in consequence of the constantly increasing salinity of the water drawn from several wells in Liverpool, which are sunk below the sea level in the Bunter sandstones of that locality. He found that one of the wells, which he selected as the type of the rest, yielded water which increased in salinity at the rate of 4·91 to 5·81 per cent annually, and inferred that the sandstone rock had the power of removing salts out of sea water. To prove this he filtered sea water through blocks of the sandstone, and found the inference to be greatly borne out by the results of his experiments. Two cubic feet of the stone removed, from the first filtrate of 3½ fluid ounces of the water, 80·8 per cent of the salts held in solution, and each measured quantity of four ounces, which were afterward filtered through, regularly showed an increase of the salts in solution, until 93½ fluid ounces had filtered through the stones. Then these ceased to be operative as filters, and the waters passed through unchanged. After allowing the stones to dry he passed the spring water through them, and found that the salts which they had taken up were again removed and washed out, thereby showing the action to be mechanical.

Miss Hosmer's Improved Sculptor's Model.

In a very appreciative account of Harriet Hosmer's "Sentinel of Pompeii," the London *Times* describes the ingenious method by which that artist overcomes the difficulties attending the use of clay models and casts. "To get rid of these," the *Times* remarks, "Miss Hosmer has devised the plan, after settling her design in the shape of a small model, of building up a rough model of the figure in plaster of Paris round a strong iron skeleton; on the surface of this she marks the more exact contour, after her small model, by steel points, such as are used in fixing the contour of a marble to be carved from a cast, and then works over the rough plaster, up to the heads of these points, in wax, applied warm, to a thickness varying from an eighth of an inch to nearly an inch, till she obtains the surface she desires, which in texture, color, and effect most closely resembles old marble.

"In this way is obtained a model which can be put aside at any moment and resumed when convenient, which can be preserved without liability to crack or shrink as long as may be desirable, and which bears the living impress of the sculptor's hand, like the clay, without the difficulty of keeping it in working order, and the liability to accident and disaster which beset the clay so sorely. How far these advantages outweigh any difficulties there may be in the preparation or working of the model thus treated, and what other advantages not here indicated the method may have, are, of course, questions for practical sculptors, to whom Miss Hosmer is ready to give full explanation of her new way of working."

In thus breaking through the immemorial customs of the art world, as in her womanly independence and energy, Miss Hosmer illustrates the true American spirit.

THE fiber of a variety of the aloe, peculiar to the Mauritius, is reported to be the best known material for ropes. It is said to be very pliant, to exceed in toughness an iron wire of the same size, and to be impervious to the effects of salt water

Suggestions for Fat People.

It is Brillat-Savarin, we believe, who, in his immortal book on gastronomy, avers that no one is entirely satisfied with his weight; every one wants to be somewhat fatter or somewhat leaner; or if he or she really is just about as he would be in this respect, he imagines a tendency one way or the other, which he feels he must be on his guard to correct.

There is enough truth in this to make it an object for that enterprising class of individuals who make their money out of the weaknesses of their fellows to advertise pretty constantly various secret fat producing and fat decreasing nostrums. The extraordinary sale of Banting's famous pamphlet, which reached sixty or seventy thousand copies, attests the same. And almost every year there is some new remedy offered to the regular profession, either to make fat or to disperse it.

The larger class, or, at any rate, apparently the more anxious class, are those who are too fat, and who wish to grow leaner. Of the various drugs proposed to accomplish this, acids, in the form of vinegar, and alkalies, especially liquor potassæ, are the best known. No doubt both these produce the effect desired, but they both do it at the cost of profound disturbances of the nutritive functions, and, in many cases, serious danger to life.

The *fucus vesiculosus* has been extensively lauded. It probably acts through the iodine in it, actively stimulating the secretory organs; and has, therefore, the injurious effects known in chronic iodism. We have seen letters from some who have used the extract to diminish their weight. The effect desired was produced, but the patients generally spoke of sensations of prostration, sinking, loss of appetite, etc.

The Banting system of diet has in many cases been tried with success; but it, too, carried out without intelligent knowledge of the patient's condition, has at times led to severe and dangerous disorders of the emunctories. In the case of a friend, of general fine health, and in early middle life, it has on several occasions, when he has tried it, resulted in rapid muscular debility and mental lassitude. In all such cases it should not be pushed.

Recently Dr. Tarnier has called attention (in the *Ann. de la Soc. de Med. de Gand.*, No. iv. 1877) to the success of a milk diet in these cases. He commences by allowing three fourths the usual food and one liter of milk the first day; one half the usual food and two liters of milk the second day; one fourth the food and three liters of milk the third day; and thereafter four liters of milk daily and nothing else.

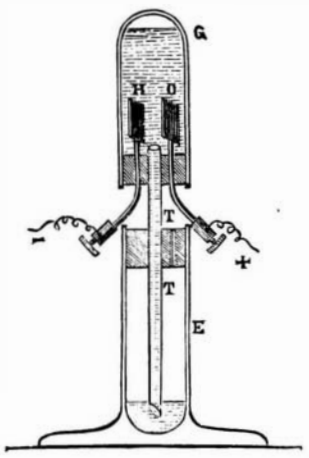
Often, however, it is better to allow a small proportion of the usual food each day, to prevent the patient becoming tired of the milk. Should diarrhea set in, the milk should be suspended for awhile, and then resumed. The treatment may be continued until the fat is reduced. Dr. Tarnier claims that this treatment is always successful, and entails no danger whatever.—*Medical and Surgical Reporter.*

Remarkable Echoes.

In the sepulcher of Metella, the wife of Sulla, in the Roman Campagna, there is an echo which repeats five times, in five different keys, and will also give back with distinctness a hexameter line which requires two and a half seconds to utter it. On the banks of the Naha, between Bingen and Coblentz, an echo repeats seventeen times. The speaker may scarcely be heard, and yet the responses are loud and distinct, sometimes appearing to approach, at other times to come from a great distance. Echoes equally beautiful and romantic are to be heard in our own islands. In the cemetery of the Abercorn family, at Paisley, when the door of the chapel is shut, the reverberations are equal to the sound of thunder. If a single note of music is breathed the tone ascends gradually with a multitude of echoes till it dies in soft and bewitching murmurs. In this chapel is interred Margery, the daughter of Bruce, and the wife of William Wallace. The echo at the Eagle's Nest, on the banks of Killarney, is renowned for its effective repetition of a bugle call, which seems to be repeated by a hundred instruments, until it gradually dies away in the air. At the report of a cannon the loudest thunders reverberate from the rock, and die in seemingly endless peals along the distant mountains. At the Castle of Simonetta, a nobleman's seat about two miles from Milan, a surprising echo is produced between the two wings of the building. The report of a pistol is repeated by this echo sixty times; and Addison, who visited the place on a somewhat foggy day, when the air was unfavorable to the experiment, counted fifty-six repetitions. At first they were very quick, but the intervals were greater in proportion as the sound decayed. It is asserted that the sound of one musical instrument in this place resembles a great number of instruments playing in concert. This echo is occasioned by the existence of two parallel walls of considerable length, between which the wave of sound is reverberated from one to the other until it is entirely spent.—*The World of Wonders.*

A Detonating Voltameter.

The following experiment, due to M. Bertin, is but little known, yet is exceedingly interesting, inasmuch as it puts on evidence certain phenomena connected with the polarization of electrodes which always take place under different conditions. The simple apparatus, represented in the engraving, consists of an inverted bell glass, G, closed with a cork, through which pass two platinum wires provided at their ends with broad plates, H O, of the same metal. It is supported by a glass tube, T, open at both ends, and fixed in the cork which closes the mouth of a test glass, E. Two wires from the batteries are connected with the platinum wires by means of ordinary binding screws. The bell glass, G, is filled with water acidulated with one-tenth of its volume of sulphuric acid. If this mixture be now decomposed by a strong current from a Bunsen battery of 50 elements, the water will be seen to lower very rapidly; and when the bell glass is almost full of gas, the mixture will detonate spontaneously, and be seen to take fire. This experiment is not attended with any danger whatever; the recomposition of the products of electrolysis takes place immediately, and during the passage of the current. It is necessary that this polarization current should have a certain tension; the phenomenon does not take place with a battery of 30 elements, but is at once spontaneously produced when the 20 elements that are necessary to make up the complement are added. With 30 elements, instead of a detonation there will be observed a phenomenon of a different nature, but none the less curious. The water, which at first lowers very rapidly to some millimeters below the platinum plates, all at once stops, in spite of the disengagement of gas on the wires. The plates recompose above what the wires decompose below.



By using pure water the decomposition takes place more slowly, and the detonation is not produced, even with 50 Bunsen elements. Still, a curious phenomenon is produced: the water lowers to the base of the plates, and then does nothing but oscillate between the base and top of these. The water is decomposed below and recomposed above. A weaker current, of 30 elements, decomposes the whole.

These curious phenomena are due to the polarization of the electrodes and not to the catalytic force of the platinum, for they may be obtained with electrodes of various metals.

Artesian Wells in England.

The lower greensand has just been penetrated at Her Majesty's Dockyard at Chatham, by a boring conducted by Messrs. Docwra & Son. The stratum was reached at a depth of 903 feet from the surface, and the water has risen so high as to overflow the top of the well. A year ago the boring had been carried down to a considerable depth in the chalk, when the character of the water was unsatisfactory, being brackish. The authorities at the Admiralty then consulted Professor Ramsay, the Director General of the Geological Survey, as to the probability of reaching the lower greensand if an attempt were made to penetrate the gault. The opinion given was decidedly in favor of the effort, the dip of the lower greensand in the Maidstone area being in the direction of Chatham. Professor Ramsay was also of opinion that the quantity of water to be thus obtained would be considerable. In accordance with this advice the boring was continued, and the anticipations expressed appear to have been fully verified, helping to throw further light on the geological aspect of the water supply in the southeast of England and the vicinity of the Metropolis. Some years ago Messrs. Docwra & Son tapped the lower greensand at Caterham, but as the boring was very small it became choked with sand. The lower greensand has also been found, somewhat recently, at Loughton, in the district of Epping Forest, about four miles southeast of Waltham, an ample supply of water being obtained from this stratum, at a depth of 1,092 feet.

Sea Sickness and its Treatment.

By a number of observers, nitrite of amyl in five drop doses is said to exert a favorable influence in sea sickness. A writer in the *Lancet*, Dr. J. R. Leeson, says, on the subject:

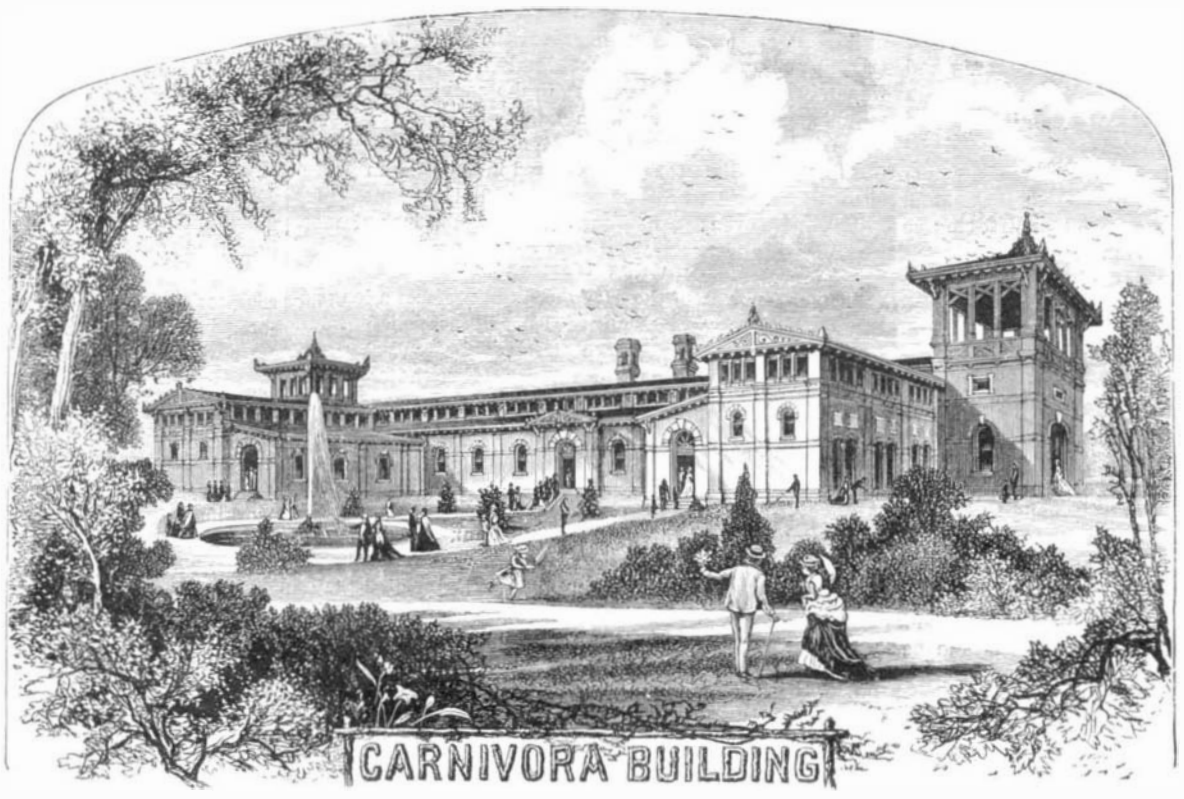
There are two theories about sea sickness: one that it is owing to the food tossing about in the stomach, and teasing it and the diaphragm with its jactitations, nausea and vomiting being the natural consequence; the other that the stomach has nothing to do with it, its cause being a congestion of the brain and cord, which acts in a reflex manner on the stomach. Those who hold the latter, of course, would expect great things from nitrite of amyl, and knowing, as we do, the marked effect it has on the "status epilepticus," one might become too sanguine. Which of these two theories is right I do not pretend to say, but I have an idea that most cases are due to a little of each, and that, with a loaded stomach and congested liver, we may expect but little from amyl; whereas in cases more purely nervous, especially as are seen in women, we have a very fairly successful remedy, and one that warrants much more varied and extensive trial than it has hitherto received.

Glycerine as an Anti-Ferment.

Mr. Munk states, in the *Chemical Journal*, that glycerine retards the lactic and alcoholic fermentations. One fifth of glycerine added to milk, at a temperature of 15° to 20° C., prevented it from turning sour for eight or ten days. One half or one third of glycerine, at the same temperature, postponed the fermentation of milk for six or seven weeks. At higher temperatures, larger quantities are needed to produce the same results.

ZOOLOGICAL GARDEN AT FAIRMOUNT PARK, PHILADELPHIA.

In a recent issue we illustrated some of the buildings of the Zoölogical Society of Philadelphia, and we give herewith engravings of the Aviary, the Bear Pits, and the Carnivora Building. These, as well as the buildings previously described, are fine examples of architecture and fit ornaments for the noble park in which they are situated.



The Aviary contains many rare specimens of the feathered tribes from all parts of the world. The Bear Pits are constructed in accordance with the requirements of these peculiar animals, and are arranged to confine them while, at the same time, they afford facilities for the exercise of their climbing propensities.

In the Carnivora Building are found the lions, tigers, hyenas, leopards, and all of those animals that one prefers to see behind strong bars.

During the year which closed on the 28th of February last, there have been added to the collection of the Society 237 mammals, 149 birds, 109 batrachians,