THE NEW PORT OF COPENHAGEN.

Copenhagen has so old a history as regards maritime commerce that it seems strange to hear a new port of this city spoken of, and yet it is really the case that it has just been provided with an entirely new one complete in every part. It is a question of a free port which has been excavated in order to permit Danish commerce to vie with the influence of the maritime canal that the Germans are now giving up to exploitation between the Baltic and North Seas. We have already spoken of this latter enterprise, and have shown not only the military, but the commercial purpose that it is to satisfy. It is a question of diverting the trade that has hitherto been carried on through Cape Skagen, and of putting the German ports of the Baltic in direct relation with the ocean, or at least of making Hamburg the great entrepot of the consumers and dealers of the Baltic. It is therefore desired to take from Copenhagen the brilliant role that it has hitherto played.

Established in part upon the island of Seeland and in part upon that of Amagar, commanding the Sund, and, on each side, even, of one of the arms of this strait, this city has very naturally, for ages, been acquiring a very great importance. As may be seen from a simple glance at a map of Northern Europe, it has a preponderant situation. It is the natural metropolis of the Baltic and the center of the transactions of the north. This port is upon one of the most frequented maritime routes in the world. The fact is that Copenhagen, or, to use the true Danish word, Kjobehavn, has developed in an extraordinary manner. In 1870 its population was but 181,000 inhabitants, while at present it reaches and even doubtless exceeds 400,000 souls. As regards the traffic properly so called, while in 1857 there were but 10,045 sail vessels on the list of entries and 9,905 on the list of clearances (vessels which at that epoch were but of small individual tonnage), the sole movement with exterior ports comprised, among the list of entries, 6,151 sailing vessels, gaging 233,394 tons and carrying 219,290 tons, and 6,449 steamers, gaging 1,763,133 tons and carrying 781,590 tons. The clearances were 6,045 sailing vessels, gaging 229,024 tons and carrying 40,433 tons, and 6,527 steamers of a gage of 1,858,000 tons and carrying 231,037 tons. In truth, the port was no longer, with the new conditions of maritime navigation, adequate for such a movement. Not only were the mechanical installations defective therein, and the entrance channels of little depth, but the utilizable surfaces were very limited. In reality, this port was formed only of a narrow passage between the islands of Seeland and Amagar, as may be seen in any plan of Copenhagen. There were indeed, under the protection of the fortifications, many basins for small boats, and canals ramifying throughout the city, but for large ships there were but a few docks in inadequate basins in the northern part of this passage. It was in the Oresund, between the coast of Seeland on the one hand and the fort of Three Crowns and that of Lunette on the other.

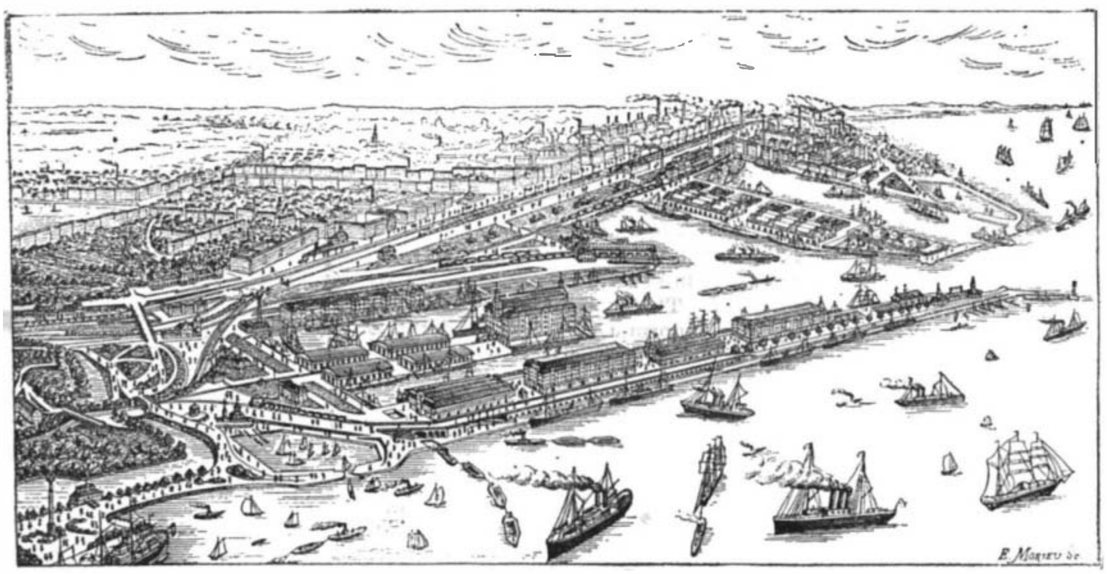
It is true that about ten years ago the "Limekiln Basin" had been dredged, with a small annex basin wholly to the north of the Oresund, but this had improved nothing, since this basin was very isolated, without ways of communication, and presented at a maximum an inadequate depth of 7·53 meters.

A reform was necessary, and became obligatory when the Kiel Canal was begun, since, if something was not done quickly and energetically, the situation of Copenhagen would be lost forever. In March, 1891, there was decided upon the construction of a free port presenting all the advantages of such establishments and designed to become a place of entrepot under the best conditions possible. This work was rapidly brought to a happy termination, and the port was opened at the end of 1894. It cost at least $3,500,000, three of which were furnished by the Port Commission, which constructed the basins, wharves, platforms, railways, and buildings, and the rest by a commercial company especially organized for the exploitation of the port. The latter is established upon ground entirely submerged between the glacis of the citadel and the Limekiln Basin, with which it even unites in part under the name of the Southern Basin. We shall say nothing of the old port of Oresund, which was, however, dredged to 8 meters. The new port opens opposite the fort of Three Crowns through a channel of 106 meters, 9 meters deep, protected by a great breakwater of 400 meters, and bordered to the south by a jetty which, like the breakwater, is of blocks of concrete. Upon entering, we meet with the southern basin, which is 471 meters in length and 188 in width, but only the southern and eastern banks of which form part of the free port. At the side is situated the central dock, which has a depth of 7·53 meters. The point of the wharf that separates it from the southern basin presents two indentations in the form of careening docks in which land the ferryboats of Malmo. At this point we perceive a railway station that permits passengers to pass directly from the cars to the ferryboats or vice versa.

The southern basin skirted by the large eastern mole (the one that is seen in the foreground of our engraving and that separates it from the Oresund) is divided into two docks by a terreplein 314 meters in length by 56 in width. The western one of these is but 8·22 meters in depth, while the rest of the basin is 9·14 meters. The large eastern mole, which is 940 meters in length up to the jetty, does not belong wholly to the free port, being divided lengthwise nearly in the center by the grillage that completely surrounds and isolates the grounds of the port. The method of executing the work was quite interesting, everything having been reclaimed from water, and the terrepleins rising from depths as great as 4 meters. A portion of the wharves are of granite, and certain of them of piles faced with metallic plates.

Railways intersect all the wharves, which possess a superficies of 36 hectares and a length of 3,660 meters. They connect with the Danish system. The sheds and stores are numerous, are provided with elevators, and are constructed of fireproof materials. At the southwestern corner of the great southern basin there is a central station of electricity that distributes power to the elevators, cranes, etc., installed upon all the wharves, and that afford a profusion of light everywhere. We must not forget a vast grain elevator 38 meters in height and 50 in length provided with carrying belts, the offices for the brokers, the dormitories for the laborers, and the storage warehouses for the ships. The Port Society has the right to issue warrants upon the merchandise deposited.

What will doubtless permit of the great development of the new port is that the charges are reduced to a minimum. A ship of 1,000 tons will have to pay but 252 crowns, while the charges formerly amounted to 1,843. It must be taken into consideration, too, that Copenhagen is but very rarely frozen in, and that the entrance to it is always possible, the tide being almost null. Some German companies have already installed regular services between America and this port as the head of the line, and the Danes flatter themselves that they will see their magnificent maritime establishment become for Northern Europe the general entrepot of the products of America and Western Europe.—La Nature.



BIRD'S EYE VIEW OF THE NEW PORT OF COPENHAGEN.

A Famous Hair Lotion.

The Pharmaceutical Journal states that the original formula for the so-called Dr. Locock's hair lotion is: Expressed oil of mace, 4 ounces; ol. olivæ, 16 fluid ounces; liquor ammoniæ fort., 16 fluid ounces; spirit rosmarini, 32 fluid ounces; aquæ rosæ, to 2 gallons (imperial). The lotion was first prescribed by Mr. Alexander, the celebrated oculist, for his wife, and it proved successful. Dr. (afterward Sir Charles) Locock, being an intimate friend, introduced it first in his own family, and afterward recommended it extensively among his numerous lady patients—hence the name. The art of dispensing the lotion consists in thoroughly beating up the expressed oil of mace with a wooden pestle, adding the olive oil in fairly large quantities at a time, and very small quantities of strong ammonia to saponify each such addition. Toward the middle of the process the oil of mace assumes a granular appearance of a reddish color. Should it not do so, or should the mace be converted into a gelatinous mass, further manipulation may be abandoned, for the resulting emulsion will separate. When all the olive oil has been incorporated, add the rose water freely, then the spirit of rosemary, and finally the remaining portion of the ammonia. It will be found that the amount of liquor ammoniæ fort. necessary in the first instance will not exceed 4 fluid drachms. The cream color of the lotion is produced on adding the remaining portion of the ammonia, and the emulsion so made will keep permanently without a sign of decomposition or separation. Twenty minutes should be the time occupied in manipulation.

Scientific Teaching as to Alcohol.

Evidence as to the action of alcohol upon the human body has been collected, not by hysterical prohibitionists, but gathered from the laboratory, the autopsy room and the bedside. One series of facts opening a decidedly new field has been obtained through the works of the experimental psychologists. Through the efforts of some of these gentlemen—and we may mention particularly work done at the Heidelberg University—it seems to be established that alcohol has an effect in dulling simple mental processes, such, for example, as learning by rote, simple arithmetical calculations, and the simpler association of ideas. Another series of facts which tend to show the evident effects of alcohol is that which have been collected by students of heredity, particularly the relation of heredity to degeneration in families. The French alienists, in particular, have shown that one of the most prominent of the factors in leading to the development of mental and physical degeneration is the use of alcohol, and it is further urged by these investigators that alcohol has more than an individual or family effect, that it produces serious deterioration of the human race.

Of course, the effects thus claimed are all due to the abuse and excess of alcohol. Whether a further and more careful investigation would show that a moderate use of alcohol leads, eventually, to somewhat similiar results, we cannot say. As regards the evidence against alcohol furnished by clinicians and pathologists, there has really been nothing particularly new added in late years. But if one take an unbiased survey of the position of medical knowledge and of medical men toward alcohol, and compare it with that held by them fifteen years ago we feel sure that he will see that the feeling against the use of it is much stronger. This is because there has been a gradual accumulation of facts carefully ascertained and thoroughly proved, demonstrating the ill effects of the drug. It is for the reason that the position of medical men regarding the use of alcohol has been always conservative and never fanatical that the present slight shifting of the front deserves the attention of our law makers and of all of those citizens who are interested in good government and in the social problems of the day.

Ancient Glass Makers.

The glass blowers of ancient Thebes are known to have been as proficient in that particular art as the most scientific craftsman of the same trade of the present day, after a lapse of forty centuries of so-called "progress." They were well acquainted with the art of staining glass, and are known to have produced that commodity in great profusion and perfection. Rossellini gives an illustration of a piece of stained glass known to be four thousand years old, which displayed artistic taste of high order, both in tint and design. In this case the color is struck through the vitrified structure, and he mentions designs struck entirely in pieces from one-half inch to three-quarters inch thick, the color being perfectly incorporated with the structure of the piece, and exactly the same on both the obverse and the reverse sides. The priests of Ptah at Memphis were adepts in the glass maker's art, and not only did they have factories for manufacturing the common crystal variety, but they had learned the vitrifying of the different colors, and the imitating of precious stones to perfection. Their imitations of the amethyst and of the various other colored gems were so true to nature that even now, after they have lain in the desert sands from two thousand to four thousand years, it takes an expert to distinguish the genuine articles from the spurious. It has been shown that they used the diamond in cutting and engraving glass. In the British Museum there is a beautiful piece of stained glass, with an engraved emblazonment of the monarch Thothmes III, who lived 3,400 years ago.

Sand and Cement.

As a contribution to the literature upon the subject of strength of mortar as influenced by the size of the particles of sand used in mixing, Mr. A. S. Cooper, United States assistant engineer, recently published a description of tests made by him to compare fine beach sand with the coarser varieties in the Journal of Franklin Institute, from which the following extracts are taken.

During the construction of a mining casemate at Fort Pulaski last year, the question arose as to the advisability of using fine beach sand instead of coarse river sand, on account of the greater cost in obtaining the latter. The writer took the position that the fine sand would be nearly as good, in fact good enough, and as its employment was estimated to save at least $1,000 in the total cost of the work, a short series of experiments was made, which, to the astonishment of all connected with the work, proved the fine sand to be slightly stronger than the coarse. These results were spoken of as being opposed to those obtained by all previous experimenters, and this fact induced the author to investigate the question in a more thorough and scientific manner.

The first matter to be settled was the method of working in order to eliminate as many uncertainties as possible. Where close figures are to be expected, a slight inaccuracy in the work might lead to erroneous conclusions. After looking over all of the different methods, the following were finally adopted as being the most suitable for this work.

The sand was first graded by means of thirteen sieves, ranging from 8 to 140 wires to the lineal inch, and the grades indicated by the two sieves used. The grade 8 12, for example, means that the sand in this grade passed a sieve with eight wires to the inch, and was held by one with twelve wires. It was concluded to mix the mortar rather dry, about the consistency of moist snow, so as to be able to handle the briquettes immediately after moulding them. It was also believed that a dry mortar would give more even results under uniform pressure than a wet one. The sand and cement were first carefully weighed, then they were mixed dry by means of a square box with a rod run through the corners, after the manner of General Q. A. Gillmore's concrete mixer. The water was measured with a graduated glass, and mixed into the cement and sand on a stone table with a trowel. If the mortar appeared too dry, more water was added , and if too wet, note was made of the fact, and the set proceeded with. In nearly all cases enough mortar was made at one mixing to make eight briquettes. Four of these were broken at the end of a week, and the remainder in eight weeks. As a difference of one per cent of water in the finished mortar could not, in all cases, be detected, a series of tests was made to determine the effect of such variations. The results proved conclusively that slight variations in the amount of water might cause considerable differences.

It should also be borne in mind that some cements and some sands of the same size require more water than others to yield a mortar of the same consistency. Generally speaking, fine sand requires more water than coarse, and natural cements more than Portlands. The briquettes were moulded in brass moulds of the form recommended by the committee of the American Society of Civil Engineers in 1885, but were not pressed in by hand as recommended by this committee. The method used by Professor Charles D. Jameson was adopted. Professor Jameson put his mortar into the moulds under a uniform pressure of 150 pounds per square inch, while in this work 200 pounds was used. The press consisted of a simple lever arranged in such a manner that when pressure was applied nothing but vertical pressure would be transmitted to the briquette.

Generally speaking, the coarser the sand, the stronger the mortar made from it; but the difference between the grades below 30-40 are so slight that, as far as sizes are concerned, they might be considered in one class. There seemed to be a tendency toward an increase in strength with grades below 100-120, but so few samples of these grades were obtained that this slight increase may be put down as accidental. There is an unmistakable indication of weakness in the upper grade, 8-12.

It is apparent that the specific gravity of all of the various kinds and grades of sand tried are not materially different, and that, therefore, the difference found between the weights of equal volumes are principally due to the different percentages of voids. It is further apparent that the smaller the grade, the greater the percentage of voids in loose sand, and vice versa; while in well packed sand there is practically no difference in percentage of voids. These results indicate that uniformity of mortar briquettes for tests can be obtained only by either measuring the sand while well packed or by weighing.

Conclusions.—(1) Other things being equal, coarse sands are better than fine sands for cement mortar up to the grade 12-16, or about $\frac{1}{13}$ of an inch in diameter. 2) Below the grade 40-50, or about $\frac{1}{45}$ of an inch in diameter, there is no practical difference in the value of the different sands, as far as the size is concerned. (3) The shape and condition of the surfaces of the grains of different sands has as much to do with their value for cement mortar as the size.

New Power Plant of the Niagara Falls Hydraulic Power and Manufacturing Company.

In view of the efforts being made to utilize the rapids of the St. Lawrence and the Ottawa along the shores of the island of Montreal, for the purposes of supplying power and electric lighting to manufacturers and others, the following description of the power plant now being constructed by the Niagara Falls Hydraulic Power and Manufacturing Company will be of interest to the public.

The hydraulic basin from which water is now taken for furnishing power to the various mills supplied with power by this company is located parallel to and about 300 feet back from the edge of the high bank of the Niagara River on the Canadian side. For this new plant the water will be taken in an open canal from this hydraulic basin to a forebay 30 feet wide and 22 feet deep, which is now being built near to the edge of the high bank. From this forebay, penstock pipes built of flange steel, eight feet in diameter, conduct the water down over the high bank 210 feet to the site of the power house on the sloping bank at the edge of the water in the river below the falls.

The site for the power house is now being cleared; broken and disintegrated rock mixed with huge bowlders which have fallen over the bank in past ages covered the site in places to a depth of 75 feet. The work of clearing this material from the site of the power house, which is now nearing completion, has been largely done by means of a giant or monitor. This is the machine so extensively used in the gold mines of the West for excavating by means of a stream of water. The machine in use at this point is the first used in the East. Below this debris is a stratum of Medina sandstone, on which the power house will stand.

The building will be 60 × 100 feet, the intention being to add to the length of the building (60 feet) and place other wheels, fed by separate penstocks, from the same forebay as above as demand arises. There are four turbine wheels of the horizontal type, furnishing about 8,000 horse power to be located in the first floor of the power house. These wheels will work under a head of 210 feet, the highest head under which water has ever been used for power in the quantity proposed in this plant. The pressures exerted by water under this head are enormous, and every detail of the penstock and waterwheels must be designed with the greatest care to hold it.

The penstock leads from the forebay vertically about 135 feet to the top of the sloping bank, thence down the slope to the side of the station next to the bank, making the total length of the eight foot pipe about 240 feet. Into the building the pipe, 10 feet in diameter, runs horizontally suspended over the tailrace. The thickness of the steel is fifteen-sixteenths of an inch. All horizontal joints are butt strapped, held with three rows of rivets on each side. The cross seams are all double riveted. The necessity for strong work in this pipe will be seen when it is remembered that the total pressure on the end of the pipe exceeds a million pounds. From this horizontal portion of the penstock the water is taken directly up through 60 inch valves on to the waterwheels, which are supported upon iron beams stiffened by braces into the side of the tailrace. The four wheels for this plant are being built by James Leffel & Company, of Springfield, Ohio, under general plans and specifications made by the engineer of the Niagara Falls Hydraulic Power and Manufacturing Company. Three of these turbines are specified to generate each seventeen hundred horse power under a head of 205 feet, which is the minimum head estimated as obtainable, and to run at a speed of 250 revolutions per minute. As the ordinary head will be from 210 to 215 feet, the power of these wheels will be from 1,800 to 2,000 horse power each.—Canadian Journal of Commerce.

Queer Kinds of Spectacles.

Spectacles, to enable the user to see objects near at hand or at a distance, are made in a variety of forms. In a common form the glasses are in two parts, joined at the center, the upper halves being of a power suited to distance and the lower halves to reading. Sometimes a piece is cut out of the glass and a piece of a different power is put in its place. Sometimes the variation is made by cementing a wafer of glass over a part of the spectacle glasses, and sometimes by grinding away a part of the spectacle glasses. There are made also spectacles with crescent-shaped glasses, the upper part of the glass being cut out entirely; the wearer reads through the glasses and looks over them to see at a distance. There are spectacles called clerical glasses, that are like glasses with the upper halves cut off; the wearer looks down through the glasses to read, and he can see over them without effort when he looks at the congregation.

Poisons of Putrid Fish.

In a short article, incorporated in the Bull. U. S. Fish Commission recently issued, Dr. J. Lawrence Hamilton points out the connection between foul fish and filth diseases. Beginning with cholera, he notes the outbreak of this disease in 1893, in the fishing ports of Grimsby and Hull, and instances cases of deaths which occurred from mussels, cockles and oysters from those infected ports.

It is well known that fishing populations, from their slovenly and dirty habits, are more prone to endemic as well as epidemic affections. The author refers to Astrakan, the seat of the sturgeon and caviare industries, as a case in point. Statistics show that the population of this place would become extinct were it not recruited from external sources. During the winter of 1878 79, the plague devastated the place, and the worst and most fatal cases were among the laborers employed in fish salting, who live under very miserable conditions. The price of bread being beyond their reach, they subsist chiefly on the leavings of the inferior parts of the prepared fish. Formerly, government rules enforced that the unused remains of the prepared fish should be thrown directly into the water, but now these, collected and accumulated in masses, are left to rot in and about the banks of the rivers under the heat of sometimes an almost tropical sun. The local atmosphere is further vitiated by many fat boiling, fish oil, isinglass, etc., works. During the five years preceding the outbreak of plague in 1878, enteric fevers, measles and smallpox were epidemic, while scarlet fever raged in 1876-77. Previous to 1878, the town of Astrakan, during 22 years, had suffered from nine epidemic attacks of cholera and three of enteric fever.

Such skin diseases as elephantiasis, ichthyosis, and beri-beri are suspected of being produced by a combination of fish, filth and poverty.

Wounds caused by the handling of decomposed fish are often very serious. The author gives a list of such cases. The Norwegian whalers take advantage of this fact by using prepared putrefactive poisoned harpoons. The whales are driven toward shore, surrounded by a net to prevent escape, and then struck with the poisoned harpoons. After twenty-four hours they show signs of exhaustion, probably through septic poisoning, and are readily captured. The harpoons are recovered and carefully preserved, without wiping, for future use.

The importance of the question of putrid food cannot be overestimated; hence the author's strong language in urging a better supervision of the fish markets. Especially does he condemn the practices of leaving fish ungutted and unbled until sold, and of keeping fish soaked and sodden with water to make the skin look bright.

The foul condition of the boats, and of the boxes in which the fish are shipped to market, and the unsanitary condition of Billingsgate Market, are described in disgusting detail, and suggestions are given for, at least, mitigating these evils.

The infection of fish by impure preservatives, such as ice made from impure water and dirty salt, and also bacterial infection, are referred to. In this connection the author remarks that "the cleanliness in the United States caviare factories is unknown in southern Russia, the home of astounding dirt and disease, augmented by the most hideous poverty and ignorance."

It has been supposed that prolonged soaking would render diseased animal food innocuous, but it would seem, from the experiments conducted by Prof. Pamem and again by Dr. Bremton, that the vitality of poisons derived from putrid and other animal matter, though weakened, is not destroyed by boiling. Accordingly, to avoid all possible danger of the use of condemned food, the author recommends that it be burnt in properly constructed local furnaces, and he includes, under this head, particularly "fish, its offal and refuse."

Another important suggestion as to public welfare is for all fish to be bled, gutted, cleaned, and dry air frozen at the place of capture. This would do away with many of the evils complained of, and is, moreover, a feasible business project. The author's investigations on this point warrant him in stating that "every day in the year, two pounds of bled, gutted, cleaned, dry air frozen (imperishable) fresh herring (about six fish) could be profitably retailed by costermongers for one penny, or two pounds of sprats for one halfpenny."

A sharp arraignment of the "Billingsgate Ring," which Dr. Hamilton accuses of diminishing the market supply of fish, in order to keep up the price, by getting the fish destroyed at various places along the coast, and a brief description of the "koshering" process for preserving animal food, closes this interesting paper.

The idea embodied in the article is, that foul fish is one of the most unwholesome, disease-producing factors in existence, but the conditions that result in such food being put upon the market are not necessary, but are due to ignorance, carelessness and greed, and can be remedied at no great expense. (Bull. U. S. Fish Commission, vol. xiii, pp. 311-334.)—Amer. Naturalist.