The World's Production of Silver.

THE recent action of the Chancellor of the Exchequer in introducing a Bill into the House of Commons for the purpose of debasing the silver currency from 925 to 500 parts per 1000 has directed public attention to the acute shortage of silver which exists. This action is unavoidable if a silver currency is to be maintained, since the price of the metal has risen so much that coins are no longer tokens. They are, in fact, worth to-day considerably more than their face value, and there is accordingly, a temptation to melt them down and sell them for the considerable profit that the transaction would bring in. Such a procedure is, of course, illegal. In the years preceding the war the market price of silver, while subject to fluctuations, was never far from 2*s.* per "standard ounce." This expression is rather unfortunate, since it is not the ounce that is standard, but the quality of the metal. Its real meaning is a troy ounce of silver alloy containing 92·5 per cent. of the metal. With standard silver at about 5*s.* 6*d.* per ounce, the coins reach parity. During recent weeks the market price has fluctuated between 7*s.* and 7*s.* 5*d.* per ounce, though it is true that a remarkable fall of $6\frac{1}{8}$ in the price took place on March 5, and a further fall of $5\frac{1}{8}$ on March 11, owing largely to the improvement in the exchange with the United States of America. As stated, however, the Chancellor's action is necessary, since the minting of silver coins is possible only at a heavy loss. Nevertheless, this Bill was opposed in the House, although the opposition was not carried to a division.

It so happens that in January this year the report and appendices of the Committee appointed by the Secretary of State for India to inquire into Indian exchange and currency were published and presented to Parliament. In vol. iii. will be found appendix xxx., which contains a report on the world's production of silver.[1] This is the work of Prof. C. Gilbert Cullis and Prof. H. C. H. Carpenter, who at the request of the Secretary of State for India undertook an inquiry more than a year ago into the output of silver during recent years in the various silver-producing countries; the prospects, so far as they could be estimated, of future output; and the causes by which it is likely to be influenced. Their report covers some sixty foolscap pages. The subject-matter is presented in five main sections dealing severally with the raw materials from which silver is obtained, the location and quantitative importance of centres where silver-bearing ores are mined, the processes involved in the extraction of the metal, the distribution and relative importance of the centres where refining is carried out, and the conclusions affecting the supplies and price of the metal.

It appears from this report that in 1860 the world's production of "fine"—*i.e.* pure—silver was 30 million ounces. With some fluctuations this increased steadily until 1912, when the output was 233 million ounces, or nearly eight times that of more than half a century earlier. From that date, although a continuance of the upward trend was to be expected, a decline in production set in and continued down to the end of 1917, which was the last year for which complete figures are available. It is clear from the report that this reduction in output is assignable not to any sudden failure of the world's resources, but to an interruption in the winning of them.

The main source of the supply of silver ore in the American Continent, which in 1912 produced 82·5 per cent. of the total output. Approximately three-quarters came from North America and Mexico, the former furnishing 42 per cent. and the latter 32 per cent. Mexico was the largest single producer. A decrease in Canadian production had set in shortly before this, due to the progressive exhaustion of the Cobalt mines, but this was more than compensated by an increase in the production of the United States. The key to the shortage of the world's supplies is to be found in Mexico, where, owing to a series of political revolutions, the production fell from an average of close upon 74 million fine ounces for the years 1910–13 to an average of little more than $30\frac{1}{2}$ million fine ounces for the years 1914–17, a reduction of some $43\frac{1}{2}$ million out of a total reduction of $50\frac{1}{2}$ million ounces in the world's output.

This serious diminution in the supply came at a time when, owing to the withdrawal of gold from circulation on account of the war, there was an unusually keen demand for silver, particularly for coinage purposes. The report of the Currency Committee points out that the coinage of the British Empire absorbed nearly 108 million ounces of fine silver in the years 1915–18, as against $30\frac{1}{2}$ million ounces in the years 1910–13, and there is evidence that there have been similar increases in the coinage of other countries. Moreover, whereas China from 1914–17 was a seller of silver, and her net exports amounted to more than 77 million ounces, she has since become a persistent buyer, and the recent remarkable rise in the price of the metal is due to her purchases. India has for many years been a heavy buyer of the metal, and in times of normal trade was the largest importer of this commodity. War conditions have accentuated this, and in the three fiscal years April, 1916, to March, 1919, purchases for the purpose of liquidating trade balances amounted to more than 500 million ounces, which was probably very nearly the entire world's production for the period. These have been the chief (but not the only) factors in raising the price of silver to its extraordinary level.

It is clearly seen from the report that silver is mainly obtained as a by-product from mines which are worked for some other metal or metals.

[1] Vol. iii., Appendices to the Report of the Committee appointed by the Secretary of State for India to inquire into Indian Exchange and Currency. No. xxx., "Report on the World's Production of Silver." By Prof. H. C. H. Carpenter and Prof. C. Gilbert Cullis. Pp. 182–241.

Relatively few properties are worked solely or even mainly for silver, and only a small proportion of the world's supply has of late years been derived from them. It is therefore essentially a by-product. The more important economic metals with which it is most commonly associated are gold, copper, lead, and zinc. These five metals tend to be gregarious, and many deposits contain all of them. It is also found with tin, as in Bolivia, and with nickel and cobalt, as in Ontario, but such cases are uncommon. Although in different regions or in different parts of the same region the above five metals are found in a great variety of combinations, certain of these are particularly common. Thus gold and silver almost invariably occur together either with or without base metals. Again, lead and zinc nearly always accompany each other, and ores carrying these two metals, notably those in which lead predominates, are often richly argentiferous, the lead and silver forming an especially characteristic association. Copper in like manner is usually accompanied by small quantities of gold or of both gold and silver. The presence or absence of base metals in silver-yielding ores is of particular importance, since it determines the existing diversity in their metallurgical treatment and occasions their classification into two groups, known respectively as "milling ores" and "smelting ores," the former signifying those in which the values are entirely or mainly in precious metal. From the figures quoted in the report, it appears that, broadly speaking, about two-thirds of the world's supply of silver in 1912 was obtained from base metal, and one-third from precious metal, ores. Further, only one-fifth was obtained from mines worked exclusively for silver, while four-fifths was derived as a by-product from mines which were worked primarily for one or more of the metals—gold, copper, lead, and zinc—and would not have been in operation if their silver had been the only metal present. Formerly, the precious metal ores were the more important source of supply, but in the last few decades more and more of the metal has been won from base metal ores. It will be seen, therefore, that the authors, in endeavouring to estimate the future production of silver, have been forced to take into consideration the mining and metallurgy of four other important metals as well.

It is stated in the report that in 1912 the New World—*i.e.* the American Continent—furnished 82·5 per cent., and the Old World only 17·5 per cent., of the mine production of silver. The output in the British Empire was 21·7 per cent. Mexico led with 32·0 per cent., followed closely by the United States with 28·3 per cent. Towards the production of refined silver the New World contributed 73·0 per cent., and the Old World 27·0 per cent., the contribution of the British Empire being 18·2 per cent. The interesting fact emerges that the United States of America refined just about one-half the world's silver (49·6 per cent.), whereas Mexico refined only 14·2 per cent. More than half the Mexican mine production was refined in the U.S.A., and very nearly the same proportion of the Canadian output. It will be seen, therefore, that the position now held by the U.S.A., as the chief source of supplies of refined silver, is one of considerable importance. The same is true to an even greater extent for the metals copper and zinc.

The authors' view of the future is that if normal industrial conditions are restored in regions of curtailed production, a silver output at least as great as any yet attained may reasonably be anticipated. If, however, conditions affecting industry in general, and mining and metallurgical industries in particular, do not become favourable in these regions, a long period must elapse before the world's output can return to the previous high-water level, and a still longer one before the advance beyond that level interrupted since 1912 can be resumed. So long as the political conditions remain unsettled in Mexico, supplies from that country will continue to be small. This is particularly serious, because of the large dimensions of the normal Mexican output.

With the demand for silver more urgent than any previously experienced, the restoring of the mines and mills of Mexico to unhampered production has become a matter of pressing international importance. It must be borne in mind, however, that any extension in the mining of precious metal ores will take time, and that the mining of base metal ores is for the moment below normal, and will continue so as long as the surplus supplies of copper, lead, and zinc produced during the war remain unabsorbed. Silver production will probably, therefore, remain for a time at a low level. When, however, increased precious metal mining reaches the production stage, and the temporary check to base metal mining has been removed, the authors anticipate a steady increase in the output of the metal.

It is well to remember that, although silver has long occupied an important position as "second string" among metals suitable for currency, there are important industrial demands for it for other purposes. It is only necessary to mention two of these. First, in addition to the mechanical properties which make it valuable as a currency metal, there are others which have long been known and utilised in the silversmith's art. Standard silver lends itself readily to rolling, stamping, spinning, and mechanical operations employed in the manipulation of the metal in the arts, and upon them important industries giving employment to many workers are based. Secondly, the well-known sensitiveness of silver salts to light, made use of in photography, is being increasingly utilised in the "moving picture" industry, which in recent years has absorbed a considerable proportion of the total output of the metal. Both these industries are formidable competitors for silver produced to-day, and they will have to be reckoned with by future Chancellors of the Exchequer.