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Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as American Association meeting, Bicycle tires, Bottle labeling machine, Bread, raising a, Bull teasing at Arles, Blast, large, Church, Memorial, Borki, Russia, Congressional Library, sculpture, Cycling, remarkable, Cottonseed press, Dynamite gun trials, Electrically heated quilt, Electric cableway for logging and towing, Electric coherer, Electric current discharger, Gauduxer's, Electric equipment, a steamer's, Firearms, Favre's sight for, Flywheels, inertia of, Glass, ornamenting with aluminum, Gun tests, pneumatic, Inventions recently patented, Iron parts shrunk on removal of scale, Knowledge, physical basis of, Life guard for street railway cars, Beals, Mars, a strange light on, Niagara and the great lakes, Notes and queries, Nothing wasted in Paris, Oil fuel, Patents granted, weekly record, Plague, the, in China, Pole, tall, erecting a (6198), Piperazine, Spiegeleisen, manufacture of, Stereopticon, the (6201), Sunflower paper, Thermometer for closed spaces, recording, Water, some peculiarities of, Water tanks, cement, Water wheel, a new impulse, Woodwork vs. flame.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 974.

For the Week Ending September 1, 1894.

Price 10 cents. For sale by all newsdealers.

Table listing articles such as I. ARCHAEOLOGY.—Greek Papyri in Egypt.—Egypt as a field for the discovery of Greek historical documents, Progress of the Excavations at Delphi.—Grecian antiquities and remarkable finds described, Roman Remains at Bath, England.—Proposed reviving of the ancient Roman bath in the city of Bath.—I illustration, II. ARCHITECTURE.—The New Protestant Cathedral, Berlin.—A proposed cathedral.—The accepted design.—I illustration, III. ASTRONOMY.—A Prolonged Sunspot Minimum.—By E. WALTER MAUNDER.—The history of sunspots and of their cycles as far as recorded by astronomers, IV. BIOGRAPHY.—Sir Joshua Reynolds.—The great artist.—His life and achievements and character of his work, V. CHEMISTRY.—New Cellulose Derivatives.—By CLAYTON BEADLE.—A new class of valuable cellulose derivatives and their commercial production and uses.—A most exhaustive paper, VI. FINANCE.—The Cost of the New Navy.—An interesting summary of what the U. S. navy has cost, GEOGRAPHY.—The Gulf Stream.—The origin, action, and extent of the great river of the ocean, MINERAL ENGINEERING.—Wind Motors.—Ancient and Modern.—By SYDNEY H. HOLLANDS.—A popular and graphic windmills of past and present times, with recent illustrations.—I illustration, VII.—The Use of India Rubber and Gutta Percha in Surgery.—By A. G. DAVIS.—Surgical instruments made of these materials.—Their place in medical, surgical, and dental practice, VIII.—A Visit to the Slate Quarries of Angers.—A picturesque scene.—The excavation of fine slate.—Description of the quarry and of the work done in it.—I illustration, Graduate and Post-graduate Engineering Degrees, Paestum, Amalfi, Sorrento.—The interesting relics of ancient Rome found in modern Italy.—Vivid descriptions of scenes in the vicinity of these places.—2 illustrations, XI. NATURAL HISTORY.—Two Curious Animals in the Dresden Zoological Garden.—An Asiatic dog and the genet.—Their near relationship.—2 illustrations, XII. NAVIGATION.—Great Circle Sailing.—By T. MACKENZIE.—A simple method of calculating distance in great circles sailing, with formulae, XIII. ORNITHOLOGY.—The Nandu.—An Ornithological Sketch.—By ADOLF ERICH BOECKING.—Ostriches of the Western Hemisphere and their habits and place in the natural scale, XIV. PHOTOGRAPHY.—Apparatus for Transforming Photographs.—An amusing phase of photography, applicable for amateurs.—2 illustrations, XV. SEISMOLOGY.—The Earthquake in Turkey.—Recent shocks felt in Turkey, with destructive effects.—1 illustration, XVI. TECHNOLOGY.—Pneumatic Tires and Reclaimed Rubber.—A business of immense development.—The reclamation of vulcanized rubber, Some Differences Between the English and American Plumber.—Comparison of the old and new country tradesmen and their different conditions.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

It is remarkable that 488 members of the Association for the Advancement of Science, and perhaps nearly as many more belonging to affiliated societies, should assemble in midsummer for a week or two of hard work, while the rest of society is having its "silly season." Most of these visitors, together with resident people of culture, have heard, in this short period, twelve public lectures, five lengthy reports of special committees, and, in the sections, 177 papers, together with the learned discussions excited by them; besides many other papers read in the kindred societies.

The local committees having in charge the entertainment of this host of searchers after truth did their part nobly, and those managing the delightful excursions to Long Branch, Cold Spring Harbor, Glen Island, West Point, the White Mountains, and elsewhere were perfectly successful. But especial mention should be made of the work done by the press committee, of which Mr. H. F. Gunnison was chairman. This difficult task was never better done in the history of the association. Duplicate typewritten copies of all the more important papers were supplied in advance to reporters; and the result was a very thorough publication of the proceedings. We observe with disapproval that several influential dailies have embellished their columns with cartoons that were doubtless meant merely for fun, but the tendency of which is to bring into ridicule the noblest pursuits in which men can engage.

The A. A. S. has indeed felt the need of a more systematic way of making its results accessible for the reading public. And after much discussion, and with some hesitation, they decided to try the experiment this year of adopting the journal Science as its medium of publication. They chose five associate editors to work without compensation, and appropriated \$750, on condition that as many as 120 pages of Science were open for them during the year. Certain other safeguards were thrown up, and the council appeared to be sanguine as to the issue of the trial. The wisdom of such an experiment remains to be demonstrated.

The next meeting of the A. A. S. will be held at San Francisco, if railroad concessions can be secured, and will probably come a month earlier than this year for certain reasons. The invitation comes heartily from the city authorities and several California universities and scientific societies, and gains force from the fact that the association has never yet met west of the Rocky Mountains.

A remarkably strong corps of officers was elected for the ensuing year: President, Prof. E. W. Morley, of Cleveland, O.; Permanent Secretary, Prof. F. W. Putnam, of Salem, Mass.; General Secretary, Dr. J. L. Howe, of Louisville, Ky.; Treasurer, Mr. R. S. Woodward, of New York City. The sections also are officered by some of our most distinguished scientists.

From the mass of valuable material put at our disposal by the agency of our special contributor, Dr. Horace C. Hovey, we have selected several of the more striking addresses and papers for publication, aware that much of what is omitted equals, or possibly may excel, what is accepted. It is somewhat embarrassing to have the privilege of choosing from among 200 communications, all of which are meritorious and interesting. We have already published some of these, and others will appear shortly. Indeed, it may be expected that the stimulus given to the public by such a series of scientific meetings will be felt for many months to come.

The evening addresses, given in the elegant Hall of the Fine Arts, whose walls were hung with beautiful paintings loaned for the occasion, drew much larger audiences than the papers read during the day in the lecture rooms of the institutes.

One of these was a brilliant address by the celebrated traveler, Paul Du Chaillu, who, after having explored Africa, has of late turned his attention to the antiquities found along the Baltic in the land of the Norsemen. He claimed that history had been falsified concerning the Vikings and their degree of civilization. They were not only stronger than the people whom they conquered, but were in almost every way their superiors. They made some of the largest and finest ships that ever floated on the seas. Some of these vessels rivaled our grandest modern ocean steamers in size. The fleet of the Vikings included, at one time, 10,000 vessels, on board of which were fully 1,000,000 seamen and soldiers. On land the Norsemen had superb mansions, magnificent temples and costly mausoleums. They were governed by a parliament, and their domestic life was pure and refined. As one of the results of his long and patient study of the Icelandic sagas, Du Chaillu expressed the positive conviction that the Norsemen were the first discoverers of America, nearly 500 years before it was rediscovered by Columbus.

Prof. E. D. Cope addressed the people one evening on "The Relation of Human Structure and Physiognomy to those of the other Mammalia." In other words, he compared men with monkeys. Or as one of the dailies wittily said, "He told who his ancestors

were." He pointed out the error of imagining all monkeys to be alike. The lemurs inhabited trees, while baboons were terrestrial in their habits. Peculiarities in dentition were important. The lemurs and many other monkeys had the same dental processes as the quadrupeds, while the anthropoid apes lost these peculiarities. Human skeletons were also diversified. Similarities were pointed out between the bones of certain types of men and the great apes. The Bushmen were at the bottom of mankind, and above them the other Africans. Then came the yellow, brown and white races, with all sorts of intermediate types. Primitive man, from a zoological point of view, did not widely differ from modern man; but from a human point of view he was widely different from his descendants.

One of the most instructive addresses was that before the chemists, by Prof. T. H. Norton, concerning what he styled "The Battle with Fire," in which he gave an exhaustive review of what had been done by science to prevent conflagrations. After describing some of the great fires mentioned in history, he stated that the total annual loss of insured property by fire is \$200,000,000, of which nearly one-half is in the United States. About 85 per cent of the 15,000 fires that occur annually can be traced to preventable causes. And aside from our direct losses by this means our fire departments cost us many millions of dollars every year. Among agencies for preventing this destructive waste, water still holds the first place. Chemical fire engines are charged with carbon dioxide, though other substances have also been recommended. Hand grenades or glass bottles, charged with carbonated water or the salts of ammonium, are practically less useful than they might be, because so often thrown in a manner that fails to break them. Various extinguishing powders were also described. Methods of making buildings, fabrics, and paper fireproof have been devised. A list of fire protectives was given, and hints offered as to the lines along which further investigations might be successful.

Major Jed Hotchkiss, of Staunton, Va., was appointed by the executive committee of the World's Fair to prepare a report on the progress made by geology during the period from the Centennial Exposition to the present time, and he gave an outline of his plan. He intends to prepare two geological maps, one showing what was known of the earth's formations and rocks in 1876, and the other what is now known. For this work he is well fitted by his wide range of general information, and by his experience in practical map making. He made the military maps for General Lee during the late war, and has devoted his whole life to science. He is now in correspondence with geological authorities in all parts of the world. Capable men have been requested each to prepare a chapter on the State, province, or country they represent, and the result will be anticipated with great interest by the scientific public.

In this connection the Atlas Folio, issued by the United States Geological Survey, was described by Mr. W. F. Maxwell. This embodies the final maps of the survey, showing the topography, geology, mines, etc., of the areas covered, with accompanying descriptions in terms popular, rather than technical, for the benefit of the public. This work has involved much expense, and is the finest specimen of geological lithography known. It is the plan of the director of the survey to issue these beautiful charts gratis to leading newspapers and to people of scientific tastes.

Aluminum violins were explained by Mr. Alfred Springer in a paper that attracted much attention. He said that sounding boards of aluminum were analogous to those of wood, in that they did not produce secondary tones discordant to the prime tones. Among the difficulties encountered was the fact that the plates had to be riveted instead of soldered. He overcame uneven thickness of parts of the violin by sheet metal ribbed and arched. It was claimed that in aluminum instruments there was not the uncertainty and lack of individuality found in those of wood, nor was there any liability to warp or crack. An aluminum violin was produced and played on to illustrate his paper. The tones were very full and resonant, and the opinion of experts was that it would be a great addition to orchestral music, but lacked the peculiarities demanded in the best solo performances.

"Salt in Savagery" was the title of a paper read by Mr. Frank Cushing, of the National Bureau of Ethnology. He referred to the universal liking for salt among Indians. The Zunis believe that salt came from the sun. It attracted the water and made the sea. They regarded it as intimately connected with the mystery of life. The salt goddess, in their mythology, is the daughter of the ocean, and stands related to all other powers. The desire for salt, more than anything else, led the cliff dwellers to forsake their caves and descend to pueblos in the plains. He advanced the original idea that man's dispersion over the habitable globe was largely influenced by his desire for salt. Coming down from rocky cliffs and arboreal retreats, he found at the seashore the only place where life could be supported. Human migra-

tions can be traced everywhere by this universal demand for salt.

Mr. R. G. Haliburton discussed the survival of dwarf races, by many regarded as myths, even as recently as 1875. But their existence in various parts of the world has been proved. The speaker discovered, in 1888, a diminutive race on the border of Honduras, whose height was about four feet, whose occupation was making Panama hats, whose weapons were poisoned arrows shot from blowpipes. Blancaneaux was the only white man who had ever lived among them, and he gave them a high character, contrary to the statements made by the soldiers of Guatemala. Dwarfs are represented in Yucatan sculpture. Some of the lake islands of Uruguay are said to be inhabited by pygmies.

Among the many papers worthy of notice were those of Hon. G. G. Hubbard on "The Geography of China, Corea and Japan;" on "Graduate and Post-graduate Degrees," by Dr. R. H. Thurston, of Cornell University; on "The Education of Engineers," by Prof. F. O. Marvin, of the University of Kansas; on "The Seat of Consciousness," by Dr. Paul Carus, the editor of the Open Court and The Monist; on "Various Phenomena of Lightning," by Messrs. McAdie, Rolliston, and Hodges; "Concerning Certain Features of California Geology," by Prof. J. P. Smith, of the Stanford University; on the "Water Resources of the United States," by Maj. J. W. Powell; and on "European Water Supplies," by Prof. W. P. Mason.

### NIAGARA AND THE GREAT LAKES.

For the last fifteen years our geologists have given attention to certain problems connected with the drainage of the chain of great American lakes, and incidentally with the probable age of the gorge of Niagara. A week was devoted to them at the Buffalo meeting of the A. A. A. S., including an exploration of Niagara River by a party of thirty geologists. The conclusion then arrived at was that while the lower lakes may have always been drained through the valley of the St. Lawrence, the upper lakes had probably found an outlet at one time by way of the Mississippi valley; and that the whole chain might do so again, should there ever be a barrier, natural or artificial, across the inlet of the Niagara near Buffalo. It was thought that a dam 25 feet high might bring about this result and cause a grander river than any now on the continent to flow out from Lake Michigan near the city of Chicago. As to the age of the Niagara gorge, the conclusion was that 7,500 years met all requirements; while a few deemed 3,500 sufficient. As the age of Niagara has been regarded as a kind of geological yardstick for measuring off the age of the human race, importance was attached to the foregoing conclusions. Geologists, however, have since then been making further study of the problems indicated. And while some of them adhere to the ground just stated, others materially modify their opinions. This fact gave special interest to three papers read at the Brooklyn meeting of A. A. A. S.

#### 1. ON THE GEOLOGICAL SURVEY OF THE GREAT LAKES.

In this paper Prof. J. W. Spencer stated the case and reported progress. The story of these remarkable lakes tells of a former high continental elevation. The present bottom of Ontario is 491 feet below sea level; of Huron, 168 feet; of Michigan, 282 feet; and of Superior, 400 feet. If these were once erosion valleys, they must have been at an altitude such as to allow their drainage to flow down to the sea. In keeping with this theory we find that the lower St. Lawrence River is a submerged channel, increasing from a depth of 1,200 feet to 1,800 feet, and with deep tributary canyons. The submerged escarpments of the existing lake basins were described, proving buried valleys that connected them. The glaciation of the region was not in the line of these escarpments, nor do their vertical walls show signs of having been shaped by glacial action. Between the Georgian Bay and Lake Ontario lies a deeply buried valley, as found by a series of borings, through which the ancient Laurentian River must have flowed. There was a southern branch crossing the Michigan peninsula and the Huron basin, to which the name Huronian River is given. Through the Erie basin flowed a now submerged river, named the Erikan, which crossed to the great canyon at the head of Lake Ontario—the Niagara River not then being in existence. These ancient valleys were broader than the modern streams, which have made for themselves new channels, instead of reopening the old ones filled with drift.

In certain instances, indeed, the river drainage has been actually reversed. This was shown by the studies of Dr. Newberry, T. Sterry Hunt, and Mr. J. F. Carll. The theory is confirmed by recent investigations. The Susquehanna and its tributaries flowed into Lake Ontario, while the Ohio River, above Pittsburg, flowed into the Erie basin. All this system of ancient drainage was obstructed by drift, and also by the warping of the earth's surface, as shown by deserted beaches, terraces, and sea cliffs, some of which have been followed for hundreds of miles. The open water within

these contracting beaches has been named by Prof. Spencer "Warren Water," which may be regarded as the mother of all the lakes, and which at one time must have covered 200,000 square miles. When the level fell 150 feet the three highest lakes were inclosed in what might be called "Algonquin Water," while Lakes Erie and Ontario were within the "Lundy Water." A further subsidence of 300 feet brought the waters to what is termed the Iroquois level, after which episodes of movement and repose formed the modern lakes.

#### 2. DRAINAGE OF THE LAKES INTO THE MISSISSIPPI.

The highest deserted strand near Chicago is 45 feet above the lake level. According to the canal survey, the divide is 25 miles south west of Chicago, and is only 8 feet above the lake. From measurements of the sets of deserted beaches the depth to which they are depressed can be calculated. The indications are that the subsiding waters (Warren, Algonquin and Huronian) were drained through the Ottawa valley for about 24,000 years. This outlet was closed by the rim being raised so as to turn the overflow into the Erie basin, whose outlet was also affected by the same uplift, so as to drain all the upper lakes into the Mississippi valley. The subsiding of the waters lowered the lake level sufficiently to turn the volume through the Niagara. But as the terrestrial uplift of the Niagara region is about one foot and a quarter a century, it follows that, if this rate shall continue, the drainage of the upper lakes will, in about 5,000 years, be diverted back again into the valley of the Mississippi.

#### 3. HISTORY AND DURATION OF NIAGARA FALLS.

The Niagara River came into existence, according to Spencer, upon the dismemberment of the "Lundy Water," and for 1,000 years drained the Erie basin without a cascade. As the Ontario basin slowly sunk, the falls were made, until the total descent was 420 feet, there being at one time three cascades, and afterward one grand united fall. Finally the Ontario waters began to rise again and reduced the height of the falls, at first to 365 feet and then to 320 feet. Mr. Spencer computes the entire age of Niagara River at about 32,000 years. This computation is based on the rate of recession and the amount of work done in each of the episodes, as discovered in working out the history of the lakes. In 1842 Prof. James Hall made the first instrumental survey of the falls; the Coast Survey made the next, in 1875; a third was made in 1886, by Prof. R. S. Woodward; and in 1890 the last was made by Dr. A. S. Kibbe. From these four surveys the mean elongation of the gorge is 4.17 feet a year. Hitherto most of the conjectures as to the age of Niagara have been based on the rate of recession alone. In 1790 Ellicot calculated it as 55,000 years; Lyell, in 1841, lowered the estimate to 35,000; in 1886, after three surveys, Woodward reduced it to 12,000; and later still, Gilbert showed that the duration of the falls should be only about 7,000 years—though he is said to have since modified his opinions.

Spencer's method differs from others, in that he takes into consideration the changing episodes of the river as well as the rate of recession through said episodes. He denies that the buried valley of St. David, hitherto regarded as an extension of the preglacial river from the Whirlpool on, is such, and affirms it to be a branch of a buried valley outside the Niagara canyon, and much shallower than it. The rate of the modern recession has been determined under changing conditions of erosion, so that each episode has to be treated separately. First episode: Waterfall 200 feet high, volume 3-11 of the modern discharge, and gorge 11,000 feet long to the terrace of Foster's Flats; duration, 17,200 years. Second episode: River falling 420 feet in three cascades; (a) discharging only Erie waters through chasm 3,000 feet long; duration, 6,000 years; (b) drainage of all the upper lakes through chasm 7,000 feet long; duration, 4,000 years. (c) Volume as before, also descent, but in one cascade, length of narrows 4,000 feet; duration, 800 years. (d) Volume as now, and level of lower lake as at present; first stage, a local rapid, as at Johnson's Ridge, with total fall of 365 feet, work perpendicular hard; length of gorge, 5,500 feet; duration, 1,500 years; second stage, as at present, work easy; length of canyon, 6,000 feet; descent of water, 320 feet; rate of recession, 3.175 feet a year; duration, about 1,500 years.

Thus Spencer computes the age of the Falls to be 31,000 years, with 1,000 years added as the age of the river before the nativity of the Falls. He thinks the turning of the Huronian waters into the Niagara was about 8,000 years ago. He finds the amount of work done in each episode by the position of the terraces and the changing effects of erosion. The modern recession is computed from four surveys extending over 48 years, but the rate is excessive, on account of favoring conditions. The history of the great lakes must be taken into the account—as already described; and also the rate of terrestrial uplift in the Niagara region. The end of the Falls seems destined to be effected, not by erosion of the rocks, but by terrestrial deformation that shall turn the drainage of all the upper lakes back

into the Mississippi, an event which it is calculated will take place in 5,000 years, which would be before the cataract would have had time to cut its way back to Buffalo.

It should be stated, in conclusion, that Mr. Spencer's theories were but briefly discussed by the Association, and some of those who would probably take issue with them most vigorously were absent.

#### COTTON SEED OIL PRESSES WANTED.

We print in another column a letter from the Hon. James Z. George, United States Senator from Mississippi, in which he calls attention to the need of new improvements in presses for expressing the oil from cotton seeds. What is wanted is a press of moderate capacity and simple construction, which can be conveniently operated upon any ordinary cotton plantation. The advantages of such a machine are very forcibly presented by Senator George. He thinks, moreover, the inventor would be likely to reap a satisfactory reward; and as a further encouragement offers the use of appliances, power, and labor at his plantation. Nothing could be more liberal; and we have no doubt some of our ingenious readers will be able to study out and produce the desired mechanism.

#### Close of the Meetings of the American Association.

The American Association for the Advancement of Science closed its sessions, which have been held in Brooklyn, August 22. The next meeting will be held in San Francisco. The following officers were elected for the ensuing year:

President, E. W. Morley, Cleveland, O.; Vice-Presidents—mathematics and astronomy, E. S. Holden, Lick Observatory, Mount Hamilton, Cal.; physics, W. Le Conte Stevens, Troy, N. Y.; chemistry, William McMurie, Brooklyn; mechanical science and engineering, William Kent, Passaic, N. J.; geology and geography, J. Hotchkiss, Staunton, Va.; zoology, D. S. Jordan, Palo Alto, Cal.; botany, J. C. Arthur, Lafayette, Ind.; anthropology, F. H. Cushing, Washington, D. C.; economic science and statistics, B. E. Fernow, Washington, D. C.; Permanent Secretary, F. W. Putnam, Cambridge, Mass.; General Secretary, James Lewis Howe, Louisville, Ky.; Secretary of the Council, Charles R. Barnes, Morison, Wis.; Secretaries of the Sections—mathematics and astronomy, E. H. Moore, Chicago, Ill.; physics, E. Merritt, Ithaca, N. Y.; chemistry, William P. Mason, Troy, N. Y.; mechanical science and engineering, H. S. Jacoby, Ithaca, N. Y.; geology and geography, J. Perrin Smith, Palo Alto, Cal.; zoology, S. A. Forbes, Champaign, Ill.; botany, B. T. Galloway, Washington, D. C.; anthropology, William Aniter Newcombe McGee, Washington, D. C.; economic science and statistics, E. A. Rose, Palo Alto, Cal.; Treasurer, R. S. Woodward, New York.

#### Remarkable Cycling.

The recent twenty-four hours cycling race for the Cuca Cup, England, resulted in a decisive victory for F. W. Shorland, of the North Road Club. Shorland having been successful in 1892 and 1893, thus secures the cup, which is valued at 100 guineas, outright. So great was the excitement aroused by the contest, that when the race started at eight o'clock on Friday evening about 10,000 spectators were present, and of these about 6,000 remained on the Herne Hill ground throughout the night. From the very commencement of the race Shorland rode at a great pace, breaking records from eleven to fifteen miles, an extraordinary thing to do in a long distance ride, and following this up by beating all previous English records from 101 miles, and all world's records from the thirteenth hour to the finish of the race. His total was 460 miles, 1,296 yards. At the conclusion of the race the crowd swarmed all over the track, and so great was the desire to get near and congratulate the winner, that it required the services of a number of police constables to escort him safely to his dressing tent. Shorland's only rest was one of nine minutes, when he had been riding about twelve hours.

#### Trials of a Dynamite Gun.

One of the fifteen inch dynamite guns was tested at Sandy Hook, August 16. The gun is fifty feet long. After firing three dummies, two shells loaded with 300 pounds of high explosives were fired so as to drop in the main ship channel. A slight noise like a whistle was the only sound made in firing. When the projectiles struck the water, a dash of spray was visible, a moment afterward the shell exploded, throwing up water and sand to the height of four hundred feet. The concussion of the explosion could be plainly felt on shore and on vessels in the vicinity. Sandy Hook is being provided with gun lifts and breech-loading mortars, which in addition to the dynamite guns would make it well nigh impossible for a hostile vessel to enter the harbor. All ships provided that they are of any considerable draft must necessarily pass within three miles of Sandy Hook and therefore directly under the guns located at this point.