something over sixty million francs, and the remaining half of its capital, with which to pay for the excavation of eighty-eight million cubic metres. From eighteen months to two years have been lost through lack of discipline and ill-directed efforts. If we judged only from the earth already moved, there would be required to complete the work four thousand million francs and thirty-six years. But the expense and time spent in getting ready, the acquisition of property, and the collection of materials, must be considered. There have been wasted in useless works, too high prices, and absurd contracts, a hundred and fifty million francs. The errors committed by the direction will amount, at the time of completion, to a loss of about three hundred and fifty million francs, to which ought to be added a large share of the ninety-four million francs paid for the Panama railroad, since the better terms he had negotiated with the railroad company were set aside.

He still adheres to and defends his original estimate of a hundred and five million cubic metres of earth as the quantity needful to be moved, provided the useless plans for the deviation of the Chagres, and the formation of a great interior port near Corrozal, are given up. The treatment he would apply to the river is that of one large dam and a number of smaller ones along its course. The earth has proved of good quality for retaining a slope, is deeper, and there is less rock and of a less hard nature than was anticipated. By a reformation of methods of administration and work, by the employment of experienced contractors, by carrying out no unnecessary projects, by push and energy, he estimates that it is possible to finish the canal in six years. The company must raise, for the eighty-eight million cubic metres of excavation, at five and a half francs per metre, four hundred and eighty-four million francs, and seventy-five millions for accessory works, and one hundred millions for discount, interest, etc., less certain savings which can be made; in all, about six hundred million francs. By proper and rigorous economy he believes that the total cost can be brought to twelve hundred million francs.

We find, further, that he calls attention anew to his alternative project at Panama, with ten or eleven locks, the fifth in the preceding enumeration, as offering a cheaper and a quicker solution of the problem in which the company is now engaged. Current rumor would seem to indicate that the company was leaning towards such a way of extricating itself from its present difficulties, even with an abandonment of the chief argument in favor of the Panama route, — that it would be a sea-level canal like the Suez canal, without locks.

He closes with a discussion of the mercantile advantages to be derived from the canal, and the revenue from which to repay the great outlay cited above.

LONDON LETTER.

IN the first of this series of letters, allusion was made to the frightfully unsanitary condition of the river Lea, in one of the London suburbs. From the upper part of this, water is still drawn for the metropolitan supply, while enormous quantities of sewage, etc., are allowed to drain into it lower down in its course. A few days ago a public meeting was held at the Mansion house, London, under the presidency of the lord mayor, in aid of the "National society to secure effective legislation against river-pollution." The attorney-general, Sir C. Russell, M.P., moved the following resolution: "That the speedy purification of our rivers would, in the opinion of this meeting, effect a great reform long urgently needed, and of vital importance to the general health and welfare of the community." There were two defects in the existing law: first, it was only permissive instead of compulsory; second, its powers could only be put in force by the sanitary authorities, who in some instances had been the main offenders. He would like to see the law so amended that no sewage-pollution should be allowed, under any circumstances, to enter any river, — at least, up to the point of its reaching the sea or a great estuary, — and he did not think the difficulty of making the law effective to that extent would prove very serious. Reform in the case of the river Lea would be a pioneer of reform in the case of other rivers; and, if the responsibility of dealing with sewage were placed on communities, the question would very soon be settled. From what came under the notice of the present writer during his recent visits to America, he thinks these weighty words should not be without due warning to various parts of the states and Canada.

The exceptional length and severity of the present winter are universal topics of conversation. For some days there has been skating in the London parks, — an event without precedent, for the second week in March. On the nights of Saturday and Sunday, March 6 and 7, the minimum temperature registered by screened thermometers (verified at Kew) near Stoke-on-Trent, in the midland districts of England, was 7° F. The next lowest temperature recorded in March was 13°, on March 13, 1845; and, according to Mr. Glaisher's Greenwich tables, that was the coldest

day for the sixty years from 1814 to 1873. Over the greater part of the British Islands, this February was one of the coldest Februarys on record; the Greenwich mean being 33°.8, or 6°.8 below the average, while through Great Britain generally, from the Grampians to the Channel, the mean temperatures were from 5° to 7° below the monthly averages. Severe snow-storms blocked the lines on the east coast in the first few days of March, and also in North Wales, as many as thirty trains being snowed up between Newcastle and Berwick alone.

It has long been observed, that, for every degree below the average temperature in any week, a definite increase takes place in the average number of deaths, chiefly among elderly people. Among recent victims, two may be mentioned, — the famous Scotch naturalist, Mr. C. W. Peach, who was a most remarkable example of the irrepressible instinct of a true lover of nature; and Dr. Storrar, for many years chairman of convocation of the University of London. To him the medical graduates of that university owe far more than most of them are aware of. In the early days of the university, nearly half a century ago, its degrees were, for various reasons, looked on with much suspicion, and the other medical bodies in authority were inclined to deny any status whatever to the new graduates; in fact, attempts were made to prevent them from engaging in ordinary medical practice. Dr. Storrar sacrificed his own professional prospects in order to fight this question, and at the present day the London university degrees in medicine rank as the highest which it is possible to obtain.

The engineering tripos at Cambridge, alluded to in a former letter, has now been fairly established, and the chief regulations in connection therewith appeared in the university intelligence of the *Times* a few days ago. Inquiries as to the desirability of establishing degrees in engineering have been issued on behalf of the University of London.

The annual report of the director of the French agricultural department on the proceedings of the Phylloxera commission has just been published. It has been decided that none of the processes made known during the year 1885 entitle the inventors to the prize offered by the government, and accordingly the old remedies continue to be recommended. These are, 1°, submersion, which was applied in 1885 to 24,329 hectares; 2°, carbon disulphide, to 40,585; and, 3°, potassium sulphocarbonate, to 5,227. American vines which have been planted now replace those destroyed, over a surface of 72,362 hectares. The surface which has resisted the attacks of the insect is about twenty-two per cent of the whole surface suffering from the disease.

The hydrophobia scare is still sufficient to keep the muzzles on the unfortunate dogs. Questioned last night in the house of commons by Sir Henry Roscoe on the subject of M. Pasteur's cure for this terrible disease, Mr. Chamberlain replied, on behalf of the government, that he hoped to be able to arrange for such an investigation as would enable a just estimate to be formed of M. Pasteur's method, and its applicability in this country. In a recent paper read before the French academy of medicine, M. Pasteur gave details of three hundred and fifty cases, all of which, with one exception, he had treated successfully; and he has, whenever possible, secured certificates from doctors and veterinary surgeons as to the existence of rabies in the animals concerned. M. Pasteur hopes soon to turn his attention to diphtheria.

W.

London, March 13.

VIENNA LETTER.

THE struggle between gas and electricity as means of lighting has reached a new stage in the invention of Dr. Auer of Welsbach, Austria, a young Vienna chemist who has been experimenting at Professor Lieben's laboratory. The principle of Dr. Auer's invention is no new one. Every one knows the Drummond light, in which a cylinder of lime is brought to incandescence by a burning mixture of hydrogen and oxygen. But, in all previous attempts of this kind, a temperature was required too high for ordinary use. Dr. Auer has found a substance — the composition of which he unfortunately keeps a secret — which becomes incandescent at the temperature of a Bunsen burner. His lamp consists of such a burner, surrounded by a common lamp-cylinder, in the flame of which is hung a hollow cylinder of thin 'organtine' impregnated with a metallic salt solution. By the action of the flame, the organic matter of the 'organtine' is destroyed; the salt is converted into an oxide; and a white, very elastic, porous cylinder remains, which becomes incandescent. Dr. Auer's lamp has given, according to recent measurements, a luminous power of twenty candles at a gas-supply of fifty-six litres per hour.

A very important discovery, both for practical and theoretical medicine, has been made here by Mr. Ernst Freund, a pupil of Prof. E. Ludwig, at Professor Stricker's laboratory. From earlier experiments, it is known that blood does not coagulate so long as it is contained within the living healthy vessels; though clotting occurs whenever the vessels are injured, or have lost their vitality,