This trial of creosoted fir for marine purposes appears to me conclusive, both as regards the preservation of the wood, and as regards its resistance to the Tereido. Experiments made in England, and recently in France and Holland, tend to the same conclusion. I cannot too strongly recommend the use of creosoted fir wood in Hydraulic engineering, in preference to oak (the price of which, especially for the larger pieces, has become excessive), since, in addition to its being cheaper, there is no doubt of the creosoted fir lasting longer. The Government Public Works Department has cordially adopted this most beneficial process, and constructed part of the dyke, and the whole of the American foot passengers' bridge in the new works at Ostend, of creosoted red fir.

At Nieuport, a visitors pier, 600 met. (660 feet), has been built of creosoted fir, upon the left bank of the channel; and the new pier, which is to be carried out from the end of it into the sea, will doubtless likewise be made of creosoted fir. Moreover, various sluice gates at Ostend have recently been ordered to be renewed, and creosoted Baltic fir and pitch pine to be used for that purpose.

The only things about which, to my mind, we need be solicitous, are *the proper creosoting of the timber with proper creosote oil, and the use of the proper kinds of timber, viz., those best suited to the process of creosoting.*

It has been observed that the resinous descriptions of wood become most thoroughly injected, and that the use of white fir should be discountenanced.

I also think it right to mention that, in the case of the sluice gates recently ordered, no limit has been fixed to the quantity of creosote which may be injected into the wood; also, that it is required that the wood be first subjected to a vacuum of 20 per cent. of the barometer for an hour; and immediately after this, have creosote oil forced into it at a pressure of 8 atmospheres during at least two hours.

OSTEND, February 5th, 1864.

MECHANICS, PHYSICS, AND CHEMISTRY.

An Account of Balloon Ascensions. By Mr. JAMES GLAISHER.

From the London Athenæum, Oct., 1864.

The Committee on balloon experiments was appointed last year for the following purposes:—To examine the electrical condition of the air at different heights; to verify the law of the decrease of temperature; and to compare the constants in different states of the atmosphere. With respect to the first of these objects, no progress had been made with the exception of preparing an instrument and apparatus for the investigation. At the request of the Committee, Mr. Fleeming Jenkin undertook the construction of the best instrument for the purpose, and one was finished towards the end of 1863, but it was constructed to be used with fire; it has since had to be adapted for water—a constant flow of which is necessary in electrical experiments in balloons.

This apparatus Mr. Glaisher was requested by the Committee not to use, as they felt that these instruments, if exerting no influence while the balloon was rising, might, when it was falling, throw considerable doubt on the experiments relating to humidity. With respect to the second of these objects, the verifying the law of the decrease of temperature in different states of the atmosphere, the Committee considered would be best attained by taking as many observations as possible, at times in the year, and at times in the day, at which no experiments had been made, for the purpose of determining whether the laws which hold good at noon apply equally well at all other times of the day. The Committee have always pressed the importance of magnetic observations in the higher regions of the air; the Astronomer Royal suggesting the use of a horizontal magnet, and taking the times of its vibration at different elevations, a method which is seldom practicable, owing to the almost constant revolution of the balloon. To obviate this, Dr. Lloyd suggested the use of a dipping-needle, placed horizontally when on the ground, by means of a magnet above it, so that, when in the balloon, the deviation from horizontality might be noticed, and which deviation would be independent of rotary motion of the balloon. The latter method has not yet been tried, Dr. Lloyd wishing some experiments to be made before the instrument was constructed; at Newcastle a very general wish being expressed that very high ascents should not again be attempted, none above five miles had since been made. Mr. Glaisher then gave an account of the ascents made by him during the past year. The first was from Newcastle, on the 31st of August. The balloon left the earth at 6h. 12m. P.M., with a north wind, and descended at five minutes past 7, at Pitlington, near Durham. The decrease of temperature within the first 200 feet of the earth in this ascent was very remarkable, no such rapid decrease having been found in any other ascents. On the ground the temperature was 64° , and by the time 200 feet had been attained, a decrease of 8 degrees had taken place, the temperature being 56° ; from this height to 1200 feet, there was but little change, and above this the temperature decreased from 2° to $3\frac{1}{2}^{\circ}$ in each succeeding 1000 feet, up to 7000 feet when the balloon entered a relatively warmer current of air. The second ascent, on the 29th of September 1863, was from Wolverhampton. The gas on this occasion had been prepared in July, expressly for a high ascent intended to have taken place before the Newcastle Meeting, but circumstances prevented this being made, and the gas was obligingly stored in the gasometer by the directors of the gas-works. The balloon left at 7h. 43m. A.M., wind S.W. At 8200 feet there were two layers of clouds below the balloon and very dense clouds above. When at 11,000 feet, the clouds were still a mile higher; there was a sea of blue-tinged cloud below, and peeps of the earth was seen through the breaks. At 13,000 feet, high clouds were still above; but after this they began to dissipate, and at 9h. 38m., at 14,000 feet, the sun shone brightly. Ten minutes afterwards the travelers discovered the Wash at a distance of only ten miles, and were compelled to descend. A south-west gale was

blowing, and so strong was the wind that on the grapnels taking the ground near Sleaford, at 10h. 30m., the balloon was rent from top to bottom. In this ascent warm currents were met with at 8000 and 13,500 feet. In the descent a warm current was passed through, extending from 14,000 to 9000 feet. Temperature at the ground on leaving 48° ; at time of descent 53° . On passing out of the mist at 3000 feet the humidity declined to 58° at 8000 feet; here there were dense clouds above and below; at 9000 feet the humidity was 71° ; and then the air became suddenly dry. The third ascent was made from the Crystal Palace, at 4h. 29m., P.M., on the 9th of October. In seventeen minutes it was 7300 feet high, and directly over London Bridge, and all the vast number of buildings comprising the whole of London could be clearly seen. There were neither warm nor cold currents met with on this day. The Secretary of State for War having granted permission to the Committee to avail themselves of the facilities afforded in the Royal Arsenal at Woolwich, the ascent of the 12th of January was made from thence. It was intended to have been made on the 21st of December previous, and from time to time the balloon had been partially inflated. It left at 2h. 7m. P.M., and in 14 minutes had crossed the Tilbury Railway, and was over Hainault Forest; at 3h. 31m. the height of 12,000 feet was attained, when the balloon began to descend and touched the ground at 4h. 10m. at Lakenheath. On the earth the wind was S.E.; at 1300 feet a strong S.W. current was entered, in which the balloon continued up to 4000 feet, when the wind changed to S. At 8000 feet the wind changed to S.S.W., and afterwards to S.S.E. At 11,000 feet, fine granular snow was met with; and the balloon passed through snow on descending, till within 8000 feet of the earth. Clouds were entered at 7000 feet, which merged at about 6000 feet into mist. This ascent is the only one ever made in January for scientific purposes. The fifth ascent was designed to have been made as near the 21st of March as possible, but through adverse weather, was deferred to the 6th of April. The balloon left Woolwich at 4h. 7m. P.M., with a S.E. wind, ascending evenly at the rate of 1000 feet in about three minutes, till 11,000 feet was attained at 4h. 37m. It descended in the Wilderness Park, near Sevenoaks in Kent. Its course was most remarkable, having passed over the Thames into Essex; the balloon, unknown to the aeronauts, must have re-passed the river and moved in a directly opposite direction, and so continued till it approached the earth, when it again moved in the same direction as at first. The ascent is remarkable for the small decrease in temperature with increase of elevation. The air at the period of starting was $45\frac{1}{2}^{\circ}$, and did not decline at all until after reaching 300 feet, after which it decreased gradually to 33° at 4300 feet. A warm current was then entered, and the temperature increased till 7500 feet was attained, when 40° were attained, being the same as had been experienced at 1500 feet. It then decreased to 34° at 8800 feet, and then increased slowly to 37° at 11,000 feet, a temperature which had been experienced at the heights of 8500, 6500, and 3000 feet in ascending. After the great injury to

the balloon on the 29th of September, in addition to the repairs it had previously undergone, Mr. Coxwell did not consider it, after the additional rough usage in the last two voyages, safe for extreme high ascents, and determined to build a new one; which he did, capable of containing 10,000 cubic feet more gas than the old one, so that, if need be, two observers could ascend together to the height of five miles. A new balloon, however, needs trying in low ascents until it proves gas-tight, before it can be used for great elevations; and, on June 13, it was therefore started on a small ascent from the Crystal Palace, at 7 o'clock; the sky cloudless and the air perfectly clear, except in the direction of London. An elevation of 1000 feet was reached in $1\frac{1}{4}$ minute, 3000 feet at 7h. 8m., when the balloon descended to 2300 feet, and then re-ascended to 3400, when, after a slight dip, it again ascended to 3550 feet, the highest point by 7h. 28m., and then, after some oscillations, began its downward course at 7h. 50m. from 2800 feet, reaching the ground at East Horndon, five miles from Brentwood, at 8h. 14m. The remarkable feature in this voyage being that below 1800 feet elevation there was scarcely any change of temperature until the earth was reached. This fact, of no change in the temperature of the air at the time of sunset, was very remarkable, for it indicated that if such be a law, the law of decrease of temperature with increase of elevation may be reversed at night for some distance from the earth. June 20th the balloon left Derby, at 17 minutes past 6, P.M., and descended near Newark. June 27, the balloon ascended from the Crystal Palace, at 6h. 33 $\frac{1}{2}$ m., the sky cloudy, wind west. The descent was made on Romney Marsh, 5 miles from the shore. These several trial trips of the new balloon were made, and it was gradually becoming gas-tight, when its lamentable destruction at Leicester took place. The mayor of that town has recently presided over a meeting for the purpose of collecting subscriptions to assist Mr. Coxwell to re-build a new balloon; and we concur in Mr. Glaisher's wish that the town of Leicester and the Foresters' Society will soon remove the stigma resting upon them. Mr. Coxwell since then has had recourse to the old balloon, which he had repaired as best he could, and the next and last ascent of which Mr. Glaisher had to speak, was made with it, on August 29, from the Crystal Palace, at 4h. 6m. The difference between the temperatures of the air and those of the dew-point in this ascent was rather remarkable. The most important point in the past year's experiments are:—That though the law of decrease of temperature under ordinary circumstances in the Summer months is pretty well determined, we cannot say such a law holds good throughout the year; nor can we say that the laws which are in force during the day will be in force at night. In carrying out these experiments, Mr. Glaisher said he had freely given up all his leisure, and that Mr. Coxwell had done the same in the most unselfish manner; indeed, had it not been for the generous spirit in which Mr. Coxwell had entered into these experiments, they never could have been made, except at a multiple of the cost that had been incurred.