

EXPERIMENTAL ACETYLENE GAS BUOY FOR NEW YORK HARBOR.

We have been favored by Lieut.-Col. D. P. Heap, Corps of Engineers, United States Army, with the particulars of an experimental acetylene gas buoy which he has designed for river and harbor service.

The new buoy, in addition to being more powerful and economical than the electrically lighted buoys, is more reliable. If one of a chain of the latter goes wrong, all the others are affected; whereas the acetylene buoy, being an independent and self-contained unit, will not affect any other buoys by its failure.

In order to save expense in carrying out the experiment, a first-class can buoy was pressed into service and modified for the test (see accompanying engravings). A cylinder, C C, of boiler iron, closed at the bottom, but open at the top, was attached to the diaphragm, D, of the buoy and firmly supported at the lower end. In this cylinder were placed and securely fastened three tanks, T T T, containing each about twenty pounds of liquefied acetylene gas under a pressure of six hundred pounds to the square inch. These three tanks are connected by piping to the regulator, R, which reduces the pressure to that of a two-inch water column.

From the regulator a pipe leads to a Naphey burner, so placed that the flame will be in the focus of a lens lantern provided with cut glass prisms, so as to concentrate the light in a horizontal plane. The candle power of the burner is twenty-five. This is increased by the lens lantern so that the emergent beam is about two hundred and thirty candle power.

One pound of liquefied acetylene will expand to fifteen cubic feet of gas; so the charge in this buoy equals nine hundred cubic feet. As the burner consumes a little less than one cubic foot per hour, the buoy should burn continuously for at least nine hundred hours.

On October 30 the buoy was lighted and placed in the water near the north dock at the lighthouse depot. It burned continuously until November 10, when it was taken up and placed next day near Bay Ridge for convenience of examination by the Lighthouse Board. On the 12th it was replaced in its former position and continued to burn brilliantly until November 26, when the light began to grow less bright. The buoy was taken up, and an examination of the burner showed that carbon had deposited at the orifice. This was probably due to the burner being defective, as other burners of the same type had given far better results. The cost of the gas consumed in this trial was about one cent per hour, which is a remarkably low figure, especially in view of the brilliance of the light.

Experiments have also been carried out with liquefied acetylene gas for beacon lights, and it gives promise of equally good results in this direction.

The Lighthouse Board considers these tests so successful that additional and more severe experiments are to be made with an acetylene gas buoy moored near the entrance to Gedney's Channel and with an acetylene gas-lighted beacon on Romer Shoal. The same buoy will be used, such modifications being made as have been suggested by the Bay Ridge experiments.

The two principal advantages which would obtain if this method of lighting proves after extended trial to be successful and practical are, first, large reduction in first cost of gas-lighted buoys and, second, large increase in the power of the light.

TROLLEY car ambulances are to be introduced in the city of Pittsburg, running independently over all the street car tracks as called for.

The Gravehals Tunnel, Norway.

The Gravehals tunnel, on the Bergen Railway in Norway, is the longest tunnel on the North European continent, its length being about three miles sixteen hundred feet. Its cost will, however, be unusually low compared to most other tunnels, which are generally double-tracked and bricked to a considerable extent, while the Gravehals tunnel, according to the present arrangements, will not only be for a single line, but even for narrow gage, although it is hoped that the legislature will increase the vote so as to allow of the

tion of the turbines. The power from the turbines amounts to 220 effective horse power, there being two turbines of, respectively, 120 and 100 horse power. The two boring machines require 60 horse power. Some 30 to 40 horse power will be required for ventilating purposes, there being some two or three ventilators coupled, the one behind the other, so that the one delivers into the other.

Some 15 horse power will be wanted for the two electric locomotives, which are intended to replace the horses used at present for the purpose of removing the debris. There being a gradient of 2 to 5 in 1,000, the loaded wagons will almost run by themselves, the locomotives being really only wanted for the purpose of pulling back the empty trucks. The machine tools in the workshop are also worked by power from the turbines, transmitted by electricity. This takes some 15 horse power, and the dynamo for lighting purposes some 25 horse power. The smaller turbine, of 100 horse power, works the two hydraulic pumps for the boring machines. The surplus, of some 40 horse power, it is intended to use for two electric drills.

The whole installation, which has been in operation for some two or three months, works perfectly satisfactorily. The number of hands employed amounts to 125 men at the west side and 35 at the east side. Barracks have

been built for the men at both places, with shops, dairy, laundry, bath house, etc. At Opsät, the average advance per day has been about 3 feet, making some 75 feet to 80 feet a month of 25 working days. About 2 pounds to 2½ pounds of dynamite have been used for every cubic meter of rock. This is by hand boring. By machine boring an advance of 7 feet to 8 feet has been made during 24 hours on the average, but the consumption of dynamite has been three or four times as large in proportion. According to the experience at Gravehals, machine boring does not come cheaper than hand boring. The tunnel has to be ready for rails by April 12, 1903, and there is every prospect of its being ready some time before then; according to the plan, about 14,000 feet will be done from the west end—1,000 feet by hand and 13,000 feet by machine—and some 3,600 feet from the east by hand.

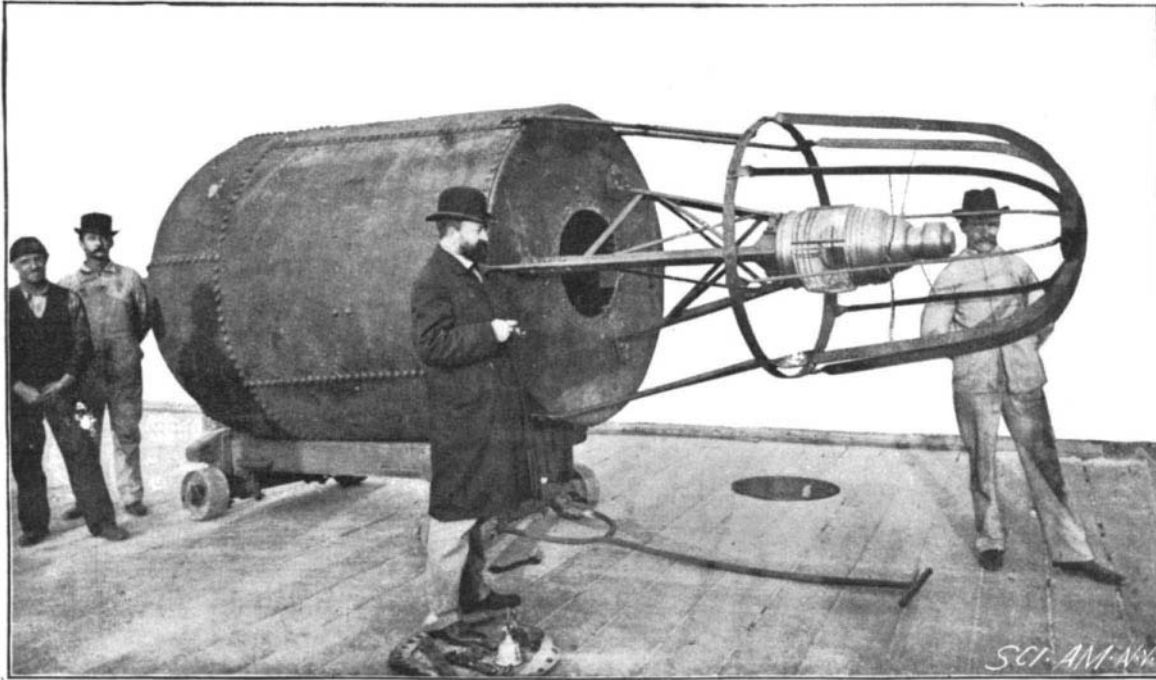
Some trouble has been experienced with the men, who will not settle down, although they can save considerably; but they rarely stay more than six months. The average pay for all piecework is 4s. 2d. per day, in addition to which the men have free lodging, light and fuel. The drillers in the rock earn some 6s. to 10s. per day. Board costs 1s. 4d. per day less for those who keep house themselves. An experiment with some 20 Italian men proved entirely unsatisfactory, and they had to be sent back.—Engineering.

A New Map of the Yukon Region.

The Coast and Geodetic Survey have prepared and will soon publish a new map which will cover the entire length of the Yukon River and most of its tributaries including the Klondike region. The scale is twenty miles to the inch. The section embraced extends from the Selwyn River, several hundred miles above Dawson City, to the mouth of the Yukon and the section is wide enough to give a fair idea of the extent and character of all the streams. It

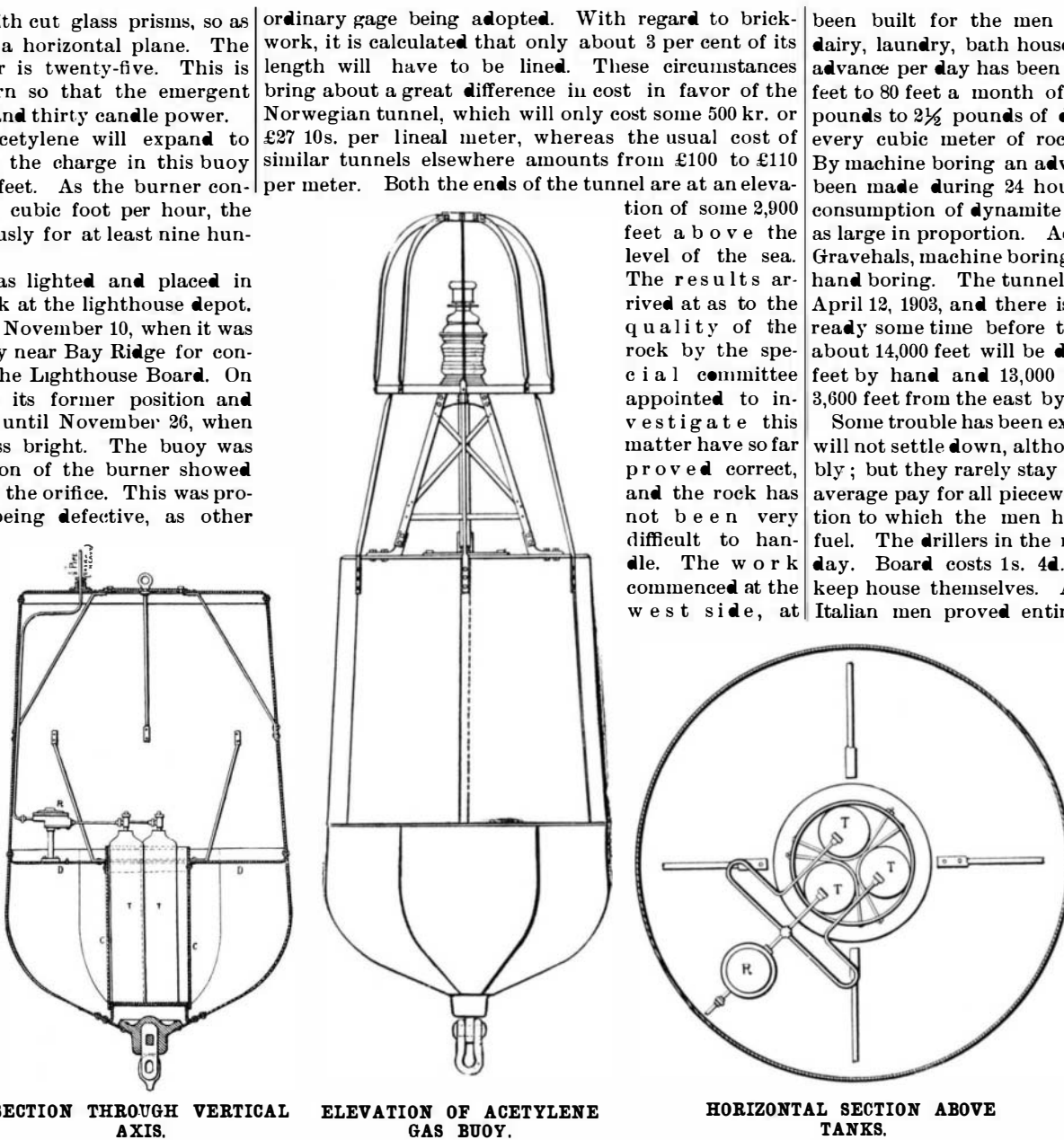
shows the location and extent of the St. Michael Military Reservation and gives the location of all towns and mining camps.

AFTER forty-eight years the Arundel Society, established to reproduce in color and popularize the masterpieces of painting, has come to an end, the improved and cheapened methods of reproduction having made its work unnecessary. Isochromatic photography has been one of the most powerful factors in rendering work of this nature obsolete.



ACETYLENE GAS BUOY FOR NEW YORK HARBOR.

Light, 230 candle power; capacity, 900 hours; cost, one cent per hour.



SECTION THROUGH VERTICAL AXIS.

ELEVATION OF ACETYLENE GAS BUOY.

HORIZONTAL SECTION ABOVE TANKS.

ordinary gage being adopted. With regard to brickwork, it is calculated that only about 3 per cent of its length will have to be lined. These circumstances bring about a great difference in cost in favor of the Norwegian tunnel, which will only cost some 500 kr. or £27 10s. per lineal meter, whereas the usual cost of similar tunnels elsewhere amounts from £100 to £110 per meter. Both the ends of the tunnel are at an elevation of some 2,900 feet above the level of the sea. The results arrived at as to the quality of the rock by the special committee appointed to investigate this matter have so far proved correct, and the rock has not been very difficult to handle. The work commenced at the west side, at

Opsät, in October, 1895. The work was, through the whole of 1896, carried on by hand boring, the necessary preliminary investigations as to the employment of water power not having been completed.

In order to procure water for the turbines, it was necessary to construct a reservoir on the mountain itself, and fears were entertained that the water would be so cold that it would freeze before it reached the turbines, even if the pipes were well protected. These fears were, however, dispelled, as the water's temperature never fell below 0° 5' C. at the spot intended for the installa-

Science Notes.

In investigating the properties of certain substances whose critical point had not been definitely ascertained, Messrs. A. Leduc and P. Sacerdote made use of an original method. They took the critical point to be that at which light ceases to be diffracted by the surface of any as yet unvolatilized liquid. By this method they were able to calculate their results to within 0.5° Centigrade and one atmosphere.—Revue Scientifique.

A number of Swiss lakes were recently sounded, the results being as below:

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| Lake Langensee..... | 1,186 feet. |
| Lake of Geneva..... | 1,007 " |
| Lake of Brienz..... | 848 " |
| Lake of Lucerne..... | 695 " |
| Zug Lake..... | 643 " |
| Lake of Zurich..... | 464 " |

—Revue Scientifique.

London fog absorbs 11.1 per cent of the luminous rays from an ordinary gas flame, while 20.8 per cent of the light from an incandescent mantle are lost in it. This is of course due to the fact that the first mentioned light contains far more red rays than the other, and that fog permits the passage of red rays to the exclusion of the blue is evident from the deep red color which the sun assumes when seen through mist.—Cosmos.

In the light of the recent researches on the oxydases recently recorded before the Académie des Sciences and the influence of manganese on vital oxidation, it is interesting to find that Guérin states that this metal is universally present as an organic compound in the ligneous tissues of trees. If sawdust is treated with feebly alkaline water and the extract is acidulated with hydrochloric acid, a precipitate will be obtained which, when washed with acid water and burned, is found to contain no iron, but 0.4 per cent of manganese and 4.6 per cent of nitrogen.—Comptes Rendus.

A Parliamentary return shows that the total number of visitors to the British Museum in the year 1896 amounted to 581,906, the highest number reached since 1890. This increase is partly accounted for by the admission of visitors on Sunday afternoons since May 17, 30,136 persons having been thus admitted. On the other hand, the number of evening visitors has further diminished since 1895 to 29,769. The total number of visits of students to the reading room during the year was 191,363, being 3,600 less than that of 1895, which again was lower than that of 1894 by 8,000. This diminution of numbers may perhaps, in some degree, be accounted for by the growth of local libraries in the metropolis, which have satisfied the requirements of students who would otherwise have had recourse to the British Museum. The daily average was about 630. The number of visitors to the Natural History Museum during 1896 was 417,033 on week days and 36,923 on Sundays, making a total of 453,956, as compared with 446,737 (on week days only) in the year 1895. The average attendance for all open days, including Sundays, during the year was 1,316; that for week days only, 1,336, as compared with 1,436 in 1895.

An optical device for the intensification of photographic pictures is described by Lord Rayleigh in the Philosophical Magazine for September. Photographers often obtain negatives which are so thin that intensification by chemical processes is insufficient to bring out any effective contrast between the transparent and opaque parts. The method devised by Lord Rayleigh is purely a physical one, and it may be described as a means of using a weak negative twice over. It is well known that by placing a feeble transparency upon a sheet of white paper, the picture becomes clearly visible, even though nothing can be seen when the transparency is viewed by holding it up to the light. Through the transparent parts the paper is seen with but little loss of brilliancy, while the opaque parts act, as it were, twice over, once before the light reaches the paper and once again after reflection on its way to the eye. This is the principle of Lord Rayleigh's method. Instead of the paper, a flat polished reflector is used, the film side of the negative being placed in close contact with it. On the other side of the negative, and fairly close to it, is a condensing lens, which gives parallelism to the rays from the candle used as a source of illumination. The candle is placed just alongside of the copying lens. The light from it passes through the condensing lens, and falls as a parallel beam upon the negative. After reflection, the light again traverses the lens, and forms an image of the candle centered upon the photographic copying lens. An optically intensified positive is thus obtained, and by copying it in the same way in the camera a negative with more pronounced contrast than the original may be made. To obtain satisfactory results, the false light reflected by the optical surfaces employed must be eliminated. In the case of the condensing lens the difficulty is overcome by giving the lens a slight slope with reference to the face of the negative. The false light reflected from the glass face of the negative to be copied may be got rid of by fixing a wedge-shaped glass plate to the glass side of the negative by means of fluid turpentine.

The Treasures of a Scrap Pile.

A scrap pile, if properly exploited, is not without its latent treasures. The Industrial World calls attention to the fact of the Baltimore & Ohio Railroad erecting a pile driver from old cast away iron. It says:

"The particular scrap pile from which the pile driver was evolved was recently enriched by the addition of the remains of the old bridge over the Muskingum River at Zanesville, which was taken down and replaced by one of modern design. In this increment was seen the opportunity for building a much needed pile driver, and the order was accordingly issued. Not a single dollar's worth of new material was ordered, except the sills of the platform, which were particularly heavy, and the hoisting engine and boiler. The castings required were made from the cast iron columns of the old bridge, with the addition of enough pig iron to insure a good quality of metal. The trucks were a pair of second-hand ones formerly used under a low flat car, put in good condition. The platform was built after the style of a flat car heavily braced. It is 40 feet long over the end sills and is supported by ten longitudinal sills. The center and intermediate sills are 5 by 9 inches, and the side sills are composed of two double sills 6 by 12 inches, spaced about 1 inch apart and trussed, with 1 inch rods on 6 inch queen posts. The whole floor is well trussed with 1½ inch rods on 12 inch queen posts, fastened to 8 inch tie timbers. Underneath is a capacious tool box. The body and truck bolsters are of the combination type, with six fitch plates ¾ inch thick, both bolsters being extended beyond the body for convenience in blocking and steadying the machine while at work. The hammer weighs 2,800 pounds and has a total fall of 38 feet. The superstructure is pivoted on a carriage that is made to travel the full length of the platform by power, so that the driver can be turned in a complete circle at any point on the platform by power from the engine. A cabin of substantial design frame with angle iron protects the engine and operator from the weather. The leads can be taken in and stowed in a longitudinal position for transportation by means of a jointed brace, using the hammer as a counterweight."

A New Developer—Diamidoresorcine.

This is a new developer derived from aromatic series and christened with an English name. Ortol is one to which MM. Lumiere and Leyewetz have already given considerable attention. The properties of this developer are essentially the same as those of amidol, but with some additional qualities. It can, like amidol, be put up in powdered form and be easily dissolved when wanted.

One of its advantages over amidol is that its action may be considerably retarded by bromide of potassium, which allows, to a certain extent, the correction of any errors due to over-exposure.

The following is the formula:

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| Water .. | 100 grammes. |
| Anhydrous sulphite soda..... | 3 " |
| Chlorhydrate diamidoresorcine..... | 1 " |

If the proportion of the diamidoresorcine is increased or diminished, the reducing power is lessened and the image lacks vigor in both cases.

By increasing the quantity of sodium sulphite the reducing or developing power is proportionately increased, 10 grammes of sodium sulphite being the limit, however. An excess of sulphite beyond the amount mentioned is liable to produce fog. The solution slowly changes; after eight days its reducing power is considerably weaker, but as has been previously mentioned, its rapid solubility permits the developer to be quickly prepared and thereby renders the keeping of a stock solution on hand unnecessary.—Paris Photographique Gazette.

A Word to Mail Subscribers.

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Recent Archaeological News.

Basle, Switzerland, is celebrating the four hundredth anniversary of Hans Holbein's death by an exhibition of his paintings and drawings, to which other Swiss museums have contributed.

While making some repairs to Heidelberg Castle recently, some workmen came across a window the style of which revealed the fact that the castle was not begun in 1411, as heretofore believed, but two hundred years earlier. Certainly, to all appearances, it has always seemed to date from a much earlier period than the beginning of the fifteenth century.

The French school at Delphi has lately unearthed two slabs of limestone which bear an inscription which is of great interest, dating, as it does, from the fourth century before Christ. This inscription, which consists of about two hundred lines, gives the price of work for building operations in Greece at the period named, and from it we learn that an architect was paid at the rate of under \$150 per annum. This is not a great sum, even if its purchasing power is multiplied, as it should be, by five or six.

Three important finds of manuscript from the lost cities of central Asia are reported by the Asiatic Society of Bengal. They were found in sand-buried tombs and other buildings in Chinese Turkestan, and were picked up by peasants and passed on to traders. They vary in age, and consist of bark, palm leaves, or very coarse paper, sometimes coated with gypsum, and often very flimsy. Dr. Hoernle, president of the society at Calcutta, after examining them, believes that they relate mainly to religious ceremonies.

Skias has been conducting excavations on the left bank of the Ilissus in the neighborhood of the Kallirrhoe. About one hundred steps from the spring he discovered the foundations of the celebrated "Ionic temple on the Ilissus," which was seen and drawn by Stuart and Revett in the last century. Thereafter the temple disappeared, and its destruction was so complete that the present ruins would scarcely be regarded as the foundations of a temple but for the drawings of Stuart and Revett, with which they correspond exactly. Dörpfeld regards this as the temple of Artemis Agrotera, which Pausanias mentions immediately after he had crossed the Ilissus, and before he turned toward the Stadium.

A considerable part of a lost play by Menander has just been published at Geneva under the title of "Le Laboureur de Menandre." Hitherto, with the exception of quotations enshrined in the works of other authors, the only authenticated specimen of Menander's work was a fragment of twenty verses that was discovered by Tischendorf. Now Jules Nicole has brought papyri from Cairo which prove to be a part of one of Menander's most celebrated plays. These papyri contain nearly a hundred verses containing the essence of the plot, enabling a reconstitution of the *dramatis personæ*, and also the best part of the comedy. The authorship is established by the occurrence of three passages that are quoted by ancient writers as being from the play in question.

A correspondent of the English Colliery Guardian writes that the site of the prehistoric Celtic lake village, near Glastonbury, has been further excavated since July last, under the superintendence of the discoverer, Mr. Arthur Bulleid. The sites of the dwellings are marked by mounds. One of these contained the greatest depth of clay yet found, no less than 9 feet, the accumulation of successive hearths which were found necessary as the weight of the clay gradually compressed the peat beneath. This mound contained 300 tons of clay, all of which must have been brought in their boats by the inhabitants from the neighboring hills. Under the mound was found the framework of a loom with brushwood and wattlework to form the foundation. Another mound was very rich in fragments of pottery and other evidences of the manufacture of hardware. A neatly cut iron file about 8 inches long was found. Parts of three broken millstones were unearthed, and in one mound a clay oven measuring 2 feet by 9 inches. One glass article only was brought to light this year, a blue glass bead with a wavy line of dark blue running round it.

Remarkable Speed of the Yacht "Ellié."

During her last trial run over a measured mile on the Hudson River, the 80-foot yacht "Ellié" made the remarkable speed of 37.89 miles an hour. This places her far ahead of any steam yacht, large or small, in the world. The fastest steamship of any kind afloat to-day is the "Turbinia," an experimental torpedo boat, propelled by the Parsons steam turbine, which has a record of 40.35 miles per hour. The "Ellié" is 80 feet long, 8 feet 4 inches beam and 3 feet 6 inches draught. She is of composite construction, with steel frames and scantlings and mahogany skin. The motive power is furnished by a quadruple expansion engine, with cylinders of 9, 13, 18 and 24 inches diameter and 10 inches stroke. The mile course over which the run was made was measured by the United States Coast Survey.