

the bounds of existence and account for the evolution of history; but the scientific man remembers that however complicated the facts which he reduces under the grasp of his laws, yet beyond all doubt there remain other groups of facts of surpassing complication. Science may ever advance, but, like an improved telescope in the hands of an astronomer, it only discloses the unsuspected extent and difficulty of the phenomena yet unreduced to law.

W. STANLEY JEVONS

### THE STATE TELEGRAPHS

OUR Government—always the last among European Governments to endow the nation with any benefit resulting from the advance of science—has at length awakened to the fact that the electric current is the scientific modern equivalent for the ancient post-boy, and we are to have a State Telegraph as we have a State Postal system.

As early as 1854, Mr. Thomas Allan, the electrician, published a paper entitled "Reasons for the Government Annexing an Electric Telegraph System to the General Post Office," in which he recommended the adoption of a shilling rate, for messages of twenty words, throughout the United Kingdom. This paper was published a second time in 1863. In 1856, Mr. Baines, an officer in the General Post Office, submitted to the Lords of the Treasury a plan for the annexation of the telegraphs, and a general charge of sixpence for messages of twenty words. In 1861, a memorandum by Mr. Ricardo, chairman of the Electric and International Telegraph Company, recommending the transfer of the telegraphs to the Government, was forwarded to the Chancellor of the Exchequer. Late in the year 1865 the proposition was again brought forward in the report of a committee appointed by the Edinburgh Chamber of Commerce "to consider the present condition of telegraphic communication in the United Kingdom, with a view to its improvement." In June 1866, Mr. Edwin Chadwick also forwarded a like scheme to the Chancellor of the Exchequer. The substance of all these papers was to the effect that the existing charges were too high, that the rapidity of transmission of messages was bad, that improvements are slow where they have to be made by competing companies fighting for high dividends, and that telegraphing in consequence was in a more backward state in the United Kingdom than in Switzerland and Belgium.

In September 1865, Mr. Scudamore was requested by the Postmaster-General to take the whole subject into consideration, and to report thereon. His first report was presented in July 1866, followed by a second in February 1868. These reports set forth that before December 1862 messages of twenty words were transmitted for fifteen pence to or from any part of Belgium, in which country the telegraphs are under the control of the State. At the end of 1862 the charge was reduced to tenpence, and in December 1865 the charge was still further reduced to fivepence. The hours of business in the telegraphic offices in Belgium are much the same as those adopted in England. The clerks have the power, which they use largely, of altering the wording of messages so as to make them read clearer, and to prevent mistakes—a plan which manifestly would not work in

England, and which would lead to many legal and other difficulties. The result of the reductions in charges was, that in 1860 one telegram was transmitted in Belgium to every 218 letters passing through the post; in 1863, one message was transmitted to every 114 letters; and in 1866, the proportion was one telegram to every 37 letters. He also reported that the charge for the transmission of messages of twenty words between any two towns in Switzerland was tenpence. In 1860, one telegram was transmitted in Switzerland to every 84 letters; in 1863, one telegram to every 74 letters; and in 1866, one telegram to every 69 letters. In the United Kingdom the proportion of telegrams to letters was, in 1860, one to 296; in 1863, one to 197; and in 1866, one to 121. At the close of the year, the telegraphic systems of Belgium and Switzerland had been in operation about fifteen years, and the working expenses during that period had amounted in the case of Switzerland to about 68 per cent., and Belgium 62½ per cent. of the total revenue during the period. At the end of the year 1866, both Governments had a good surplus on hand from the telegraphic departments. The post offices of Switzerland and Belgium have less work than that of the United Kingdom, as shown by the following table, giving national statistics for the year 1865:—

Nation.	Number of Inland Telegrams.	Number of Inland Letters.
Belgium . . .	332,718	24,530,688
Switzerland . . .	364,118	25,183,136
United Kingdom	4,662,687	706,057,667

From these figures, Mr. Scudamore concluded that the use of the telegraphs was in a more backward state in the United Kingdom than in Switzerland or Belgium; and he recommended their transference to the Government. One principal reason urged by him to prove that the Government could better afford to send messages at a lower rate than the companies was, that the post offices could spare for the use of the telegraph 12,000 offices rent-free, and a large staff of officials at present engaged, but not all of them fully employed throughout the whole of their hours of duty.

He therefore recommended the purchase of the telegraphs by the State. In August last an Act of Parliament was passed by the late Government sanctioning the plan, and authority was given to buy up the telegraphs by paying the companies £5,715,048 8s. 11d. (The odd elevenpence shows the extreme nicety of the calculation.) The Electric International Telegraph Company will receive £2,938,826 9s. 0d.; the British and Irish Magnetic, £1,243,536; Reuter's Telegram Company, Limited, £726,000; the Universal Private Telegraph Company, £184,421 10s.; the London and Provincial Telegraph Company, Limited, £60,000; and the United Kingdom Telegraph Company, Limited, £562,264 9s. 11d.

At the present time everything relating to the transfer of the telegraphs to the Government is in a transition state, very many of the arrangements not having as yet been completed. It is intended, if possible, to effect the transfer on the 1st of January next; but so much preliminary work remains to be done, that it is doubtful whether all will be ready by that date. A large room has

been fitted up in the General Post Office, with telegraphic instruments, in order that the clerks on the premises may learn to work them; and "dummy" instruments for the use of learners have been sent to the post offices in the provinces. The apparatus for common use will be the Morse printing telegraph and the single needle instrument; a wise selection, for long experience has proved them to be the best to place in the hands of unscientific clerks. They are not very liable to get out of order, and are very certain in their indications.

The following are among the changes that will be gradually made, some of them, however, at so distant a date that even the preliminaries have not been arranged as yet. The nine large district post offices in London will be made central stations, and each one will be connected by wire with the subordinate offices in its district. The chief post office in each of the largest provincial towns will be made a central telegraphic station, and the chief provincial towns will be placed in direct communication with three of the largest central London offices, namely, those in the West Central, Western, and South-western districts, in addition to the chief office in the East Central district. Subordinate offices will be opened throughout the kingdom at the money-order offices in all places having a population of 2,000 persons and upwards. Messages will be received at all post offices for transmission by hand in the ordinary way to stations in connection with the telegraphic lines; pillar boxes will be places of deposit for messages written on stamped paper; and, as a rule, all messages will have to be paid for in stamps. The charge for transmission of a message of twenty words from any one part of the United Kingdom to any other part will be one shilling; but when it has to be delivered at a considerable distance from the nearest terminal station, it will be forwarded from that station by post for a penny, or by special messenger at sixpence per mile. Facilities will be given for the transmission of money-orders by telegraph, and as soon as possible the charges for messages to foreign parts will be reduced. Such are the plans which will be carried out, some of which will be in a very forward state in a few weeks' time.

#### THE GOLD FIELDS OF VICTORIA

*The Gold Fields and Mineral Districts of Victoria.* By R. Brough Smyth. (Melbourne: J. Ferres; London: Trübner and Co.)

#### II.

ALTHOUGH large quantities of gold are obtained from the detrital accumulations which overlie the palæozoic rocks of Victoria, there can be no doubt that they have come originally from the decomposition and removal of the auriferous quartz veins by which these rocks are traversed. The gold is simply a part of the detritus, in the same way that the fragments of quartz, sandstone, and slate are. Each nugget and bit of gold is only a more or less water-worn pebble, its edges being, as a rule, less worn, and its size larger, the nearer it is found to its parent reef. Yet some writers have endeavoured to show that the nuggets really grow by a kind of accretion, each fragment of gold becoming larger by successive depositions of the metal held in solution in the water percolating through the gravels. Mr. Brough Smyth, in discussing these and other disputed questions, usually

avoids the expression of any decided opinion of his own. He treats them very much as a judge treats the evidence at a trial, and he leaves the decision to the jurymen, his readers. Yet we can very commonly guess what his opinions are, though he may not expressly state them. He gives us a tolerably copious account of opinions which have been published relative to the origin of quartz veins, and among these a valuable series of notes and sections specially made for him by a mining engineer of repute in the colony. The whole of this subject is, he says, involved in obscurity; "and though it is not possible for any one who has given attention to it to attach equal weight to the several theories which have been proposed, he would do wrong rashly to dismiss any of them as altogether improbable." Perhaps a judicial summing-up of this kind was, in the circumstances, better than the keen advocacy of any one theory. What is of value to the engineer in the colony is, to know what has really been written about the veins; and this he can learn with ease and satisfaction from Mr. Smyth's pages.

Allusion was made, in the previous notice of this volume, to the excellence of the geological and mining sections. It is rare to meet with such sections, so clearly conceived, so tastefully drawn, and carrying with them such conviction of their truth. The plate illustrative of the Ballarat gold fields is quite a model of clearness and clever drawing. No colour is used, but the various rocks are sharply defined, while, by the kind of drawing given to each, the internal structure of the mass is felicitously rendered. In the way of illustrations, the book seems to have only one failing, but it is a serious one: there is no geological map of the colony. The map at the end does not supply the want. A little coloured sketch-map, giving a general outline of the distribution of the geological formations, would have been an invaluable addition to the book, and would have certainly been worth a whole chapter of description.

One of the most striking facts brought out by the data compiled by Mr. Smyth is the high geological antiquity of the present land-surface of Victoria, or, in other words, the immense period during which that surface has remained above the sea. The palæozoic strata form the framework out of which the contour of the land has been moulded. These strata have been curved and folded, thrown on end, inverted, fractured, and upheaved. But the surface outlines are not found to bear any close relation to the direction of the subterranean movements. "There is scarcely one range in the colony which is not due to denudation, and those following lines of upheaval have been so modified by the action of water, through countless ages, as to make it difficult to determine where and how the elevating forces have operated." The palæozoic rocks were carved out into systems of valleys by the descent of rain-water from the watersheds to the lower grounds. Along these valleys river-gravels were laid down. In later times many volcanoes broke out, and thick streams of basalt rolled into the valleys and buried the ancient river-courses. Thus, in many places, the surface and the drainage of wide areas were wholly changed. New streams began to flow and to excavate new channels, which often flowed across the trend of the older valleys lying buried beneath them. By slow degrees these later valleys sank deeper into the frame-