REMOVAL OF THE HELL GATE ROCKS.

The great obstruction impeding the ship travel between the Atlantic ocean and New York city *vid* Long Island Sound is located at a promontory of Long Island, called Hallett's Point; it extends out into the East river, approaching Ward's Island, which occupies three fifths of the width of the river at that point, and some dangerous rocks are found in the immediate vicinity. The narrow channel thus formed has been a danger and a difficulty to navigators ever since this part of the country was first explored, and the rush of water taking place through the pass gave it the name of Whorl Gate, afterwards Hurl Gate, whence the name by which it is now known was easily derived

Our readers have been informed, from time to time, of the progress of the great work of excavation, which has now been completed; and the blast which will shortly take place will put an end to the difficulty in navigating this now dangerous pass, and end the years of labor that have been so perseveringly bestowed upon it. A very widespread interest has been centered on the operations; and the work is one of national importance, although this city is of course more interested in it than any other section of the country.

The first mention of preparations for commencing this work is found in the report by Lieutenants Davis and Porter, of the United States navy, made in the year 1848. This document gives a very accurate description of the course of the tidal currents, the dangers to navigation caused by rocks, obstructions, etc.; and it recommends that Pot Rock, the Frying Pan, and Way's Reef be blasted and scattered. The two former are single rocks of a pointed shape; the latter is long and has the character of a ledge. The report also recommends that the middle channel be improved by blasting so as to make a clear channel of sufficient depth for common vessels and steamboats; and it also speaks of the increased facilities for naval defence which this improvement would afford. The difficulty of blockading the port of New York, with her two outlets instead of one, would be at least doubled. Lieutenant Porter did not exactly agree with Lieutenant Davis as to the best plan for improving the channel. They both recommended the removal of the small rocks—Frying Pan and Pot Rock—from the middle of the channel, and Porter included a part of the reef at Hallett's Point, the shell of which is now so nearly ready to be blown into atoms, its interior having been removed and deposited far away on dry land. But the art of blasting under water was almost unknown at that time, and engineers agree that even the little improvement recommended by them could not have been effected without the inventions and discoveries which have since been made. The process adopted in those times for submarine blasting was to take down cans of powder, place them against the side or top of the rock, and explode them by means of a galvanic battery. This did well enough for rough and jagged rocks and boulders; but so soon as the surface had been leveled off, it was of little or no use to attempt to continue the operation.

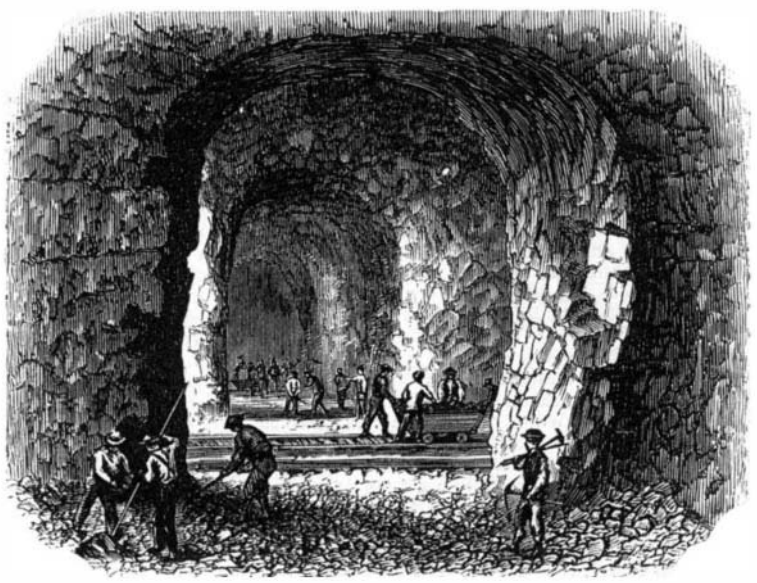

Fig. 2.—SECTION VIEW OF A TRANSVERSE AVENUE, HELL GATE.

In 1852, Congress having made an appropriation of $20,000 for the removal of rocks at Hell Gate, Major Fraser, of the Engineers, began operations according to the Maillefert process above described. The sum of $18,000 was expended on Pot Rock, and the depth of water was increased from 18·3 feet to 20·6 feet.

This is all that had been accomplished up to 1868, when the duty of an examination of Hell Gate was committed to General Newton, of the United States Engineers, who made his report in January, 1867. For operating on the rocks in the middle of the channel a steam drilling cupola scow was constructed. It had a well hole in it 32 feet in diameter, through which 21 drills were worked, while the scow lay on the surface of the water directly over the rock to be operated on. This formidable machine was first used in the spring of 1869, on Diamond Reef. A large number of holes were drilled into this rock, varying from 7 to 13 feet in depth, 4½ feet in diameter at the top and 3½ at the bottom, and the rock was broken up by charges of nitro-glycerin of from 30 to 35 lbs. Coenties Reef was operated on in 1871. Ninety-three holes were drilled and charged with nitro-glycerin, and seventeen surface blasts were made. In 1873, three hundred and seven holes more were drilled and thirty-nine surface blasts were made. The amount of nitro glycerin consumed was 17,127 lbs., and the reef was thoroughly broken up. The *débris* had been partly removed, when, in 1875, Congress, owing to a mere clerical blunder, failed to include Diamond Reef in the appropriation, and work at that place had to be suspended. In 1872 the drilling scow was towed to Frying Pan Rock. Seventeen holes were drilled and eleven surface blasts made.

COMMENCING THE WORK.

Operations for removing the reef at Hallett's Point were begun in August, 1869. A coffer dam was built of heavy timber, securely fastened to the rocks by bolts passing through the framework. This structure is shown in our engraving, Fig. 1.

The coffer dam was pumped out about the middle of October, and operations on the interior for sinking the shaft

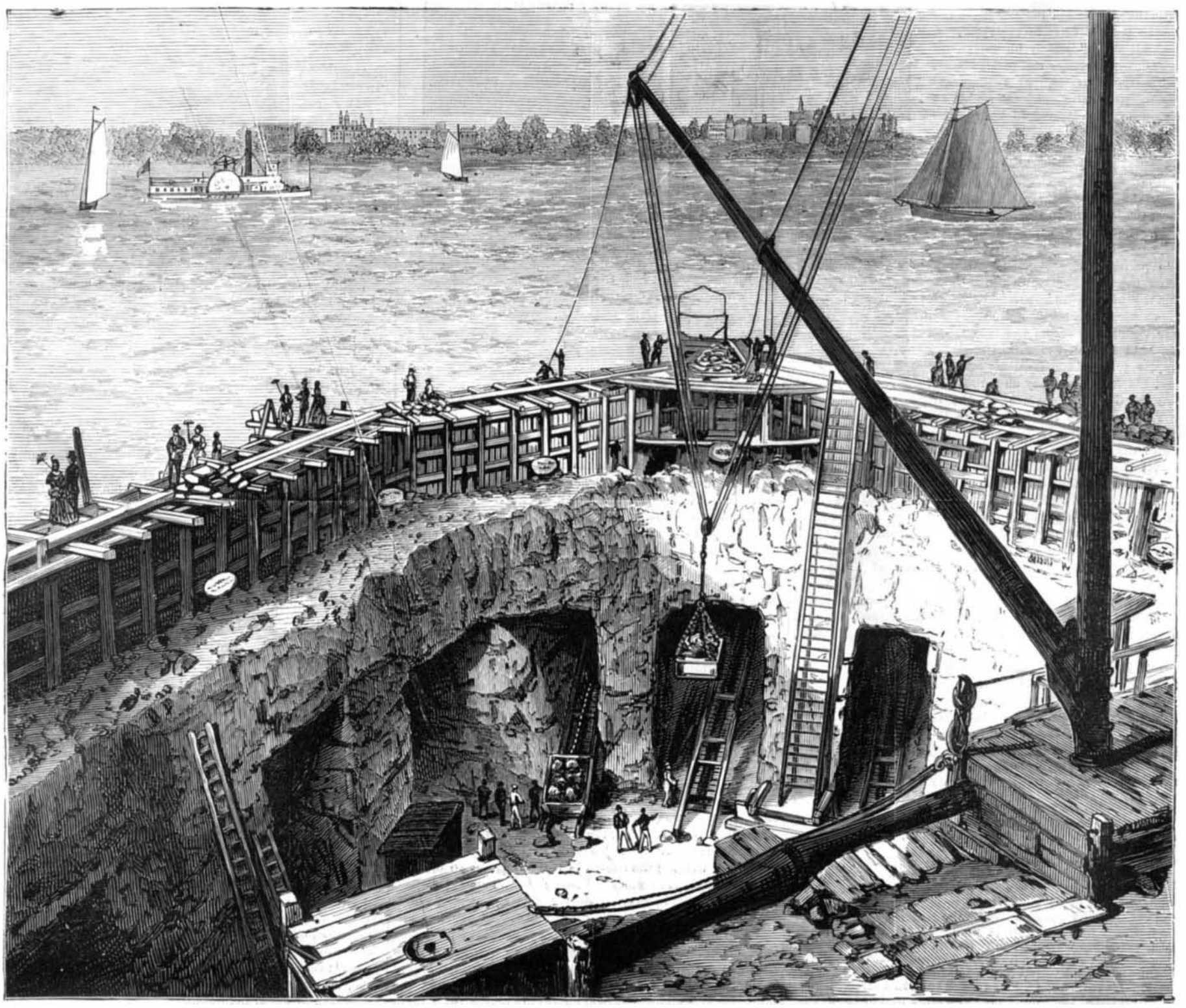

Fig. 1.—COFFER DAM, MAIN SHAFT, AND ENTRANCE TO HEADINGS, HELL GATE, EAST RIVER.

were begun early in November, and continued till the middle of June, 1870, when work was suspended on account of the funds appropriated for this part of the work being exhausted. At that time 484 cubic yards of rock had been taken out, at a cost of $5.75 per yard. In the latter part of July, operations were resumed, and during that fiscal year the shaft was sunk to the required depth of 33 feet below mean low water, and the heads of the ten tunnels opened to distances varying from 51 to 126 feet. Two of the cross galleries had also been opened. The amount of rock excavated from this place that year was 8,306 cubic yards, and the drilling was all done by hand. During the next year the use of steam drills partially succeeded hand drilling, and the work was pushed more rapidly. The number of feet of tunnel driven during the year was 1,653, and of transverse galleries 653·75. The quantity of rock removed was 8,293 cubic yards.

A sectional view of one of the cross galleries or avenues is given in our engraving Fig. 2; and a ground plan of the work, Fig. 3, gives an excellent idea of the extent of the excavation, which is now complete. A longitudinal section of one tunnel, called by General Newton "Grant heading," is given in Fig. 4.

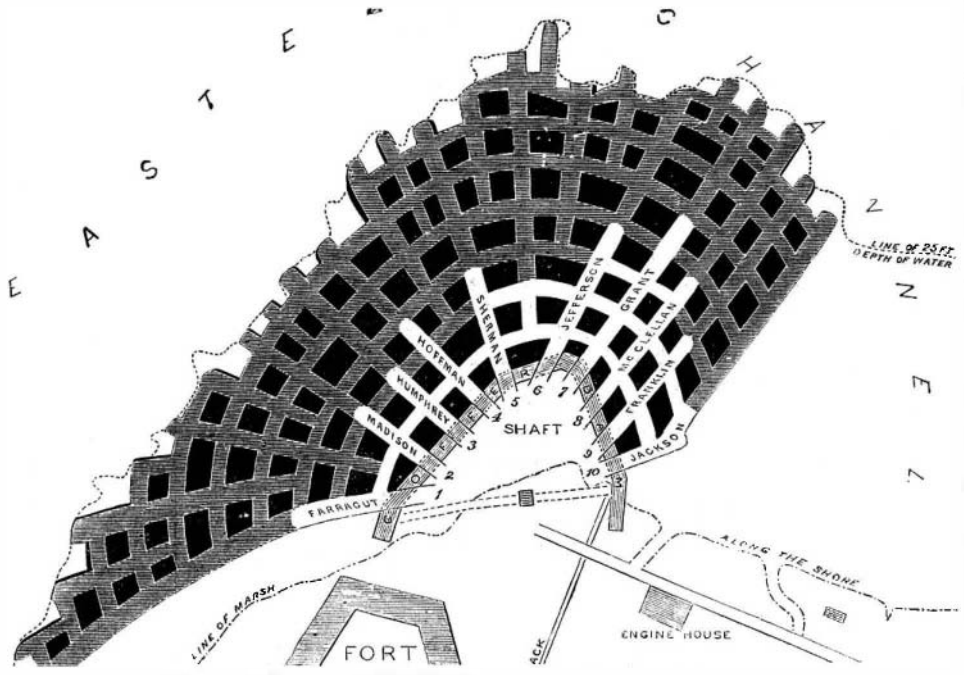

Fig. 3.—GROUND PLAN OF THE WORK AT HELL GATE.

An exceedingly well executed model of the works is now on exhibition in the United States Government Building at the Centennial Exposition at Philadelphia. It is made exactly to scale, and well represents the nature and extent of the vast operations that have now been successfully completed. The rock bed of the river is, in the model, raised from the pillars that support it, so that a close inspection of the interior may be made. There are 172 of these pillars, pierced with about 4,000 drill holes; and the shell, or roof, or bed of the river varies from 6 to 16 feet in thickness. No less than 30,000 cubic yards of broken stone will be left under water, all of which will have to be removed by dredging. The model referred to is accurately represented in our Fig. 5, and Fig. 6 shows a birdseye view of Hallett's Point, with the large cofferdam inclosing the entrance to the submarine works.

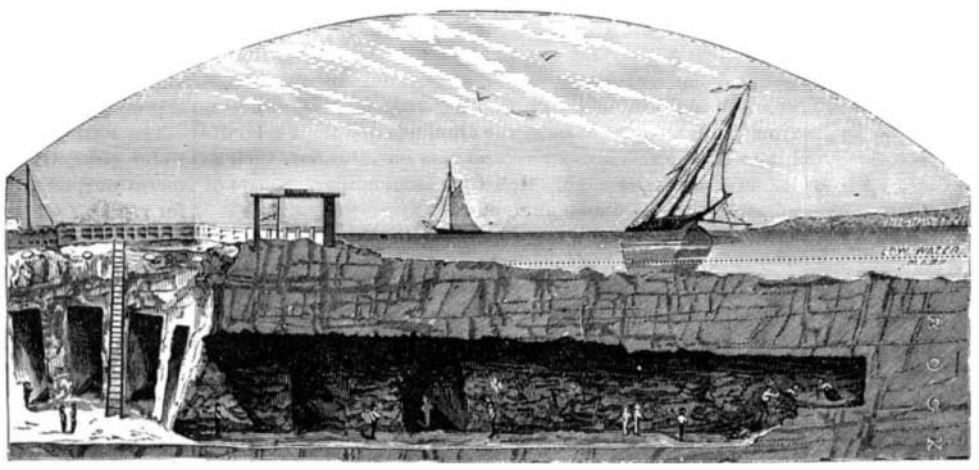

Fig. 4.—LONGITUDINAL SECTION OF GRANT HEADING.

THE RIVER SURVEY.

A detailed survey of the upper surface of the reef was made in 1871 by Mr. William Preass, assisted by Mr. F. Sylvester. They took more than 16,000 soundings, each separately located, by means of instruments, from the shore. Great pains were taken to delineate exactly the surface of the rocks. The appropriation of 1871 was $225,000, just one half the amount asked for by General Newton, who regretted that the beginning of operations on the Gridiron was thus prevented, as he considered this rock more dangerous to the navigation of large vessels than the Hallett's Point reef. For the next year he asked $600,000, but got less than half that sum. About the middle of November, 1873, work was suspended for want of funds, but at the end of the fiscal year, June 30, 1874, it was found that, for the four months and a half during which operations had been carried on, 896 linear feet of tunnels had been opened, and 4,648 cubic yards of rock removed. The total length of tunnels and galleries then amounted to 6,780·67 feet. The excavation now being nearly finished, the manner of finally blowing up the whole mine began to exercise the minds of the engineers.

EFFECTING THE BLAST.

General Newton finally suggested his own plan for blowing up the reef at Hallett's Point, which was to perforate each pier with drill holes entirely or partly through its mass, a sufficient number of those being provided to complete the destruction of the pier when fully charged. The charges in the different holes of the same pier were to be connected together, and a fuse, composed of a quick explosive, would connect the system of charges in each pier with those of the neighboring piers. By this mode the communication of heat or the electric spark to a few centers of explosion would suffice to propagate it through the whole system, because the explosion of the connecting fuse would advance more rapidly than the demolition of the rock. General Newton's plan is the one that has been adopted, although a few slight changes, principally suggested by himself, have been made. Instead of depending on explosives to convey the fire from pier to pier throughout the mine, an electric spark will be sent directly to every center, insuring the simultaneously explosion of the whole mine, unless some unexpected difficulty shall intervene to prevent it. General Newton decided that the minimum amount of explosives could be determined by placing one charge in each square pier and two in each oblong pier, but this mode would make the lines of least resistance the maximum, and thus increase the shock, which would be propagated through the reef to the dwellings upon the land. It was therefore determined to decrease the lines of least resistance, which will multiply the number of blasts and increase the quantity of explosives, but will, at the same time, reduce to a minimum the vibrating influence through the reef. It is hence calculated that the exterior effect, except an agitation of the water, will be small.

THE FORM OF THE REEF.

Hallett's Point Reef is in the shape of an irregular semi-ellipse, the major axis, which lies next to the shore, being 770 feet in length, and the minor axis, projecting straight into the channel, about 300 feet. The cubic contents, above the depth of twenty-six feet at mean low water, amount to 51,000 yards. Besides the risk of striking the reef, it produces eddies on both sides of it according to the direction of the tidal currents, and is much in the way of vessels coming down in the ebb in the effort to hug the shore and thus avoid being drawn upon the Middle Reef.

THE EXPLOSIVES.

The explosives used in tunneling at Hallett's Point have been nitro-glycerin and its compounds, and gunpowder, the latter being used only when the rock was weak and seamy. Nitro-glycerin was always used for driving the headings of the tunnels. To drive a heading, the drill holes are made at an angle with the face, so that the charge lifts out the rock by its explosion. A cavity being made in the middle of the heading, holes are drilled around it and the surrounding rock blown into it. Only one blast is exploded at a time, as great care has to be taken not to shake the structure overhead by too heavy vibrations. There is consequently no volley firing, and the galvanic battery is not used for discharging the blasts.

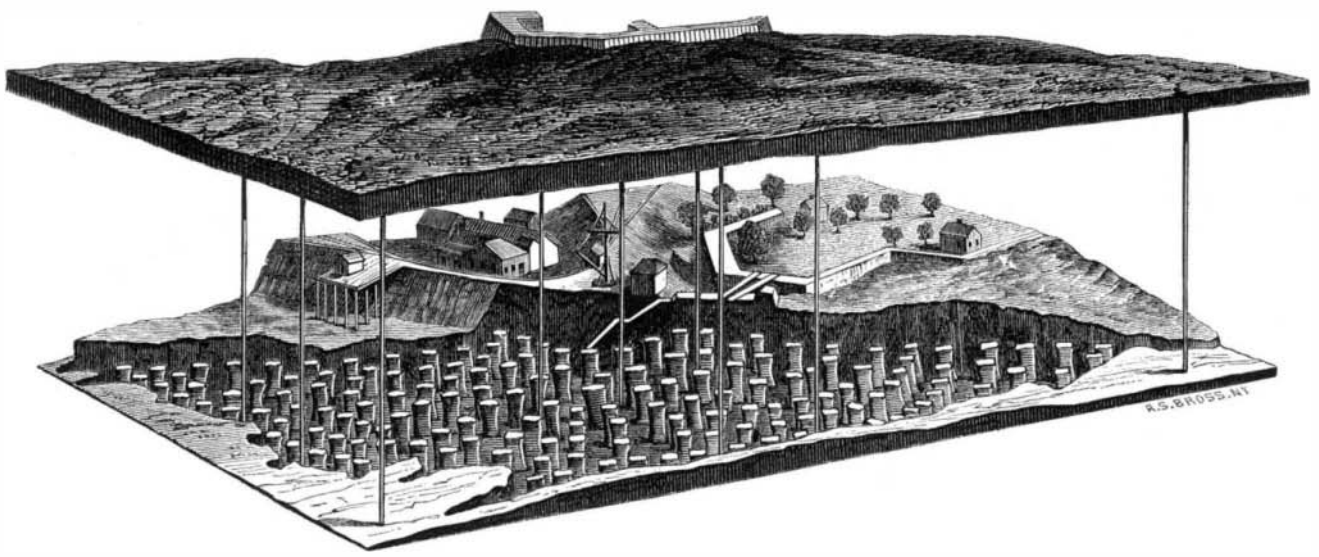

Fig. 5.- THE CENTENNIAL MODEL OF THE HELL GATE WORK.

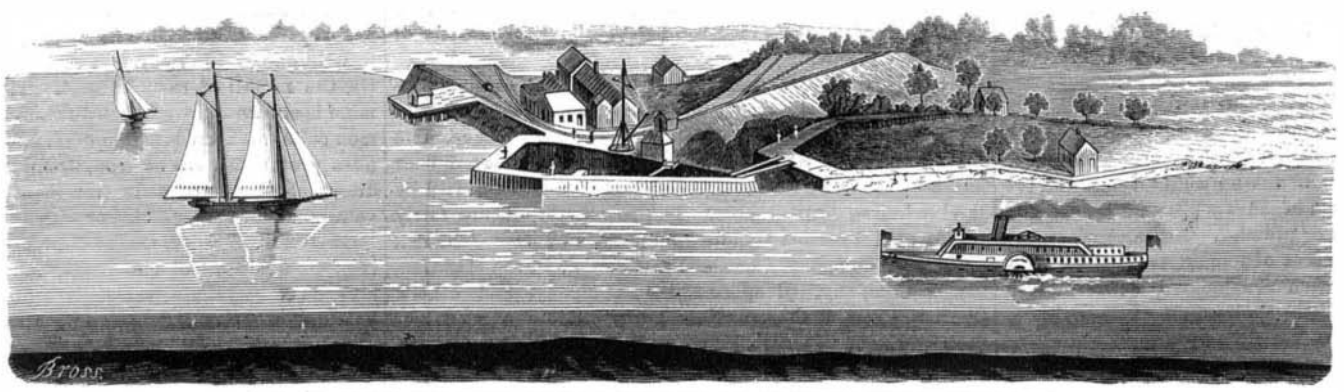

Fig. 6.—BIRDSEYE VIEW OF HALLETT'S POINT, SHOWING THE COFFER DAM.

THE DRILLING.

The average of twelve months' work with six Burleigh drills was the excavation of 235 lineal feet of heading per month. Up to June, 1872, the work had been prosecuted by hand drilling, with the exception of 20,160 lineal feet of drilling by the Burleigh drill, and 7,000 feet by the diamond drill. That by the Burleigh drills was done by contract at so much a foot; and the diamond drill, purchased for the purpose of exploring the rock ahead, was put in competition with it. The cost of drilling, after a long trial with the Burleigh drill, is found to be between 36 and 37 cents per foot, including repairs, etc. The cost of hammer drilling was found to be about 95 cents per foot. The number of feet of holes, drilled by each machine per shift of eight hours, was 30 feet. The diamond drill, owing to the encounter of frequent

veins of pure quartz in the rock, often gives out and has to be repaired. Owing to the restricted area of the tunnels and galleries, the work of excavation was almost exclusively that denominated heading, without the advantage of enlargement. The rock, after being blasted, was lifted by hand into a box resting on a truck car, which was run down to the place upon a rail track, and thence drawn by a mule to the shaft, where the box was hoisted by a derrick and its contents emptied into the dump cars, to be rolled away and deposited in the pile. Calling the cost of blasting and removing one cubic yard $1.00, the following gives the proportion of each item of expenditure:

Blasting	0.46
Transporting rock to shaft	0.17
Hoisting	0.0328
Dumping	0.0203
Pumping	0.1087
Incidental	0.2132
	$1.00

The work of excavation having been finished, the drills were set to work perforating the roof and piers with holes to receive the final charges which are to explode the mine. These holes were made from two to three inches in diameter, and from six to ten feet apart, and their average depth was about nine feet. The size of the holes and their direction and distances apart were made to vary according to the character of the rock to be broken. The drilling of these holes up into the roof of the mine soon increased the leakage of water into the works from 300 gallons per minute to 500, it being impossible to avoid tapping a seam occasionally. Many of the holes that were found to be leaking were plugged up temporarily, and the leakage thus reduced. The outside gallery and the No. 4 heading were deepened so as to concentrate all the leakage, and cause it to flow to the shaft end of that heading, where the pumps were placed.

THE COST OF THE WORK.

The following shows the amount of the appropriations made by Congress each year for the Hell Gate and East River improvement, and the whole amount expended up to the date of the last report of General Newton to the chief engineer:

1868	$85,000	1873	$225,000
1869	180,000	1874	250,000
1870	250,000	1875	250,000
1871	225,000		
1872	225,000	Total	$1,690,000

Amount expended, $1,434,129.99.

Since this report was made, Congress has appropriated $250,000.

Total amount of appropriations to date	$1,940,000.00
Total amount expended to August 1, 1876	1,686,841.45
Estimated cost of completing the entire work of improving Hell Gate and the East River	5,139,120,00

Care has been taken to test the various kinds of explosives. Up to the middle of 1874, nitro-glycerin had been principally used for blasting purposes. Several hundred lbs. of mica powder were then tried, some giant powder, several thousand lbs. of rendrock, and later considerable vulcan powder was used. All of these are nitro-glycerin compounds. Neither of them was found to be as powerful as the glycerin itself; but it was repeatedly demonstrated that, with 10 ozs. of rendrock or vulcan powder, they could break as much rock as they formerly did with 8 ozs. of nitro-glycerin, while the cost per lb. was less than one half that of the glycerin.

THE FINAL EXPLOSION.

The blast is to be effected by 96 batteries of 10 cells each, which are to be placed in a bombproof structure. The cells are charged with the fluid known as electropoion and bichromate of potash in dilute sulphuric acid. The zinc and carbon plates are 4x6 inches, and oppose an area when lowered into the fluid of 40 square inches each. The cells are connected for intensity, about 42 of them forming one battery, the intensity of which is sufficient to ignite simultaneously one set, consisting of eight groups of 20 fuses in continuous circuit, equivalent to 160 fuses. There are, in all, 23 sets to be exploded by 23 such batteries. In order to ensure the simultaneous explosion of these 23 times 160 fuses, a novel apparatus will be interposed into the circuit of each of these independent sets. The apparatus consists of a gravity circuit closer, a brass pin closing the open circuit when the batteries are lowered down, after the charging of the mines is finished, by dropping into a cup filled with mercury, both brass cup and pin being part of the circuit. It is understood that there are 23 brass pins and as many mercury cups in the instrument forming the circuit closer. The simultaneous explosion of all the mines will hence, if no accident changes the programme, be accomplished in the following way: After the wires are connected with the poles of the battery, and the brass pin and cup respectively, the plate containing the brass pin is to be lifted and held by a cord containing the fuse, the destruction of which, by a separate battery, will cause the closing of the circuit by the contact of the brass pins with the mercury in the cups, and the explosion must follow. It is appointed to take place on Thursday, September 21.

Discovery at Pompeii.

A discovery has been made at Pompeii, consisting of a number of objects of gold and silver, and close to them the carbonized skeletons of two men, who would seem to have been borne down in the storm of ashes while endeavouring to escape with their valuables or plunder. Among the articles found are eight rings, six pieces of money, two pairs of earrings, two large armlets, each ornamented with thirteen pairs of half globes, with little shells upon them, held together by chainwork, and a necklace of chainwork, all of gold; a silver ring, 332 pieces of silver money, a *casserole* of the same material broken in pieces, and three large bronze coins.

The city of Pompeii, it will be remembered, was completely buried up in the year 79, nearly 1,800 years ago, by ashes from the neighboring volcano of Vesuvius. The ruins of the city were rediscovered in 1748.

CHEMICALS AT THE CENTENNIAL.

THE AMERICAN EXHIBIT.

Not only does America occupy a great deal more space with her chemicals, as with nearly every thing else, than any other country, but the display is more gorgeous and imposing. Large and handsome, we shall see whether it possesses as much intrnisic value and excites as much deep scientific interest as that of Germany, directly opposite.

Powers & Weightman, of Philadelphia, make the finest display of all the manufacturing chemists. In a little palace erected in a conspicuous spot on the transept or cross aisle, they exhibit the costly medicinal alkaloids by the bushel, and poisonous ones in quantities sufficient to destroy a city. The most beautiful things, however, that they show are two large dishes of crystallized nitrate of ammonia, the salt from which nitrous oxide is prepared. Then come beautiful crystals of caffeine, of nitrate of silver, of tartaric and citric acids, and other more common substances. In the center of this little palace is a cake of crystallized alum, as tall, almost, as a man, with openings cut through to show the beautiful interior. But these exhibitors, we shall find, are not so far ahead in the display of alum as they are in some of the more costly but less showy specimens, like lithium salts, tannate and ferrocyanide of quinine, bromide and iodide of iron, monobromide of camphor, nitrite of amyl, nitrate of cerium, codeia, prussic acid, and opium and its alkaloids, with numerous salts of each. The display reflects great credit on the enterprising firm which sent it there.

The next display on the right of this is that of Rosengarten & Sons, of Philadelphia, second only in size to that before described, and like that deriving its chief interest from the large quantities of the alkaloids and their salts exhibited. We also noticed several rare preparations, such as iodide of manganese, subsulphate of iron, sulpocarbonate of potassium and of ammonium, etc.

Adjoining this, again, is a very prettily arranged exhibit of oils in numerous tall bottles on an elevated stand. They embrace natural, mineral, vegetable, and animal oils for commercial, chemical, and medicinal purposes, and are exhibited by F. S. Pease, of Buffalo, N. Y. Next follows a good display of camphor, by William F. Simes & Son, of Philadelphia, and near this again an exhibit of paints by Charles Moser & Co., of Cincinnati, O. And here we may note, in passing, that, from the very nature of the exhibit, paints and colors, if tasefully arranged, present a pleasing sight and attract more attention than almost any other in this department. This is particularly true of the exhibit of C. T. Raynolds & Co., of this city, well known from their customary display at the American Institute.

Directly opposite to Raynolds & Co.'s is the no less attractive display of Harrison Brothers & Co., of Philadelphia. In the center rises a tall pyramid surrounded by bright mineral colors. In a case near it is a pile of wood on which are arranged the products derived from the wood by dry distillation: pyroligneous acid, wood spirits, methyl alcohol, acetic acid, white, gray, and brown sugar of lead, charcoal, etc. Then come some bones, with a group of the necessary chemicals for converting them into home-made fertilizers. There too are beautiful lakes, paints for brickwork, moist colors for paper staining, and lastly white lead, with the best illustration that we have seen of the process of manufacture known as the "Dutch method." First we have the ore, galena; then the metallic lead cut into grates, or buckles, as they are technically called; then the pots, resembling ordinary red flower pots, with the grates in them; then a bed of tan bark, in which the pots are set while the conversion takes place; and finally pots as they come from the tan, filled with white lead, still preserving the shape of the original grates, and adhering loosely to the undecomposed lead within.

Another first class display of paints and varnishes is made by John Lucas & Co., of Philadelphia, Pa. It embraces, among other things, zinc ores, spelter, white lead pots, and buckles, sugar of lead, gums, kauri, dammar, copal, shellac, etc. They exhibit some bright green paints comparing very favorably with Paris green, but claimed to be free from arsenic. They have also fitted up a miniature laboratory with sink, wash bottle, test tubes, filters, funnels, etc.

The Brooklyn White Lead Works exhibit white lead and litharge, also a few pots and buckles. Wetherill & Brothers, of Philadelphia, exhibit red and white lead, litharge, and the like. Jemett & Son make the usual exhibit of white lead, as do also some others; but the above will, we think, be found to embrace the principal large exhibits of paints and pigments.

Nearly allied to the paints are the oils; but as they possess little or no novelty, we must pass them with mere mention. Gest and Atkinson, Cincinnati, O., draw attention to their exhibit of lard, tallow, and oils, by a large boar mounted above their case. Cotton seed oil is exhibited by Boyl & Lewis, Philadelphia. The petroleum oils are fairly represented by the Aladdin Company, of Pittsburgh, Pa., Elaine Oil Company, Charles Pratt & Co., Devoe Manufacturing Company, Oleophena Oil Company, and others. Charles Pratt & Co., of New York, exhibit a model of their works at Hunter's Point, and specimens of petroleum and its various products. The model, which is on a scale of ½ inch to a foot, is very interesting, as showing not only the extent of these particular works—some eight acres—but as giving a faint idea of capital invested and machinery, buildings, and apparatus required to make the Astral oil and other illuminating and lubricating oils.

The Elaine Oil Company exhibit, under the name of petrozcene, a greenish, odorless, solid substance with crystalline fracture somewhat like paraffin This, they state, is a new product of petroleum, and exactly what it is we are unable at present writing to say. In another place the same company have a working model of an oil well with a pump run by clockwork, and this conveys a good idea of this most important branch of American industry.

One of the best displays of alum is the alum cave exhibited by the Philadelphia Salt Manufacturing Company, Philadelphia. This immense cake of alum is said to weigh nine tuns. In the same case is a large mass of cryolite, a fluoride of aluminum and sodium, chiefly imported from Greenland, this company having a monopoly of all the cryolite brought from there. They exhibit models of the Esquimaux fishing boats, and of the cabins built of blocks of ice and moss, the ice being represented in the model by blocks of wood. This company also exhibits alumina, alum lyes, chloride of calcium, and soda.

Directly opposite we see another beautiful alum cave, with its stalactites of crystals, and on either side tall monuments of concentrated alum and sulphate of alumina, while round about are large and fine crystals of nitrate of lead and other salts. These constitute the exhibit of the Tacony Chemical Works, Philadelphia.

If alum seems omnipresent in the chemical section, what shall we say of acetic acid and its salts that greet us at every turn? We have referred to it several times already in connection with other exhibits. Browning & Brothers, Philadelphia, exhibit pyroligneous acid and a series of acetates, as also dye wood and naphtha. H. J. Baker & Brothers exhibit this acid along with camphor, saltpeter, and borax. A prettier display is that of O. S. Follett, New York, of acetic acid, vinegar, chloroform, and fine large crystal masses of sugar of lead.

The Philadelphia Quartz Company make a good show of water glass, dry and in solution of various strengths, for different purposes. Its use in cleaning the cotton waste used for rubbing off machinery was forcibly illustrated by the exhibition of quantities of the waste before and after treatment with water glass.

The only exhibit of cream of tartar and argols that we saw was by the well known importers Dreyfuss & Co., New York. H. Bower, Philadelphia, exhibited the largest, if not the only, mass of crystallized ferrocyanide of potassium, also small specimens of sulphate of ammonia and the fatty acids. Savage, Keyser, & Stovell, of Philadelphia, exhibit tin salts and the mineral acids. H. D. Gray, of New York, was the only exhibitor of sulphur, which he imports and refines, our own immense sulphur deposits not yet being worked, although magnificent specimens of pure native American sulphur are to be seen in the United States Government building. When we shall be independent of Italy for our supply of sulphur is only a question of time and transportation.

Nickel salts, batteries, and specimens of nickel plating on iron, brass, and tin are exhibited here by Condit; but the display of nickel and cobalt with the ores and salts, by J. Wharton, in the metallurgical section farther north, is still more interesting.

There is no end of stale and uninteresting specialties distributed through this section, purely for advertising purposes; they are of no chemical value, although in some few cases a knowledge of chemistry has been invoked in their preparation. We refer to soaps, blacking, varnishes, perfumery, baking powders, mucilage, and printing and writing inks. The ink competition seems as lively as any, although one manufacturer claims to supply nine tenths or more of all the banks and offices, leaving a small field for other makers. Dr. J. S. C. Rowland, of Philadelphia, exhibits an indelible canceling ink which he claims has been adopted by the United States post office department. We omitted to mention last week an indelible black ink exhibited by Blackwood, John, & Co., London, under the name of jetoline. It consists of chloride of aniline, chlorate of potash, and chloride of the rare metal vanadium, and is in fact a kind of aniline black.

To return to the pharmaceutical and rarer chemicals, like those exhibited by Powers & Weightman and Rosengarten, we find in another part of the chemical section several very good displays. One of the largest, best mounted, and most interesting is that of Billings, Clapp, & Co., Boston, the manufacturers of the cinchoquinine which has been so much analyzed, and about which so many contradictory statements have been circulated. This firm exhibits two gallons of propylamine, C_3 H_7, HHN, one of those organic ammonias in which an atom of hydrogen is replaced by the propyl radical C_3 H_7, just as aniline, C_6H_5, HHN, is ammonia with one of the hydrogen atoms replaced by phenyl, C_6 H_5, the radical of carbolic acid. The chloride of propylamine is shown in large quantities, as are also the more common salts such as bromide of ammonium, citrate of iron pure protocarbonate of iron, bromide of potassium and sodium, bisulphite of soda (for making the hydrosulphite) valerianate of zinc, and other salts used in medicine.

Charles T. White & Co., of New York, make a good exhibit of pharmaceutical chemicals, including some very fine crystals of strychnin, valerianate of quinine, and other alkaloids. Charles Pfizer & Co., also of this city, exhibit pharmaceutical and chemical products in large and showy quantities, including refined borax and camphor. Kurlbaum & Co., of Philadelphia, exhibit camphor, cream of tartar, chloroform, mercurial compounds, and the essential oils. The finest specimen of crystallized monobromated