ogeneous collection of ornaments and trophies with which it is bedecked.

The head is of heroic size, the face only being made of wood. This is strongly carved, having a prominent nose, and wide, firm mouth. The eyes are formed by excavating oval depressions, and setting in pieces of shell. First, oval pieces of white clam-shell are inserted, which represent the whites of the eyes: upon these, small circular bits of dark shell are cemented, forming the pupils. Locks of hair have been set in beneath the shell, the ends of which project, representing the lashes of the eye. The wooden part of the mask is flat behind; but the head has been neatly rounded out by a hemispherical bundle of dried leaves, which is held in place by an open net of twisted cords.

Besides this, a great variety of articles have been attached to the margin of the mask by means of five pairs of perforations. Upon the crown a large bunch of brilliantly colored feathers had been fixed: behind this, extending across the top of the head, is a long pouch of coarse white cloth, in which a great number of articles had been placed, — little packages of beans and seeds, rolls of cloth of different colors and textures, minute bundles of wool and flax, bits of copper and earth carefully wrapped in husks, bundles of feathers, etc. Encircling the forehead are long, narrow bands or sashes, one of which is white, the others having figures woven in brilliant colors. The ends of these hang down at the sides of the face.

Attached to the left side of the mask by long stout cords is a pouch resembling a tobacco-bag, about six inches square, the fabric of which resembles a coarse sail-cloth: attached to the lower part of this is a fringe of long, heavy cords. From the opposite side of the head, a net was suspended in which had been placed a variety of objects, — a sling made of cords very skilfully constructed; bundles of flax and cords; small nets containing beans, gourd-seeds, and other articles; copper fish-hooks still attached to the lines, which are wound about a bit of corn-stalk or cane; neatly made sinkers of dark slate wrapped in corn-husks; together with many other curious relics.

These articles were doubtless the property of the departed, so placed in accordance with the established customs of the race to which he belonged. The mask-head was probably in itself an object of much consideration; although we are at a loss to determine its exact use by the living, or its significance as a companion of the dead.

W. H. HOLMES.

## *MEETING OF THE CIVIL ENGINEERS AT BUFFALO.*

THE annual convention of the American society of civil engineers was held in Buffalo, June 10–13, and will be remembered by all who attended as one of the most successful in the history of the society. A spe-

cial train, courteously tendered by the management of the New York, West-Shore, and Buffalo railroad, left New York on the morning of June 9, carrying a large number of members from the eastern states, while many more came from other directions; the total number present, including guests, being between three and four hundred. At the opening meeting, on Tuesday, June 10, the reading of papers was begun; and many of great interest were presented at this and the following sessions. Mr. James B. Francis of Lowell, past president of the society, presented one describing some tests, made under his direction, to determine the efficiency of a Humphrey turbine water-wheel of large power (about 275-horse power), lately put into one of the mills of the Tremont and Suffolk manufacturing company at Lowell. The test showed an efficiency of about eighty-two per cent, which was considered satisfactory. Mr. Francis also presented a paper giving the results of a large number of experiments, which he had made in connection with this turbine test, to determine the coefficients of the formula for the flow of water over a submerged weir, or one in which the level of the water on the down-stream side is above the crest of the weir. Experiments on weirs of this kind have not been very numerous, especially with large quantities of water. The maximum quantity in Mr. Francis's experiments had been somewhat over two hundred cubic feet per second, and his paper gave the proper constants to be used in the ordinary formula for cases of this kind. His results must be considered as of great value, and as forming a worthy supplement to his former extended experiments on ordinary weirs.

Mr. A. M. Wellington read a paper on a line of railroad which he had located from Vera Cruz to the City of Mexico, comparing it with an existing line built some time ago. Although the elevation surmounted was the same in both cases (about 8,050 feet), the old line had a grade of 216 feet per mile for most of the distance, and had cost over three times the estimated cost of the new line, which had a continuous grade of 106 feet to the mile for a distance of about eighty miles, broken in but one place by a level stretch of half a mile, at an important station. This is probably the longest unbroken grade in the world. The maximum curvature was about the same in both lines, though rather sharper in the case of the new line, where the smallest radius was about 300 feet.

Mr. P. C. Asserson of Norfolk gave the results of his experiments in endeavoring to protect wood from the ravages of the Teredo navalis. He had tried some twenty different preservatives, both paints and substances to be injected into the wood, and had found nothing effective except creosote. Leaving the bark on piles, or incasing them in a sheathing of plank, was also stated to be effectual, as the Teredo could not cross a seam, and therefore could not penetrate the pile under these circumstances. In the discussion on this paper it was stated that covering piles with yellow metal had proved effectual, as the animal would not pursue its ravages within the distance so covered, even though it might be able to gain access to the wood on either side of the metal. It was therefore only necessary to cover piles with the metal down to the mud bottom, or a little farther. Driving small-headed nails thickly all over the surface of the pile was also said to have preserved piles for over seventy years, by preventing the entrance and growth of the animal.

Mr. Robert Moore of St. Louis described the landing arrangements for a car-ferry across the Mississippi River at St. Louis. The ordinary range of the water being about thirty-one feet, and the current very swift, the problem had presented some difficulty; and it had been necessary to protect the bank of the river, for some distance above and below, by willow mattresses sunk with stone in the ordinary way. The details of the arrangement adopted were shown by drawings.

Mr. D. Fitzgerald of Boston read a paper on the rainfall at Lake Cochituate, discussing the results of observations extending from 1852 to the present time. His results differ somewhat from those obtained by Mr. Schott, in his work on rainfall, published among the Smithsonian contributions, on account of the longer period at the command of Mr. Fitzgerald.

The application of the water-power of Niagara to the generation of electricity was the subject of an interesting paper by Mr. Benjamin Rhodes of Niagara Falls. He estimated the average power as seven million horse-power, on the total fall, including the rapids above, of two hundred and thirty feet; and the cost of the plant necessary to utilize this power, transform it into electricity, and transmit it anywhere within a radius of five hundred miles, was placed at five thousand million dollars. About six thousand horse-power is now in use at the falls, the greater part on the hydraulic canal, which takes the water from the extreme head of the rapids, and discharges it below the falls, using it on the wheels under heads of from fifty to a hundred feet. Water-power has been used to run a Brush dynamo since 1879, for lighting the grounds of Prospect Park. The speaker calculated that there would be a saving per light, at the city of Buffalo, by using the Niagara water-power instead of steam-power, of forty dollars per annum. The well-known advantages of the water-power at Niagara, as regards steadiness, etc., were dwelt upon.

Capt. O. E. Micharles, U.S.A., discussed the heavy-gun question, taking the ground that it would be better for the government to make large contracts with private establishments for the manufacture of heavy cannon, than to establish a government foundry for their manufacture, and advocating the employment of a Rodman gun, cast from open-hearth steel, annealed from the interior.

The most important business action taken by the society was a vote to memorialize the president of the United States, asking that the president of the society be appointed a member of the international conference to meet at Washington in October next, to fix and determine a prime meridian from which time should be reckoned. The committee on standard

time reported that a great majority of those whose opinions had been sought had expressed themselves in favor of a consecutive numbering of the hours of the day from 1 to 24.

At the evening session on Tuesday, June 10, the society were welcomed to Buffalo by the city officers; and the president of the society, Mr. D. J. Whittemore, delivered the annual address. On Wednesday an excursion was made to the so-called Tifft farm, where improvements are being made, designed to facilitate the transfer of coal from the railroads to the lake vessels. They will consist in an extensive system of docks, excavated on the mainland, together with coal-pockets and other structures for loading into the boats. Near by, an extensive storage-place for coal is provided; the loaded cars being drawn up a long incline of trestle-work, from which they descend by gravity after unloading their coal beneath. The mountain of coal thus formed is penetrated by a wooden tunnel eight feet square, into which cars are run and loaded through sliding doors, when the coal is to be transported to the pockets at the docks. At this place a hundred and twenty thousand tons of coal may be stored during the season, when navigation is closed, or from Dec. 1 to May 1. Although the dock frontage of Buffalo already measures five miles, the Tifft farm improvements will add eight miles more, at an estimated cost of eighty dollars per foot front. The unloading and loading facilities are already so complete at Buffalo, that a two-thousand ton vessel may arrive loaded with grain, and depart loaded with coal, within eighteen hours. There is a growing demand, however, for greater capacity as the lake traffic increases.

Thursday was devoted to an excursion to Niagara Falls and the new cantilever bridge, and on Friday the reading of papers was resumed. Mr. E. L. Corthell, chief engineer of the West-Shore railroad, and formerly in charge of the works at the mouth of the Mississippi, read a paper on the South-Pass jetties, dwelling chiefly upon the lessons which had been taught by their construction. The channel is now nearly straight for two and a quarter miles, and the depth is continually increasing. A survey made last May showed the least depth through the channel to be forty feet except in a few places, and everywhere much in excess of that guaranteed by the contract. Moreover, the jetties had now become thoroughly embedded in the sand, which had become firmly packed into all their interstices, so that their permanence was assured. There was, further, no advance of the bar toward the gulf, although a rapid advance had been predicted by many engineers. The effect on commerce had been very great, and there was now no delay whatever at the mouth of the river; so that New Orleans might be said to have a better channel from the ocean than any other city in America. The results of the work had clearly proved the advantage of a concentration of the force of the current, and had shown that the river could obtain what it could maintain, and that it could not maintain what it could not obtain. Altogether, the result of the works had been in every way satisfactory.

A paper by Mr. Benjamin Reese, on the management of forces engaged in railroad-track repairs, was listened to with evident appreciation by the railroad engineers present.

Mr. E. Sweet, state engineer of New York, contributed a paper on the enlargement of the Erie Canal, arguing, that, in order to be a proper highway, the canal should be large enough to carry the largest lake vessels, or eighteen feet deep and a hundred feet wide on the bottom, with locks four hundred and fifty feet long and sixty feet wide. The cost of the improvements proposed, which would involve a relocation of part of the canal, and the canalization by locks and dams of the Mohawk River, as well as some works on the Hudson, was estimated at from a hundred and twenty-five to a hundred and fifty million dollars; while the probable tonnage was placed at twenty to twenty-five million tons per annum. Thirty years ago the Erie Canal carried nine-tenths of all the traffic between Buffalo and New York, while now it carries less than one-fifth of the total. The paper was followed by one prepared by Capt. Drake of Buffalo, urging the importance and the cheapness of water-carriage.

Mr. J. J. R. Croes of New York read a paper, comparing the water-rates in a large number of cities and towns. Assuming the conditions of a dwelling for seven persons, he found that the rates would vary in different towns from five dollars to seventy-two dollars per annum, and that they were by no means in proportion to the cost of the works. The average rates in different parts of the country were compared, and the advantages of measuring the water delivered to consumers were discussed.

The remainder of the session was devoted to a discussion on the subject of steel, and a comparison between steel and iron for structural purposes; but, on account of the want of time, a number of papers were read by title only.

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## *RECENT OBSERVATIONS ON EXPLOSIVE AGENTS.*

JUDGING from the many attempts made to vary the form and composition of 'explosive gelatine,' this method of using nitroglycerine is meeting with favor. As invented by Nobel, it is made by dissolving seven parts of soluble gun-cotton in ninety-three parts of nitroglycerine at a temperature of 35° C. Under the circumstances, the whole mass gelatinizes, and, when cool, is quite a stiff and translucent jelly, insoluble in water, quite insensible to shocks, and holding its nitroglycerine firmly. Unfortunately its stability has become a matter of doubt. Hill, Gen. Abbot, and others have cited instances of spontaneous decomposition during storage; and the writer has recently described the circumstances attending a similar case occurring under his own observation. The cause is believed to exist in the lack of uniformity of composition of the gun-cotton, and the failure to remove from it the last traces of free acid. It is hoped that these difficulties may be overcome.