IX.—WORLD'S INDEX-NUMBER OF PRICES.

1. **General.**—Very diverse reasons have been put forward for the world-wide movements in prices, such as the rise which occurred prior to the early seventies, the following decline, and, again, the rise in more recent years. While it is not the essential aim of this Report to analyse the cause of price movements, it is desirable to refer briefly to certain statistical and historical aspects of what is so frequently stated to constitute one of the main controlling factors—*viz.*, the world's gold-supply.

The following table shews the value of the average annual gold production of the world during each year since 1851, and the estimated annual production during the period 1840 to 1850. The "world's index-number of prices," shewn in the same table, has been compiled from the index-numbers for the countries already referred to, by weighting each index-number by a number proportional to the population of the country to which it refers (see p. 76 hereinbefore).

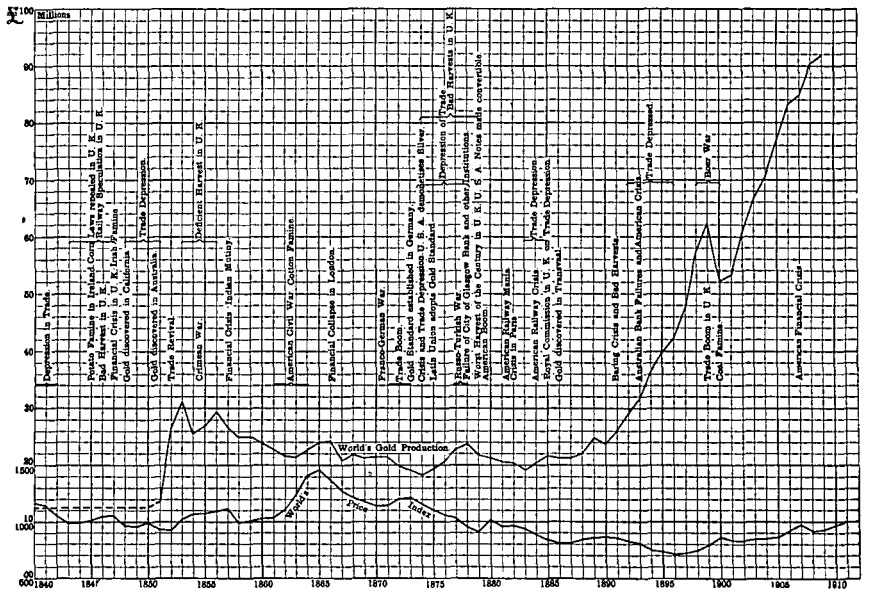
World's Index Numbers and World's Gold Production, 1840 to 1911.

Year.	World's Index No.*	World's Gold Production. £0,000 omitted.	Year.	World's Index No.*	World's Gold Production. £0,000 omitted.
1840	1,165		1876	1,056	2,074
1841	1,146		1877	1,030	2,280
1842	1,058		1878	950	2,380
1843	985		1879	903	2,180
1844	992		1880	1,016	2,132
1845	1,010	1,250	1881	955	2,062
1846	1,041		1882	964	2,040
1847	1,052		1883	938	1,908
1848	961		1884	887	2,034
1849	956		1885	838	2,168
1850	996		1886	807	2,120
1851	928	1,354	1887	809	2,106
1852	923	2,656	1888	837	2,204
1853	1,021	3,110	1889	853	2,470
1854	1,071	2,550	1890	865	2,377
1855	1,073	2,702	1891	855	2,613
1856	1,095	2,952	1892	825	2,926
1857	1,115	2,666	1893	810	3,169
1858	991	2,494	1894	750	3,650
1859	1,004	2,498	1895	732	3,980
1860	1,026	2,386	1896	716	4,225
1861	1,033	2,276	1897	721	4,820
1862	1,102	2,156	1898	749	5,814
1863	1,243	2,140	1899	797	6,301
1864	1,416	2,260	1900	864	5,209
1865	1,463	2,404	1901	831	5,334
1866	1,368	2,420	1902	830	6,062
1867	1,273	2,080	1903	847	6,676
1868	1,212	2,194	1904	850	7,052
1869	1,186	2,124	1905	864	7,688
1870	1,137	2,138	1906	923	8,317
1871	1,142	2,140	1907	978	8,476
1872	1,206	1,992	1908	915	9,036
1873	1,215	1,924	1909	931	9,308
1874	1,153	1,816	1910	970	9,419
1875	1,100	1,950	1911	**1,000**	..

* This cannot, of course, be strictly calculated for reasons which will be clear on referring to Appendixes VIII. and IX.

The preceding figures are shewn in the following graph:—

WORLD'S INDEX-NUMBERS AND WORLD'S GOLD-SUPPLY, 1840 TO 1911.



The increase in the annual gold production and the rise and fall in average prices may be more readily seen by taking averages for quinquennial periods. The following table accordingly shews the value of the average annual gold production and the average of the annual index-numbers for each quinquennial period since 1841:—

Value of Average Annual World's Gold Production and Average of corresponding Worlds' Index-Number for each Quinquennial Period from 1841 to 1910.

Period.	Average Index-Number.	Average Annual Gold Production. (£0,000)	Period.	Average Index-Number.	Average Annual Gold Production. (£0,000).
1841-55	1,038	} 1,250	1881-85	916	2,042
1846-50	1,001		1886-90	834	2,255
1851-55	1,003	2,474	1891-95	794	3,268
1856-60	1,046	2,599	1896-1900	769	5,274
1861-65	1,251	2,247	1901-05	844	6,562
1866-70	1,235	2,191	1906-10	943	8,911
1871-75	1,163	1,964	**1911**	**1,000**	*
1876-80	991	2,209			

* Not available.

The average value of the world's production during the decade 1841 to 1850 was only £12,500,000; but it may be seen that in the next quinquennium the average value of the production had risen to £24,740,000 and £25,990,000 between 1856 and 1860, *viz.*, during the great impetus given by the almost simultaneous discoveries in Australia and California. It then fell to £19,640,000 in 1871-5.

When the rich alluvial deposits in these countries began to be worked out, and until the opening of the Transvaal mines, it remained fairly constant. It was then, viz., in about 1888, that the production commences to take an upward sweep, as the graph will shew. In 1891 the value produced exceeded £26,000,000, in 1898 it was £58,140,000, and in 1899 £63,010,000; then after a momentary reaction, caused by the South African War, the output rose to £66,760,000 in 1903, and to £94,190,000 in 1910. From 1896 to 1910 the output increased rapidly. The opening of the Klondike mines and the discovery and application of the cyanide process had important effects on the production. Thus, in 1910 the output was very nearly four times as great as in 1890, twenty years earlier.

The index-numbers given in the above table, being based on prices in all countries for which index-numbers are available, are, of course, more directly applicable than any others in an investigation into the relation between world's gold-supply and prices.

Now an examination of these two graphs shews several instances of corresponding upward or downward movements, which may be to some extent due to some law acting between the gold-supply and the world's prices, though, even if this be so, prices do not, in general, seem to feel the reaction set up by a change in the gold-supply, at least not till after a very noticeable interval. It is probably true that the important factor to consider, when estimating the effect of gold on prices, is not so much the annual production, as the quantity and rapidity of gold in circulation relatively to the varying demand for gold, arising, among other things, by extensions or contractions of credit. Notwithstanding that a large quantity of statistical material bearing more or less directly on these matters has been collected, no reliable estimates of gold in circulation, and therefore of velocity of circulation, are available, except for one or two countries.

2. **From 1850 to 1857.**—One of the most marked and frequently cited coincidences between increase in gold-production and a rise in prices is that which marks the periods between 1851 and 1857, following the abnormal and exceptional discoveries in Australia and California.

The increased output of gold in the fifties first found its way to Europe and the United States, and resulted in a large increase in the coinage of gold in England, France, and the United States, and thus, in the quantity of gold in actual circulation. The impetus given to general settlement by the gold discoveries (as in Victoria) created a demand for manufactured commodities, which tended to accelerate the rise in prices. Other influences, too, were operating in the same direction. The Crimean War tended to raise the price of many commodities, while in various countries, and especially in England, it is probable that a considerable extension of credit took place. Under the stimulus of abundant loan capital and an optimistic spirit of expanding trade, many new enterprises were started. During the years 1853 to 1856 there were bad seasons in England, and the price of foodstuffs rose to a high point. In 1857-8—at the time of the Indian Mutiny—the index-number shews a decline from 1115 to 991, and then, again, moves upward until 1865, when it was as high as 1463.

3. **Prices High from 1858 to 1873.**—The expansion of trade in the sixties was greatly assisted by the extension of the Limited Liability Acts to banking corporations in 1858, and by the passing of the Company Act, 1861, which gave a great impetus to the flotation of joint-stock enterprises. Inventions and discoveries also did much to assist the boom, as also did improvements in transport facilities and in the arts of manufacture. The introduction of the Bessemer process of steel making in 1859 is a landmark in the industrial history of the period.

Important influences are, on the other hand, commonly supposed to have operated in the opposite direction, such as the numerous wars during the fifties and sixties, which not merely kept men from productive occupations, but caused a considerable loss in life and property. When it is remembered that the period includes, among others, the Crimean, Austro-Prussian, Franco-Prussian, Danish and Italian wars in Europe, and the Civil War and the Mexican campaigns of Napoleon III. in America, it may readily be appreciated that war must have had adverse effects on trade and general prosperity.

From 1858 to 1865 prices rose rapidly, largely owing to the abnormal conditions in the United States of America. During this period, however, the gold production generally decreased. Between 1862 and 1866, the American Civil War cut off Lancashire's supply of cotton, and though this shortage stimulated cotton-growing in India and other countries, the supplies were quite insufficient. The cotton famine naturally had an effect on other textiles, and the price of wool and flax rose rapidly. After the end of the war prices again fell, but not quite to their old level. In the following period up to 1873, the output of gold continued to decrease, while prices shewed a marked rise from 1871 to 1873. Reviewing the whole period from 1855 to 1875, the decrease in the gold-production, coinciding with an extension of civilisation and trade over the whole world, and with new needs for gold, ought, it seems, on the theory which holds that the supply of gold is the supreme influence, to have led to a general fall in the price of commodities. Still, it is contended that the increased gold output of the previous years had not yet become insufficient to meet the consumption at the enhanced prices, and so the continuation of industrial development would still tend to exercise a predominant influence. So that, although it is stated that in the case of many manufactured articles a fall in price really occurred, owing to the boom in trade, reduced cost of transport, and other causes, natural products continued to increase in price, and the index-number for all commodities to rise. Speaking generally, it is probably true that the annual production of gold during the twenty-two years, from about 1851 to 1873, was available for monetary purposes, whereas the quantity available for the following two decades was largely absorbed by the extra demand due to changes in the monetary systems, so that the total monetary circulation did not increase during the latter period, even relatively to the reduced output of gold, to the same extent as in the former period.

4. **Prices Falling from 1873 to 1896.**—The period 1873 to 1896 was marked by a progressive fall in prices, this time probably in conformity with the stagnation or recoil in the supply of gold in relation to the demand therefor. It may be seen (see page 87) that from 1878 to 1883, there was a considerable decline in the world's production

of gold, but that after the following six years the output regained its former value. The important fact appears, however, to be that these years saw a great increase in the demand for gold. Immediately after the Franco-Prussian war, Germany decided to establish her currency on a gold basis, and a law to that effect was passed in December, 1871. The gold standard was not introduced until 1873, though it is stated that considerable importations of the precious metal took place immediately.* Further, the United States commenced to draw gold from Europe in 1878, consequent upon a law making the inconvertible Government bank-notes, which had been issued during the Civil War, convertible into gold at the United States Treasury. There is no reason to doubt that this resumption was followed by a great extension in the use of gold, and a country which was formerly one of the chief sources of supply began to reabsorb some of the world's gold. In other countries, too, currency reforms were effected at or about this period, and gold became practically the sole standard measure of value.* It may here be observed that the question of currency reforms in relation to the supply of gold is greatly complicated by various considerations, such as (*a*) changes in the rapidity of circulation of money, (*b*) economies in the use of coin either in international trade, by the payment of balances, by the transfer of stocks, or in general trade by the extension of banking facilities on the introduction of paper money, and (*c*) the amount of credit instruments in circulation, which varies with the commercial habits of the people and the character of the banking system.

It is alleged by many economists that the increase in production at this period had an important effect on prices. The highly remunerative prices hitherto prevailing are stated to have greatly stimulated production, and when prices declined, it is said that producers in many branches of trade were obliged to further increase their production, in order to balance, at least to some extent, the shrinkage of values.

The diminution in the cost of production and conveyance at this time probably had its greatest effect in extra-European Countries. As there had been a European era of the development of steam and of railways, so there was now an extra-European era. Not only were existing settlements connected, but the railroads were taken through uncultivated and sparsely populated districts, which were thus opened for new settlement. The producer could not only convey his products cheaper and quicker to port and to other countries, but he could also obtain his requirements at less cost and more rapidly. The effect of long distances was reduced owing to the better communications, and the increasing civilisation in the new countries attracted an increasing number of immigrants. Land was abundant, and other factors of production, such as labour and capital, were more easily acquired.

Steamers superseded more and more sailing vessels; their number increased enormously, and as they travelled three times as quick, their tonnage counted thrice that of the sailers. The opening of the Suez Canal had an additional influence in accelerating the conveyance of goods.

* See "On Prices of Commodities and the Precious Metals," A. Sauerbeck. "Journal of the Royal Statistical Society, London, Vol. 49 (1868), p. 587.

* See "An Introduction to the Study of Prices," W. T. Layton, M.A., London, 1912.

Another influence upon commerce generally may be ascribed to telegraphic communication; this kept producer and consumer in closer touch. As products could be quickly exchanged between various countries, less dependence was placed upon stocks, and the market could not be so easily manipulated by speculators. Also, the effect of bad harvests in certain districts or countries was minimised, as, thanks to the quick communications, a deficit in one country could be covered by an excess in another. If heavy stocks still existed, it was owing chiefly to the great production, and the unprofitable state of business, not to any great necessity for them; they consequently weighed upon the market with additional force, and caused a greater depression than similar quantities would have occasioned in former periods.

Last, but not least, may be mentioned the inventions of the period. Attention may specially be directed to the improvements in the smelting of ore, in the production of steel, and in the sugar industry; to the development of the chemical industry, and to the improvement of machinery in all branches.

To sum up, the following are the causes which have been alleged to be responsible for the appreciation in the purchasing power of gold during the period between 1873 and 1886.*

(*a*) Reduction in the cost of production would tend to cause the prices of these commodities to fall and to produce changes in relative prices, but would have no effect on the general price-level unless the quantities produced were increased.

(*b*) Reduction in the cost of transport would produce no effect on the general price-level, unless it led to an increase in the quantities of commodities produced, or to an increase in the number of exchanges.

(*c*) The reduced cost of production and the reduction of cost of transport would probably, and did in fact, cause changes in the relative advantages of different countries in the international trade of the world, which would have the effect of altering the internal scale of prices and wages in the countries affected.

(*d*) There was an increase in the quantities of commodities produced and an increase in the number of exchanges, both causes tending to bring about a fall in the general price-level.

(*e*) There were additional demands for gold due to the substitution of the gold for the silver standard in certain countries.

(*f*) There were additional demands for gold due to changes from inconvertible paper to a metallic (gold) standard.

(*g*) There were special demands for gold due to the great development of the United States of America. This cause is, to some extent, identical with that stated in (*c*).

(*h*) There was some reduction in the yearly production of gold.

From 1890 onwards the gold output began to rise with a rapidity probably without precedent. Yet the fall in prices for some years steadily continued, with a few interruptions (from 1886 to 1890) until 1896, thus shewing once more the same discordance, at least apparently, between the two phenomena. Perhaps there is something

* See "The Standard of Value." Sir David Barbour, K.C.S.I., K.C.M.G., London, 1912.

analogous at this stage to what occurred in the other direction during the period between 1858 and 1873; and it is probable that any influence which the output of gold exercises on prices takes some years to shew itself. In any case, moreover, evidence as to increase in gold supply does not appear to be conclusive, until it is known whether a greater increase in the number of business transactions occurred involving increased use for gold. A feature of the period was the increase in overseas trade. It is obvious that increase of trade of this kind tends to bring about an even greater use of currency than increase in domestic trade, for every time that a commodity changes hands metallic currency or a credit document of some kind is given in exchange, and commodities brought to market from overseas will ordinarily change hands a greater number of times than domestic produce. Thus, as trade is developed and becomes more world-wide, a greater demand for currency or its equivalent tends to be brought about. It is unlikely, indeed, that there was any actual shortage of gold during this period, but prices are determined not only by the absolute amount of currency, but by the relative quantity of currency as compared with the volume of trade which it has to do and with other matters.

This view of the question has been presented by Professor Irving Fisher,* who points out that the total amount of money expended on commodities in a given community during a given period is equal to sum of the product of the average price of sale of each commodity into the quantity of such commodity sold. This must be equal to the amount of money in circulation among the community for that period, multiplied by its velocity of circulation. The money by which payment is made consists of (*a*) actual coin in circulation, and (*b*) credit money based on gold and on other forms of property deposited in the banks, the latter usually taking the form of bank-notes, cheques, and bills of exchange.† Therefore, it follows that the sum of (*a*) the amount of legal-tender currency in circulation multiplied by its velocity of circulation, and (*b*) the amount of credit money in circulation multiplied by its velocity, is equal to the sum of the prices of all commodities multiplied respectively by the quantity of each commodity sold. The general price-level, or the average of the prices, for the period is therefore equal to the sum of (*a*) the legal-tender currency multiplied by its velocity of circulation, and (*b*) the credit money multiplied by its velocity, divided by the total quantity of commodities sold.‡ It is, therefore, clear that *the general level of prices depends directly upon five factors, viz., (i.) The amount of money in circulation. (ii.) Its velocity of circulation.*

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* See "The Purchasing Power of Money." Prof. Irving Fisher. New York, 1911

† See "Report of Commission on Cost of Living in New Zealand." Wellington, 1912, p. xxxv.

‡ The "Equation of Exchange" may be expressed mathematically as follows:—

If M represent the quantity of actual currency money, and V its velocity of circulation, M_1 the quantity of credit money and V_1 its velocity of circulation; also if the average prices of the various commodities sold during the period under review be P_1, P_2, P_3, etc., and the corresponding quantities sold be Q^1, Q^2, Q^3, etc., respectively, then

$$MV + M_1V_1 = \Sigma(PQ),$$

which may be written

$MV + M_1V_1 = PT$, where P is a weighted average of all the P's, and T is the sum of all the Q's. P then represents in one magnitude *the level of prices*, and T represents in one magnitude the volume of trade.

$$\text{The price level } P = \frac{MV + M_1V_1}{T}.$$

(iii.) The amount of credit money in circulation. (iv.) Its velocity of circulation, and (v.) The total quantity of goods sold, that is the volume of trade. It is obvious that if any one of these factors change in magnitude, there must result a change in the general level of prices; if more than one of them change, the net result on the level of prices will depend on whichever factor has a preponderating influence. The general principle stated by Professor Irving Fisher is that *the price level increases with the increase of money (either currency or credit) and with the velocities of their circulation, and decreases with an increase in the volume of trade.* Reaction to these factors is, however, not instantaneous, nor equally quick for each; hence the actual relation is very complex. It is, moreover, influenced by an element not susceptible of numerical evaluation, *viz.*, the human element of faith or confidence in the stability of economic relations at a particular moment.

5. From 1896 to 1911, Prices Rising.—The main features of the graph of prices since 1896 are the general upward movement, accompanied by the rises in 1900 and 1907, with a considerable depression in the intervening years, and since 1907 a fall with a further rise to the highest point in 1911. The average levels of the index-number during the three quinquennia, 1896 to 1910, were 769, 844 and 943 respectively, and the corresponding values of the gold production were £52,740,000, £65,620,000 and £89,110,000 respectively. The association of these changes in the same direction is frequently cited as proving the inter-relation between the two phenomena. It has already been pointed out, however, that any relation which may exist is of by no means a simple character.

It is alleged that the enormous additions to the world's gold since 1890 would have caused an economic revolution unless they had been absorbed under very special circumstances.*

The director of the United States Mint has published an estimate of the manner in which the output has been absorbed during the last twenty years. The world's industrial consumption of gold is stated to have been about £114,000,000 during the ten years from 1890 to 1899, and £191,000,000 during the eleven years 1900 to 1910. These figures are exclusive of amounts used in Asia, Egypt, and South America, which for both monetary, industrial and other purposes, are computed to have absorbed during the latter period (1900 to 1910) about £204,000,000. The table given on page 87 shews that the total output during the second period (1900 to 1910) was £825,770,000. Therefore, subtracting the value of that used industrially and also the amount absorbed by Asia, Egypt and part of South America, the remainder available for coinage and bank reserves in Europe, the United States, Canada, Australasia, and parts of South America, would be £430,770,000. There is little doubt that this addition has had a considerable influence in raising prices both directly and indirectly by enabling a large extension of credit to take place. It appears, moreover, that this influence has tended to be more marked in the United States than in other countries, and it is, in fact, stated that the most rapidly rising prices are, in the main, those over which the United States of America exercises a preponderating influence, especially in regard to tin, copper,

* See "An Introduction to the Study of Prices," W. T. Layton, M.A. London, 1911.

and cotton. This contention is, to some extent, borne out by the graphs on page 78 and the tables on pages 77 and 81. From these it may be seen that the increase in price-level in the United States since 1891 has been greater than in any other country except Germany.

In the report of the director of the United States Mint, it is pointed out that it is scarcely conceivable, at any rate under the existing banking system, that the industrial development which has taken place in the United States during the period 1901 to 1910 could have occurred or been financed without the enlarged bank reserves which the gold output provided. In regard to the effect of this development on prices, it is alleged that the operations of large industrial and commercial trusts have accelerated the upward movement of price-levels, and it is asserted that times of rising prices are more favourable than times of falling prices for monopolists who wish to maintain prices at a high level. It should be pointed out, however, that even if the United States had not absorbed such large quantities of gold in recent years, the abundance of currency in other countries might readily (in accordance with the principles of the "quantity" theory) have made the prices of commodities, in the production of which Europe plays the chief part, rise faster and higher than they actually have done.

It is maintained that in many countries the rapid rise of trusts, conferences, pools and other forms of trade combination or agreement belongs to the recent epoch of rising prices and must be considered contributory to it.*

It should be pointed out that, in the view of many economists, the increase in gold-production is not the main primary *cause* of the recent increase in prices. It is stated that the simplicity of that explanation is impaired by a crucial test, viz., the lower price of credit which should follow the increased flow of gold into the bank reserves and stimulate the increased borrowing and the circulation through the banks. It is maintained that no such lowering of the price of credit has occurred, but that, on the contrary, the price of money has been higher than usual during the period of expanding output of gold. While it is admitted that the increased output of gold has been an essential constituent in the production of credit, it is stated that the utilisation of stocks, shares and vendible goods as a credit-basis has facilitated an enormous expansion in the *demand* for credit, so great that, in spite of the tendency of abundant gold to lower its price, that price has actually risen, and, in spite of the rise, the enhanced demand has been maintained. The cause of this increased demand for credit is said to be due to the great development of profitable economic enterprises upon a large business scale that has been taking place simultaneously in a number of new areas of enterprise. The impetus given to development in South America and North West Canada, the entering of Japan upon an era of enterprise, and the general industrial expansion, taken in conjunction with the enlarged output of gold, are said to have involved a rapid and continuous demand for the application of large masses of capital. Moreover, the sinking of a large and growing proportion of the newly created wealth and labour of the world into developmental, but at present unremunerative, processes in the new and backward countries of the world, is said to be attended by a considerable sacrifice from

* See "Causes of the Rise of Prices" by J. A. Hobson. "The Contemporary Review," No. 562, October 1912.

the standpoint of consumers, in a corresponding immediate rate of increase in output of food and materials. If this be so, when the development of these new countries and enterprises has matured, an increase in output and a fall of prices may then be expected to ensue.*

6. **Conclusion.**—In conclusion, it may be said that, in the present state of knowledge, it would seem impossible to determine with any certainty to what extent the gold-supply directly influences price-levels, but there is evidently ground for the prevalent opinion that the two are closely related. It would seem, however, that any direct influence which the gold output may have on prices, is at many periods less perceptible than the effects of war and militarism, industrial activity and depression, seasonal and climatic influences, change in transport facilities, and methods of production consequent on scientific discovery and invention, the extension of the use of credit instruments, alternating crises in trade and financial speculation, capitalistic and industrial development and other contemporary movements.

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* See "Causes of the Rise in Prices" by J. A. Hobson. "The Contemporary Review," No. 562, October, 1912.