engineers of other countries can learn much from their study.

He first describes and illustrates the method of constructing the portion of the London underground railway between Aldgate station and the Mansion house, by the way of the Tower. The difficulties encountered from gas and water pipes, sewers, and foundations of buildings, and the necessity of providing for the continuance of street-traffic, called for ingenious contrivances, by means of which the construction was successfully carried forward. Beton or concrete was used for the invert, beton or brick for the side-walls, and brick arches covered the top. All varied in thickness to suit the circumstances of the case, and the superincumbent load.

Next follows an account of the building of a tunnel in London for the Midland railway, with illustrations of the timbering employed in the work, and the tunnel cross-section found best adapted to resist the pressure of the London clay. A brief description of a contemplated subway under the Thames at Woolwich is then given.

The tunnel under the Mersey, between Birkenhead and Liverpool, a little less than a mile long, communication between the ends of which was opened early in 1884; and the Severn tunnel, not far from Bristol, to be four miles and a half in length, and now well advanced, — occupy in description about one-half of this report. The drainage-tunnel below the main tunnel under the Mersey; the arrangements for pumping and ventilation; the introduction of Col. Beaumont's machine, which had previously bored five thousand linear yards through chalk in the proposed tunnel under the English Channel, and here bores a hole seven feet in diameter through the sandstone rock, — are well described. The Severn tunnel is prosecuted with drills driven by compressed air. Progress has been hindered from time to time by the influx of water, even to the extent of completely flooding the works. The pumps required are consequently very powerful, having a capacity of eighty-two thousand six hundred cubic metres in twenty-four hours.

With the exception of two pages devoted to an intercepting or trunk sewer at Brighton, the closing pages are devoted to an account of the examinations and investigations already made in regard to a tunnel under the English Channel, between Dover and Calais, the present state of the project, and the possibilities of the scheme.

The book is handsomely printed, and the illustrations are very clear and explicit.

NOTES AND NEWS.

IN a lecture at Johns Hopkins on the place of the science of hygiene in a liberal education, Dr. Billings states the objections to the establishment of such a course, as follows: first, that there is no existing demand on the part of students for it; second, that the subject is not yet on a scientific basis; third, that the present courses of instruction given in the chemical, physical, and biological departments of the university, include all that a well-educated man need know of this subject, unless he proposes to make it a specialty; fourth, that the students have no time for any studies additional to the course already supplied. To the first objection Dr. Billings replied, that the same might be said as to other branches of the curriculum, — that the majority of students do not know what they ought to study, — and that the question is, whether the time has not come to create the demand, and for the university to lead the way in the matter. The second objection is only partly true. The general rule holds good in man, as it does in the laboratory, that like causes, under like circumstances, will produce like effects. When it has been shown in a number of well-marked cases that polluted water has been the means of spreading typhoid-fever, that overcrowding and foul air precede epidemic typhus, that scarlet-fever or diphtheria has been conveyed to a village by infected clothing from a distance, we have enough information to enable us to advise in similar cases, although we also know that men have drunk sewage with impunity, and that unprotected children have slept in the same bed with a scarlet-fever case and have not taken the disease.

— The foundations under the stone piers supporting the iron bridge, twenty-five feet above low-water level, by which the Wabash, St. Louis, and Pacific railway crosses the Kankakee River, have lately been giving trouble. The bed-rock of shale is hard and soft in places in the short space of a few feet. The three piers were built when the water was high, and were placed on platforms of four thicknesses of pine timber twelve inches square. Before these platforms were located, some of the loose material was removed; but it would appear that the foundation was dug deepest in the centre, and the rapid current of high water washed under and disturbed the piers. In order to fill the space, give a firm bearing over all the bottom, make the piers thoroughly durable, and at the same time not interrupt or interfere with the traffic over the bridge, the application of wooden wedges was suggested and carried out by P. E. Falcon of Chicago. By a strong jet of water and other appliances, the sediment and loose material were cleared away by divers from under two timbers at a time, and the bed-rock was cut away to a level. Oak timbers were fitted to the cavity; and a double row of broad oak wedges, to insure a complete bearing from the middle of the pier to the outside edge, was driven between the oak timbers and the pine platform by means of a steel bar weighing eight hundred pounds, suspended from the bridge by wires, and adjusted to

strike the heads of the wedges. The wedges, when all in place, were driven in the proper order to bring the pier back to its original position, and were then fastened by iron spikes driven by a ram-rod dropped through a gas-pipe as a guide. The work was done on the three piers by three divers in ninety days, and three hundred wedges were used.

— On an obscure passage in the Koran, Mr. W. T. Lynn, late of the Royal observatory, Greenwich, writes as follows: "In reference to Sir George Airy's letter in the *Athenaeum*, suggesting that the famous passage in the fifty-fourth Sura of the Koran does not relate to any phenomenal or supposed miraculous appearance in the moon, but to the ordinary semi-lunar phase when she is said, in the language of astronomers, to be dichotomized, perhaps I may quote Mr. Rodwell's rendering of the passage: 'The hour hath approached, and the moon hath been cleft. But if *the unbelievers* see a miracle, they turn aside and say, "magic that shall pass away." And they treat *the prophets* as impostors, and follow their own lusts; but every thing is unalterably fixed.'

"This hardly reads like a reference to an ordinary appearance of the moon as a chronological datum. The 'unbelievers' could surely not speak of that which occurs every fortnight as 'magic;' though many might conclude from previous experience that a peculiar appearance, produced by some meteorological condition, even though of a more remarkable kind than they had seen before, would pass away, and had no prophetical meaning. As to the expression, 'every thing is unalterably fixed,' Mohammed would probably mean that even miracles took place, like ordinary phenomena, by divine appointment. Mr. Rodwell, like Sale, thinks the word translated 'hath been cleft' may mean 'will be cleft,' the future 'being expressed by the prophetic preterite, and the reference being to one of the signs of the last day.' Nevertheless, he admits that the passage may refer to a miracle said to have been wrought by Mohammed; and this is, I believe, the general impression of Mohammedans with regard to it. I well remember travelling many years ago to Oxford with an Egyptian who had some scientific acquaintance with astronomy, and was at the time visiting the English observatories; and, on my remarking that Mohammed laid no claim to miraculous powers, he exclaimed, 'Oh, pardon! il a fait des miracles; il divisa la lune en deux parties, et puis' — Here my companion broke off his own sentence with a hearty laugh, sufficiently indicating his own scepticism of the alleged miracle. He was evidently about to refer to the later accretions of the story with which I was familiar as given by Gibbon from Maracci; but he gave the Koran as his authority, and his primary reference was undoubtedly to the passage quoted by Sir George Airy."

— The Swedish academy of sciences has recently published the results of the measurements of the level of the Baltic, begun in 1750, to decide the controversy on the point between Celsius and the German scientific men of his day. The verdict of these hundred and thirty-four years is that both parties were right, and both were wrong. The Swedish coast has been steadily rising, while that along the southern fringe of the Baltic has been as steadily sinking. The dividing-line, along which no change is perceptible, passes from Sweden to the Schleswig-Holstein coast, over Bornholm and Laland. The northern part of Sweden has risen about seven feet. The rate of elevation gradually declines as we go southward, being only about one foot at the Naze, and nothing at Bornholm, which remains at the same level as in the middle of the last century. An example will best illustrate the process. The cliff near Pieta, known as 'Stora Reppen,' was, in 1851, ninety-three centimetres higher above the water-level than it was in the year 1750; and on the 12th of August, 1884, it was found to be about fifty centimetres higher than in 1851, showing that the rate of elevation had been quickened during the thirty years immediately preceding. The general average result would be that the Swedish coast has risen about a hundred and forty-three centimetres (nearly fifty-six inches) during the last hundred and thirty-four years.

— Writing to *Kosmos* from the Brazilian province of Rio Grande do Sul, Dr. H. von Ihreng, in regard to a case of polydactylism in a horse, which came under his own observation, says he has scarcely spoken to any one, who has travelled much in that region, who has not himself met one or more cases of the kind. The extra toes are on the inner side of the fore-feet. The question, he says, forces itself upon one, whether there has not been a survival of the old race of Equus in a few regions, which has escaped the notice of the discoverers and early settlers of the country. "The horse certainly still existed in the Rio Grande during the pleistocene era, as I have received horse-teeth from alluvial soil which were found in digging a well, and which agree in the very slightest details with the corresponding teeth of Equus Caballus. It is possible that among the wild horses of South America there are still to be found descendants of the native horses of the alluvial."

— Human skulls and other bones were lately dug up from the kjökkenmöddings at Muyem, near the Tajo, Portugal, which, judging from the character of the deposits and accompanying fauna, can almost with certainty be ascribed to the quaternary epoch. The earlier race was dolichocephalic. To this belonged a number of skulls of wonderful uniformity, offering so few differences, except of a sexual character, that we have unquestionably to do here with a homogeneous race. The prognathism of the skulls, and the length of the fore-arm, such as is only met with among negroes, recall at once the African races; while the capacity of the cranium is so small that it can be compared only with that of the Australian. There are also but few races of so small stature as these old inhabitants of Portugal. Only three brachycephalic skulls were found; and, judging from the organic marks, these belonged to a larger race than the dolichocephalic.