

CHAPTER V

INDUSTRIES

Old-time Industries

THERE is not much on record to show the nature of industries that flourished in the district before the advent of the modern age, but it can be presumed that the rural parts in the district of Kolar had their own activities for the development of such of the cottage industries whose products found a ready market. The manufactured wares consisted of handloom goods including blankets of coarse and fine varieties, bangles, etc. There was abundant demand for these products. The Kolar *kambli* (blanket) was in great demand in the old days. It is recorded that in the early years of the 19th century, in the villages round about Malur and elsewhere, coarse woollen blankets or *kamblies* were woven from the wool of the sheep. Twelve sheep were reckoned as giving as much wool as was necessary for a blanket, 6 cubits long and 3 cubits wide. The wool-weaving occupation has been put on a firm foundation by the sustained support given by successive Governments. This industry is the oldest on record.

Next in importance came the manufacture of glass-bangles. This industrial art was practised in Bagepalli and Sidlaghatta taluks and handed down from father to son as a traditional occupation. The Julupalya bangles were spoken of highly in the old days and when the markets were flooded with these attractive bangles, ladies of all classes used to buy them. Some villages in Sidlaghatta taluk like Thimmasandra and Hosahalli were also noted for the manufacture of glass-bangles. In the old days, the artisans here used to manufacture bangles of a special variety which gave added grace to the wearers. In recent decades, there has been a noticeable decline in this once flourishing industry because of the importation of cheap-priced bangles from outside which forced most bangle-making units to close down.

According to Francis Buchanan, earth-salt was being manufactured at Takal¹ (Tekal) in Malur taluk. In the dry season, the surface of the earth was scraped and collected in heaps. In front of these heaps, the salt-makers constructed a semi-circle of small round cisterns, each about three feet in diameter and a foot in depth. The sides and floors of these cisterns were made of dry mud and each cistern had, at its bottom on the side towards the heap of saline earth, a small aperture with a wooden spout to convey the brine into an earthen pot that was placed in a cavity under it. The bottoms of the cisterns were covered with straw and then the saline earth was put in, till it rose nearly to the tops of the walls. Water was then poured on the surface of the saline earth and in filtering through into the pots carried with it all the salts. The inert earth was then thrown out behind the cisterns and new earth was put in with more water. In the meantime, the brine was emptied into a cavity cut in a rock and the evaporation was entirely done by the sun. This salt was very cheap and was sold at the rate of 20 seers a Sultani Fanam. **Earth-salt**

The sugar-candy made at Chikballapur² was famous and the clayed sugar was very white and fine. The process of manufacture, it is said, was introduced by Tipu Sultan and was kept a secret. The price of the fine sugar-candy was 10 rupees for a maund of 24 lbs., and of the fine soft-sugar 25 Sultani Fanams a maund, while the prices of the common brown sugar-candy and soft-sugar varied from Rs. 3 to 5 per maund. The sugar-makers purchased the juice of the cane from the farmers after it had been boiled down to a certain degree, and paid Rs. 2 for the produce of 2 maunds or 80 seers of jaggery. Gudibanda and Sidlaghatta were also known for the manufacture of jaggery and sugar-candy. **Sugar-candy**

In parts of Srinivaspur taluk, hand-pounding of rice, leather-tanning and handloom-weaving flourished once; but hand-pounding of rice suffered a setback because of the increase in the number of rice mills. The leather-tanning industry also declined, because hides and skins were largely exported outside. Handloom-weaving also suffered because of certain handicaps like lack of demand to some extent and paucity of adequate marketing facilities; the same pattern of industry existed in Chintamani taluk. In this area, hand-pounding of rice, oil *ghanas*, smithy and sculpture flourished in the old days. In later days, there was a perceptible decline due to financial difficulties, lack of technical skill and non-availability of raw materials. The contiguous Bagepalli and Gudibanda taluks were also noted for silk-weaving, hand-pounding of rice and sculpture. These also showed a decline with the passage of time. Shivarapatna in

1. Modern Mysore [(from [the beginning to 1868) by M. Shama Rao, 1936, p-309.

2. Ibid, p-314.

Malur taluk was famous for the manufacture of fine stone-ware idols. This hereditary art is still being practised by a number of families at the place.

One prominent industry, which had great potentialities, was gold-mining and this has developed in recent years. This has been discussed in full elsewhere in this chapter. Modern industrial growth is mainly dependent on the availability of power, modernisation of machinery, good markets and the necessary technical know-how. The Central and State Governments have, of late, formulated various schemes to help the growth of not only large-scale but also small-scale and cottage industries.

Power supply

The Kolar district was the first along with Bangalore and Mysore to get the benefit of hydel power generated at the Cauvery Power Station at Shivasamudram. Though the district had no thermal or hydro-electric power production units, the area was among the first to get electric power on account of the gold-mining industry. In June 1899, Captain A. J. De Lotbiniere of the Royal Engineers, who was the Deputy Chief Engineer of Mysore, conceived the idea of power motivation to work the mining machinery in the Kolar Gold Fields area. Captain Lotbiniere had the required experience of power installation at the Niagara Falls in America. The scheme as adumbrated by the Royal Engineer received the warm support of Sri K. Seshadri Iyer, the Dewan of Mysore at that time, and was sanctioned by Her Highness the Maharani Regent.

In August 1900, the Mysore Government entered into an agreement with the Mining Companies for the supply of power. The contracts were then given to the General Electric Company of New York and Messrs. Escher Wyss and Company of Zurich for the supply and erection of the electric and hydro-electric plants, respectively. The first agreement entered into by Messrs. John Taylor and Sons with the Mysore Government stipulated a power supply to the extent of 4,000 H.P. for working the mines at the rate of £ 20 per annum per H.P. for an initial period of 10 years. This rate was reduced to £ 10 per H.P. per annum after the tenth year. This rate existed upto 1941 when a fresh agreement was entered into based on a flat rate of .49 anna per unit.

As per agreement, the General Electric Company of New York undertook the execution of the Cauvery power scheme and laid a transmission line to the mining area from Shivasamudram by 1902. The voltage was stepped up to 33,000 volts by the method of diffused transformers of 1,200 k.w. each, which were four in number. The power supply was stepped down to 23,000 volts at the mining site. In the beginning, there were 31 motors in the mining area and now there are 1,016 motors.

By 1916, the then existing system of transmission was changed over to 78,000 volts with the installation of 4 banks of transformers of 5,250 K.V.A. It has been noticed that the demand for electric power in the mining area from 1902 to the present time has gradually increased. The demand now is about 20,000 K.W. The whole mining area is now depending on the power supply from Shivasamudram. The mining area has a contract demand of more than 16,000 K.W., yielding a revenue to the State of 28.91 lakhs of rupees per annum. The power supply for running the machineries is on 25 cycles and the mining authorities do not desire any change in the frequency as all their equipments work only on 25 cycles.

As the output in the mines increased, it was noticed that the power supply from the Cauvery power scheme became inadequate. It was then decided to erect a Mines' Power Station by way of supplementing the hydel power. In 1905, the then Mining Company brought into existence a new power station consisting of Babcock and Wilcox's water tube boilers, coal being fired by hand to supply steam to high speed reciprocating Allen Engine-driven alternators. This power was first used for running motors in intermittent use and was known as the intermittent power. The fields were also lighted by this power. In the early days of this power station, a total of 2,10,294 units was consumed. Now the consumption is anywhere in the neighbourhood of 3,50,000 units. With the increasing demand for power from all sides, the optimum benefit was derived from this power station. In 1915, a new contract was entered into for the purchase of bulk supply from the Shivasamudram Hydel Scheme. The distribution was on 25 cycles for operating motors and 50 cycles for lighting. The generating unit of the mines was used purely as a stand-by.

Mines' Power Station

In 1957, the conversion from steam to diesel was completed and the present capacity of the Mines' Power Station is 4,325 K.W. on 25 cycles and 400 K.W. on 50 cycles. The emergency plant is kept in constant readiness in case of a prolonged failure of the Shivasamudram system. The total average consumption of power per year in the mining area is now about 9,43,86,000 K.W.H. The power is purchased in bulk from the Shivasamudram generating unit and transmitted from there on 25 cycles. There are 42 large and medium-size and 26 small-size electric hoists both on the surface and underground. Three large-size surface hoists are at Edgar's, Gifford's and Henry's shafts. These hoists have fly-wheel generator sets for storing the power drawn from the line to equalise the peak loads caused at starting. The largest electric winder installed on these mines is at Gifford's shaft, which is of the conical double drum type with a drum diameter of 36 feet and is driven by two 1,275 H.P. D.C. motors directly geared to the main drum shaft. The power for the motors is received from the motor generator set driven by a 1,750 H.P. synchronous motor,

driving through a hydraulic coupling with two 20-ton fly-wheels. Until recently, this was one of the largest winder installations in the world.

Extension of power supply

The power supply in Kolar Gold Fields area gave an impetus to the rest of the district's inhabitants who also wanted their houses and villages to be electrified. Representations were sent to Government to provide power to as many villages as possible. The Government was not slow in meeting the popular demands. The busy area of Andersonpet was first electrified in May 1924. Bangarpet, in the proximity of the Gold Mines, received electric supply in September 1927, while the headquarters town of Kolar was electrified in October 1929. According to the statistics prepared by the Mysore State Electricity Board, there were 256 electrified towns and villages in the district in 1960; this number increased to 931 by the year 1966, thus registering about a four-fold increase in the number of villages and towns electrified.

With the easy availability of power, the cultivators of the district came forward in good numbers to instal irrigation pump sets. This method of irrigation became very popular in all taluks of the district. It was ascertained that there were in all 2,335 pump sets in the district worked by electricity in 1960 and this number registered a sharp increase, and by 1966-67, there were as many as 9,535 pump sets in the district. The following are some relevant particulars of development of power supply in the district relating to the year 1966-67 :—

Number of lighting installations	..	27,625
Number of heating circuits	..	398
Number of power circuits	..	953
Irrigation pumping sets	..	9,535
Number of towns and villages electrified	..	931

Power distribution

The hydel power produced at Shivasamudram is taken through transmission lines by way of Kanakapura, Anekal and Bangarpet taluks and then on to the mining area. Important step-down stations are located at various places with installed capacities ranging from 300 K.V.A. to 28,500 K.V.A. The following were the step-down stations located in the district in 1966-67 :—

Kolar Gold Fields step-down station.	28,500	K.V.A.
Bangarpet	.. ..	300 "
Kolar	.. ..	10,000 "
Chintamani	.. ..	750 "
Chikballapur	.. ..	2,100 "
Gauribidanur	.. ..	6,000 "
Bagepalli	.. ..	1,000 "
Mulbagal	.. ..	750 "
Sidlaghatta	.. ..	750 "

Recently, the Mysore State Electricity Board has decided to have a uniform frequency in the power distribution. It has been programmed to give 50 cycles power to all the areas except the mining area. Chikballapur, Sidlaghatta, Gauribidanur, Malur, Bagepalli and Gudibanda areas are already fed with 50-cycle power supply. The remaining areas around Kolar, viz., Bangarpet, Chintamani, Srinivaspur and Mulbagal will be supplied with 50-cycle power in the coming years.

Some of the important economic minerals like gold, corundum, kyanite, sillimanite, kaoline, ochres, building stones, graphite, feldspar are available in the district. The gold-bearing lodes of the Kolar Gold Fields lie in a narrow band of rocks of the Dharwar series for about 50 miles in length. Corundum, which is used for the manufacture of abrasive products, is available in Gauribidanur taluk. Kaoline, another mineral used in the manufacture of porcelain and china clay, is obtainable in Mulbagal, Sidlaghatta and Chintamani taluks. Kyanite and sillimanite are available in Sakarasanahalli, Dodderi and Kamasandra in Bangarpet taluk; these are used in aluminium refractories. Several patchy deposits of pale yellow ochre occur in parts of Kolar, Mulbagal and Srinivaspur taluks. This mineral is used in the manufacture of pigments, distempers and oil paints. Amethyst, a transparent crystal of quartz, rock crystal and other building stones are available near Chikballapur and Malur. Some of these minerals are already being worked in the district and the following figures, relating to the year 1963-64, indicate the quantity of minerals worked and their value :—

**Economic
minerals**

<i>Mineral</i>	<i>Quantity worked</i>	<i>Value in Rs.</i>
Gold	.. 34,38,074 grams	1,80,75,000
Silver	.. 2,37,456 „	55,000
Feldspar	.. 2,334 tonnes	19,378
Graphite	.. 681 „	19,378
Kaoline	.. 381 „	2,602
Ochre	.. 172 „	1,580

LARGE-SCALE INDUSTRIES

The progressive outlook of Mysore has been evident in several directions—cultural, educational, industrial and other fields—and the State has carved out her own unique place in the map of India for several pioneering undertakings of economic and industrial importance. Nature has been bountiful in her blessings in this part of the country. The two waterfalls of the Cauvery and Sharavathy in Mysore State have been harnessed to generate electricity on a large scale which is so essential for industrial development.

**Kolar Gold
Mining
Undertakings**

With the help of this motive force, several large-scale industries took their birth in the State and have prospered. One such industry that has been helped by electric power is the gold-mining industry in Kolar Gold Fields.

Gold, the queen of metals, coveted alike by prince and peasant and from times immemorial the most eagerly sought precious metal by every nation on earth, savage or civilised, is being produced to a considerable extent in Kolar Gold Fields. Gold mining is a highly speculative venture, but a venture of a kind which will repay a hundred-fold if it succeeds. It is estimated that India's annual contribution to the world's gold production amounts to a little less than one per cent. More than 99 per cent of it comes from Mysore and a major portion of this from Kolar Gold Fields, situated sixty miles from Bangalore and ten miles from Bangarpet on the Bangarpet-Marikuppam branch of the Southern Railway.

Early history

The early history of gold-mining in India is lost in the mists of antiquity and nothing is now known for certain of the identity of the miners who worked for the precious metal; neither is it known when exactly gold-mining first started. In the first century A.D., the Roman historian, Pliny, recorded that "in the country of the Nareae (Nairs) beyond the mountain Capitalia (Mt. Abu in Rajasthan) there are numerous mines of gold and silver in which the Indians work very extensively" and it must be assumed that the industry was well established by then for its fame to have spread as far as Rome. None of the European adventurers, who visited India in the middle ages, mentions gold-mining, and what happened to cause an almost complete cessation of the production of gold for many centuries is not known. It is quite certain, however, that it was not the exhaustion of the gold-bearing lodes. Natural disasters such as famine or disease might have overtaken the mining communities or invasions might have caused the miners to fill up their workings so that the invaders could not work them, and to retreat in the hope that they or their sons might be spared to reopen the mines in later years—a hope that was never fulfilled. Whatever the reason for the abandonment of the mines might have been, it is fairly certain that they remained idle until the 17th or 18th centuries.

Ancient workings

Ancient mine-workings are wide-spread in the Deccan, particularly in the areas of Mysore and Madras, some of them extending to depths of 300 feet in the Kolar Gold Fields and 640 feet at Hutti, in the Raichur district, and it was mainly the existence of ancient workings that led to the commencement of modern prospecting on the Kolar Gold Fields.

The earliest workers of the gold-bearing lodes in South India had neither steel nor explosives and they employed the slow process of "fire-setting" to extract the ore. Wood fires were lit

against the face of the rock which, when sufficiently heated, was quenched with water and so disintegrated. In the old Coromandal Mine (now part of the Nundydroog Mine), at a depth of 200 feet in the ancient workings, remains of old water vessels were found and a series of niches in the foot-wall were observed which were apparently for the purpose of holding the feet of workers who were passing up the water and ore.

The wide distribution and the great number and extent of the ancient workings discovered in South India indicate an industry of great magnitude and it is strange that there is no recorded or traditional history of the ancient miners, of their activities or of their identity.

It is believed that over the years, some desultory mining continued in the Kolar Gold Fields and it is stated that in the 18th century, Tipu Sultan tried to work the mines but failed. Local workers continued to win a little gold from the ancient mines, but so numerous were the accidents that under-ground working was prohibited by law in 1859 and so, once again the production of gold ceased.

**Recent
history**

The first authentic record of gold in the Kolar district is found in the report of Lieut. John Warren of H.M. 33rd Regiment in the Asiatic Journal of 1804. In 1802, while demarcating the Mysore boundary on the south side of Yerakonda hill, about five miles from Marikuppam, he heard rumours of the discovery of gold at Marikuppam and Oorgaum, and prospected the area but without success. During the next 60 years, spasmodic prospecting operations were conducted, and in 1860, a small syndicate of military residents of Bangalore was formed. Their capital was soon exhausted in prospecting, and no tangible results having been obtained, they also abandoned the search.

The pioneer of the present industry was undoubtedly Michael F. Lavelle. He was an Irish soldier who served with his Regiment during the Maori War of 1864 and, on the cessation of hostilities, he returned to Bangalore. While in New Zealand, he had learned something about gold-mining and when, on his return to Bangalore, he heard rumours of the occurrence of gold in the Kolar district, he decided to prospect the area. He first visited the district in 1871, and in 1873, applied to the Mysore Government for a licence to prospect for coal and other minerals. In 1875, he obtained the exclusive right to prospect for minerals in the Kolar district for a period of three years, with the option of selecting not more than ten blocks of land, each not exceeding two square miles in area, on which to commence mining operations. On each selected block, the Mysore authorities agreed to grant a twenty years lease. Lavelle commenced operations by sinking

a shaft near Oorgaum. But finding that a large capital was required for carrying out the work, he made repeated efforts to obtain the support of influential people. He eventually succeeded and in 1877 transferred his rights to Maj. Gen. de la Peor Beresford of the Madras Staff Corps and others who later formed a syndicate known as the Colar Concessionaries Company Limited. The capital of the syndicate was soon exhausted. Fresh capital was raised and in 1879 a little auriferous quartz was found. Shortly afterwards, the original Oorgaum Company of Madras Limited was formed with a capital of £ 10,000. At this time, the Wynad boom was at its height and interest soon spread to the Kolar area. By the year 1881, as many as eleven companies with an aggregate capital of £ 1,300,000 had been floated, the majority of which, however, subsequently ceased operations.

**John Taylor
Company**

In 1880, Messrs. John Taylor and Sons of London were approached to undertake the development of certain of the properties of the Kolar Gold Fields. The results for a time were disappointing, and credit must be given to Mr. John Taylor of that firm, who, with Captain Plummer, who discovered the Champion lode, and Mr. Bell Davies, persevered when several of the original companies had gone or were going into liquidation. The case of the Mysore Mine is remarkable. On 5th October 1883, at a momentous meeting of the shareholders in London, it was disclosed that only £ 13,000 in cash was left. The shareholders debated whether it was better to distribute the money or continue operations. Mr. John Taylor persuaded them to make a further trial. His wise counsel prevailed and in a short time valuable gold discoveries were made. Had the mine then been abandoned as desired by a number of shareholders, the Kolar Gold Fields, instead of becoming one of the greatest gold-producers, would, in all probability, have been numbered among its failures.

By 1885, the success of the Kolar Gold Fields became established. In 1886, the Mysore Mine paid a royalty of Rs. 33,368 to the Government. This was the first sum of royalty received by the Mysore Government from the Mines. The sum went on increasing in the subsequent years and it was Rs. 7.33 lakhs in 1895 and Rs. 9.80 lakhs in 1935. In 1894-95, there were 13 companies at work representing a capital of £ 3,500,000, with a labour population of 400 Europeans and 11,700 Indians. The initial output of gold was 16,325 ounces (1886-87) valued at Rs. 8,88,606. But although the State and the country at large were naturally benefited thereby, the principal transactions in respect of the mining companies used to take place in England from where all the capital had been raised and to where all the gold was conveyed.

The history of the Gold Fields would be incomplete without an account of the firm of John Taylor and Sons, who, as mining engineers, had a notable record in mining history. Founded in 1798 by Mr. John Taylor, a young engineer of Norwich, it conducted mining operations in all parts of the world. The development and management of the mines of the Kolar Gold Fields were started by a grandson of the founder, and the efficient manner in which it was continued resulted in the industry becoming the largest and a most successful commercial enterprise in the Mysore State.

During the three quarters of a century since organised gold-mining in the Kolar Gold Fields started, many mining companies were floated and some of them either failed or were absorbed by their more powerful neighbours, and eventually the number of operating mines was reduced to five. In 1931, the Balaghat Mine was taken over by the Nundydroog Company, and in 1953, the Oorgaum Mine was amalgamated with the Champion Reef Mine leaving only three mines.

At the request of the Mysore Government, new companies were formed and registered in India in 1950, the share capital of which was, however, totally owned by the original British Companies; the place of business was transferred from London to the Kolar Gold Fields and Messrs. John Taylor and Sons formed a subsidiary Indian Company to carry on the management of the Mines.

In 1955, the Government of Mysore announced their intention to nationalise the gold-mining industry of the Kolar Gold Fields. After some negotiations, it was agreed that the Government should take over all the assets and liabilities of the mining companies in India for a net payment of Rs. 1,64,00,000. A Bill was accordingly formulated and it was passed by the Mysore State Legislature embodying the terms agreed upon and providing substantial safeguards and guarantees for all grades of employees of the Mines.

**Nationali-
sation of
Mines**

On 29th November 1956, the management of the Mines passed from the control of the British private enterprise into the hands of the Government of Mysore as a national venture and on that day, Sri S. Nijalingappa, the then Chief Minister of Mysore, formally took over the industry on behalf of the State Government. With the passing of the nationalisation Act, the firm of Messrs. John Taylor and Sons ceased to be Managers of the Mines, but were appointed by the Government of Mysore to serve as Mining Consultants. By the Act of nationalisation, the Mysore Government acquired the Mysore, Champion Reef and Nundydroog Mines, together with the Kolar Mines Power Station and the

Kolar Gold Fields Hospital. These enterprises, which constitute one of the largest industrial units in the country, provide employment to over 13,000 persons as at present and support a local population of over one lakh. To illustrate the magnitude of the industry taken over from the mining companies, some recent figures of production and value of gold are given elsewhere in this chapter.

The gold-mining industry has been a source of revenue to the Government of Mysore in the form of payment of royalty and taxes and since its inception, over Rs. 25 crores have been paid to the Government on these accounts. Over the same period, the annual return to the Government on account of sales of power and water to the Mines has averaged over Rs. 30 lakhs. In addition to direct payments to the Government, much of the revenue from mining has been paid out in the State in the form of wages and purchases of local supplies. The circulation of new wealth thus created within the State has undoubtedly contributed to the economic prosperity and industrialisation of the Mysore State.

The Kolar Gold Mines were taken over by the Government of India on 1st December 1962 from the Government of Mysore and these mines are now under the administrative control of the Department of Economic Affairs, Ministry of Finance, Government of India. The management of the Undertakings is vested in a Board of Management constituted by the Government of India of which, the Joint Secretary, Ministry of Finance, Department of Economic Affairs, Government of India, is the Chairman. Messrs. John Taylor and Sons continued to be Consulting Engineers for the Gold Mining Undertakings.

Geology of Gold Fields

The gold-bearing lodes of the Kolar Gold Fields lie in a narrow band of rocks of the Dharwar series. This band is about 50 miles in length reaching from Srinivaspur in the north to within a few miles of Krishnagiri in Madras State in the south and the width in the gold fields area is about three miles. The major gold producing region, which is located near the centre of the band, is contained within a strike-length of about five miles. Minor occurrences of gold are to be found elsewhere throughout the length of the band. The Dharwar rocks in this area consist of a pseudoconglomerate series on the eastern side, schists in the centre and ferruginous quartzites to the west, the whole lying within a complex of fundamental granite gneiss rocks.

The gold-bearing lodes in general are all located within the schists though gold does occur occasionally in the quartzites. The schists are generally hornblendic, but are complex and varied in nature, and no definite relation has yet been proved between any particular type of schist and the rich auriferous chutes which

occur within the lodes. Recently, an extensive and detailed investigation of the schists of the Kolar Gold Fields area has been undertaken by the Geological Survey of India.

The schists are intruded by both diabasic dykes and pegmatites and are cut and in varying degree displaced by numerous faults. The occurrence of these intrusive rocks and the nature of the faults, which are still undoubtedly under very great geological strain, have played a major part in the development of the special mining techniques employed on the Kolar Gold Fields.

In the early days of prospecting on the Kolar Gold Fields, **Lodes of Gold Fields** extensive parallel runs of ancient workings and lodes were discovered but the work was eventually concentrated upon what came to be known as the Main or Champion lode. This lode, which can be traced along its strike for over four miles, has been worked to a depth of nearly 10,000 feet and a highly payable ore has been mined over the whole of the strike distance. The width rises, in places, to over 30 feet but averages under four feet, and a marked feature is the concentration of gold values into well-defined and persistent ore chutes which have yielded great tonnages of high grade ore. Closely parallel to and possibly concentrated with the Champion lode, are a number of smaller eastern and western branches which have also yielded appreciable tonnages of payable ore. The lode is occasionally, and in particular, on the Mysore Mine, closely folded on itself. These fold structures persist for considerable distances and are frequently the source of high grade ore, the mining of which presents many special problems of extraction and support.

Lying well to the west of the Champion lode is a well-defined system of western lodes. These were mined in the earlier days on the Golconda, Nine Reefs, West Balaghat and Road Block Mines which now form parts of the Nundydroog property. The lower grade of the ore, however, and the metallurgical problems associated with its highly mineralised nature, eventually resulted in the suspension of operations at these mines for many years, and it was not until 1935 that a limited amount of mining was re-started. As a result of the approaching exhaustion of the ore reserves on the Champion lode at the Nundydroog Mine, an intensive search was initiated in 1946 by that Company for the downward extension of the western lodes which had been worked in the small and shallow mines in the region. A very large tonnage of medium and low grade ore has already been opened up, and there is every indication that further development will yield many millions of tons of ore of similar grade in the next decade.

The greater part of the ore so far developed is on what is known as the Oriental lode which runs parallel to the Champion lode at an average distance of 1,700 feet to the west. Between these two are a number of minor lodes, the most important of which are the McTaggart's East and McTaggart's West, which, as yet, have not been extensively explored underground. The western lodes are most clearly defined at the northern end of the Kolar Gold Fields, and whilst there can be little doubt as to the relationship between those worked by the ancients and in the earlier days of modern mining and the exposures in depth in the Nundydroog Mine, the problem of the relationship between the lodes on Nundydroog and the complicated system of western outcrops, which extend through Champion Reef to the Mysore Mine, has yet to be established.

The Geological Survey of India has, in recent months, carried out an investigation of the western lodes at the south end of the Gold Fields and active prospecting is on hand in the Mysore Mine and it is hoped that this may lead to the further discovery of payable ore on the western lode system. The development of the Western lode system on Nundydroog Mine has called for new shafts, and after a period of many years during which there has been no shaft sunk from surface anywhere on the Gold Fields, two new shafts have recently been started.

The new trial shaft, which reached a depth of 1,668 feet on 1st December 1966, serves the workings on McTaggart's lode near the south end of Nundydroog Mine and ore is being hoisted regularly from several levels. It is intended to sink an auxiliary shaft below 1,500 feet level to develop McTaggart's West Reef in depth. The Golconda shaft at the north end of the mine had reached a depth of 2,213 feet and hoisting of ore has been in force for the last eight years. It is proposed to continue the shaft to 38th level which is equivalent to 3,200 feet below surface. The Golconda auxiliary shaft, from its 2,000 ft. level horizon, has been sunk to a depth of 1,025 feet and this shaft is used for developing the southern parts of the Oriental lode above the 38th level and it is intended to continue sinking of the shaft to the ultimate depth of 3,800 feet. Hoisting of ore is already in progress in this shaft for the last five years.

Mineralogy

The gold of the Champion lode is disseminated throughout the quartz and the individual particles cover a wide range of sizes, from the finest upwards, nuggets weighing over 10 ounces having been recovered in the Mysore Mine some years ago. The gold is naturally alloyed with silver and for many years the bullion sent to the Bombay Mint has averaged 7.2 per cent silver.

The quartz of the Champion lode contains, in addition to gold, small quantities of sulphide minerals. Pyrite, pyrrhotite and arseno-pyrite are the most common; galena and chalcopyrite also occur occasionally, and very rarely, zinc blende. The galena is very markedly associated with the richest portions of the lode. Biotite mica is frequently found in the wall rocks of the lode. Tourmaline is not uncommon and appears almost certainly to be derived from the granitic intrusions into the schists whilst garnets occur under similar conditions. The total content of sulphide mineral is low and the ore milled from the Champion lode rarely contains as much as 1 per cent.

The mineral associations of the Western lode system are similar to those of the Champion lode, but the sulphide mineral content is far higher. Pyrrhotite and arseno-pyrite predominate and occur in both massive and disseminated form. The other sulphides are far less common, and blende has not yet been detected. Garnets and tourmaline occur, and occasionally graphite is found. The sulphide content of the ore from this system at present being milled at Nundydroog averages about 5 per cent and occasionally rises well above this figure.

In contrast to the sulphides of the Champion lode, those of the Western lode system contain gold in a form that is not completely liberated by fine grinding with the result that the extraction of gold on Nundydroog is not so high as on the other mines.

In the early days of the Mines, the shafts were usually sunk through the quartz reef in order to avoid any unprofitable excavation of barren rock. But with the progress of the industry, this practice had to be abandoned, for the hoisting of large tonnages at high speeds was found to be impossible through tortuous shafts which followed the vagaries of the various reefs. **Shafts**

The rapid development of the mines in depth required straight shafts which were sunk either vertically or on incline in the foot-wall rock below the reef. There is, however, a limit to the economic depth of a shaft and as mining continued to ever lower horizons, it eventually became necessary to sink a number of secondary shafts, sited deep within the mine. These shafts, moreover, are often positioned at distances of upto 500 feet from the reef, with the intention that they will be unaffected by the stresses and strains which develop in the rock when the reef is subsequently removed. Finally, with the attainment of ultra-deep levels, the limit of these secondary shafts is now being approached and plans are on hand for the sinking of tertiary shafts which will be necessary to obtain access to the gold ore lying at and below the 10,000 feet horizon.

**Gifford's
shaft**

Resulting from the tremendous depths at which work is carried out, the technique of sinking deep shafts was undoubtedly pioneered on the Kolar Gold Fields. Remarkable among these shafts is the Gifford's Shaft, the principal means of access to the Champion Reef Mine. At the time of its completion in 1940, this was the deepest single shaft in the world, having a depth of 6,586 feet or almost exactly $1\frac{1}{4}$ miles. The shaft is circular in cross-sections, with a diameter of 18 feet and is lined throughout its length in brick and concrete. The two duralumin cages weigh 3.6 tons each with a capacity of either 50 men or four $1\frac{1}{4}$ ton trucks. The time of travel through the shaft is $3\frac{1}{2}$ minutes, the cages attaining a speed of about 30 miles per hour. The driving power is provided by a Ward-Leonard controlled winding engine, which can be said to be one of the most powerful of its kind in the world and develops 4,450 H.P. at peak load. The cages are suspended by wire ropes each of which weighs 21 tons. In short, this shaft is an engineering wonder of no mean dimensions, and indeed, many well-known personages including His Highness Sri Jayachamaraja Wadiyar, Lord Wavell, Dr. Rajendra Prasad and Pandit Jawaharlal Nehru have all, at one time or other, visited Gifford's Shaft and travelled in its cages.

The other shafts worthy of note are Bullen's Shaft (1911) which is 3,871 feet in depth and is rectangular in section and timber-lined; Edgar's Shaft (1917) which reaches a depth of 3,804 feet and is the principal means of access to the Mysore Mine to the south, and Henry's Shaft (1924) which reaches a depth of 4,088 feet and serves the Nundydroog Mine to the north. These two shafts are circular in section and are brick or concrete-lined throughout. A fine example of a secondary shaft is the Bullen's Incline, serving the lower levels of the Oorgaum section of the Champion Reef Mine. This shaft was sunk 4,975 feet from the 40th to the 88th level and is equipped for hoisting men and large tonnage of ore at high speed. The winding engines used to drive the cages in these and the many other shafts of the Gold Fields are operated either by electricity or compressed air, electricity being used for the larger and more modern shafts.

Recently, certain safety devices were invented by the Chief Engineers attached to the Undertakings so as to make the underground mining operations safer and easier. Sri A. R. Satyabodha Rao, Chief Engineer of the Central Workshop of the Mines, invented a new device that automatically stops the over-winding of the engines operating the underground and surface cages of the Mines, while Sri B. V. Krishnaiah, Chief Engineer of the Nundydroog Mine, invented an automatic speed-indicating recorder for the winding engines. These devices, apart from making underground mining safer, have also helped to save a considerable amount of foreign exchange.

In order to obtain access from the shafts to the lode, to exploit the lode itself and to carry out prospecting operations in the unending search for gold, it is necessary to tunnel through the rock and some 600 miles of such tunnels have been driven. The ground below the surface is, therefore, honeycombed with a maze of workings so intricate that there is no man living who can claim to know them all.

Prior to the introduction of the compressed air-operated rock drill, "hammer-men" were employed to drill holes by hand in the rock face, these holes being subsequently charged with explosives and blasted. This was, however, an inefficient process, as one hammer-man and his assistant could not normally drill more than three or four feet with a day's work because of the hard nature of the rock. Machine-drilling was introduced about half a century ago, and the various types of rock-drill in use since their introduction have undergone a remarkable evolution from the cumbersome old reciprocating machines, which had to be laboriously rigged to a bar, to the fast and light jack-hammers in current use.

Drilling operations

The development practice, to-day, consists of drilling some 20 holes in the face of the tunnel, using a compressed air jack-hammer, an "air-leg" support, and tungsten carbide tipped drill rods, the holes being some three feet in depth and about $1\frac{1}{4}$ inches in diameter. After completion, they are charged with blasting gelatine which is detonated either electrically or by safety fuse. The holes are timed to explode in such a way that the first few shots release the wedge of rock in the centre of the face and the remaining shots are then free to explode into the opening so formed. Where safety fuse is used, the timing is effected by varying the length of the fuses, but in the case of electrical detonation, advantage is taken of the different grades of detonators which are manufactured in such a way that they explode with the required time-lag after the current has been passed through them.

The typical data for development work on the Kolar Gold Fields are as follows :

Size of face	.. 7 ft. x 6 ft.
Explosive consumption per foot advanced	.. 8 lbs.
Drilling crew	.. 1 maistry and 2 men.
Mucking and tramming crew	.. 1 maistry and 3 men.
Blasts per day	.. 2.
Daily advance	.. 3 to 4 feet.

In the deeper levels of the Mines, which in some places have reached nearly 10,000 feet below the surface, the rock pressure is

so great that the tunnels have to be continuously supported by massive steel rings or "setts" placed at intervals of 3'-6" and lagged with casuarina poles. If this is not done, there is the danger of violent collapse taking place.

**Stoping
operations**

The tunnels or "drives" through the lode are sited at intervals of about 100 feet in depth. These are inter-connected by sinking a series of minor shafts of "winzes" at the required intervals, these being essential both for ventilation and to help expose the ore body. When this work is completed, the next operation is the mining of the quartz "blocks" opened up by the winze and drive development, this operation being known as "stoping".

The most common methods of stoping employed in the Kolar Gold Fields are back-stoping, bottom-stoping and rill-stoping. The same type of drilling equipment is used as was previously described for development. The holes are usually 2'-6" to 3'-6" in depth and inclined to the face of the stope at about 35°. These holes are charged with explosives and blasted at the end of the day's work and the gold-bearing quartz is thus broken into the open portion of the stope. Subsequently, it is shovelled or scraped mechanically into chutes, where it falls into trucks on the level below and is transported to the nearest shaft for hoisting to the surface. In main levels, electric or diesel locomotives are now used to facilitate underground transport of ore and material.

If the maximum safety of working is to be attained, the problem of stoping is not so much that of extracting the ore as of the sequence in which it is extracted and of supporting the excavation afterwards. The most common method of support is to build into the stope solid masonry walls of granite quarried from the surrounding country-side. This keeps the deformation of the rock and closure of the excavation to a minimum and thus helps to preserve its strength.

In recent years, on the Nundydroog Mine, extensive investigations have been made into the possibility of filling the stopes with sand. A large section of the mine on the West Reef has been laid out for the systematic use of sand-filling as the standard method of support and sand is now being regularly lowered into the mine for this purpose. The sand is transported into the stope hydraulically which rapidly settles down as a compact "fill". The advantages of this method are that it is considerably cheaper than granite, the work may be carried out more rapidly and the sandfill is of a much more uniform texture than is the granite. Unfortunately, however, the method is unsuitable for use in the lower and hotter levels of the mines since the air rapidly becomes very humid as a result of the large quantities of water which must

be used, and, in consequence, working conditions would become intolerable.

The current methods of support represent the culmination of decades of experience. In the earlier stages of mining, the support consisted merely of timber props, but with increasing depths, it became necessary to substitute for these props timber packs filled with waste rock. At a still later stage, the stopes were completely filled with broken waste rock and thus it can be seen that the present methods have only been developed as a result of a long period of evolution.

A matter of great importance is the disposal of water encountered in the course of mining operations. Innumerable pumps, both large and small, driven either by compressed air or electric power, are installed in different levels of the mines and water is collected in suitable dams underground and pumped to the surface in stages. The quantity of water thus raised is of the order of 2.1 million gallons per day, and this water is used for the processing of ore as well as for other purposes.

Pumping of water

One of the main problems of mining at great depths is that of the high temperatures which exist underground. The temperature of the rock increases by about 1°F for every 110 feet in depth and at 10,000 feet, the temperature of the newly exposed rock is 150°F. Human physique, even at its best, cannot withstand this heat for more than a brief period; nor can efficiency of labour be sustained at a reasonable level throughout the entire working shift. In order to mitigate the effects of such extreme temperatures, air-conditioning plants, four in number, with an aggregate capacity of supplying one million cft. of dry air per minute, are installed on surface. In addition to this, a secondary air-conditioning plant for further lowering of temperature in the deepest working places has been installed at a depth of nearly 8,000 feet below the ground on the Champion Reef section of the Mysore Champion Reef Amalgamated Mine and the provision of "spot coolers" for cooling isolated development points remote from the main ventilation circuits of that mine is now an established practice.

Air-conditioning plants

The inhalation of the fine dust produced by mining operations such as drilling, blasting and handling of ore can have serious physical effects upon underground workers and necessary steps are taken to suppress the formation of dust and its distribution in the mine atmosphere. Whenever working conditions permit, water is used to damp down the rock and wet drilling is customary where, owing to the extreme heat of the lower levels of the mine, the use of water is impracticable; various forms of dust trap are in general use to collect the dust produced when rock drills have

Dust suppression

to be run dry. Up-to-date methods of dust suppression are continuously under review and currently experiments are on hand on the use of certain chemicals and oils to increase the efficacy of the water used for damping down and on the use of water stemming in blasting, which not only reduces the production of dust but also improves blasting efficacy. Regular sampling of underground air to estimate its dust content is carried out and all possible steps are taken to reduce the dust hazard to a minimum.

Fire precautions

The fire risk in the mines is a special danger and is accentuated by the hot ventilating air which rapidly dries out the timber used underground. In consequence, the fire fighting organisation on the Kolar Gold Fields has been developed to a high degree of efficiency.

Warning of fire is given by injecting eucalyptus oil into the compressed air supply and sprinkling it into the downcast shafts. Within a few minutes, all the workers in the mine become aware of the smell and gather at the shaft stations to be hoisted to the surface. Teams wearing "proto" oxygen-breathing apparatus go into action immediately but unless very early warning is given, it is often necessary to seal off a fire rather than to fight it directly.

In order to facilitate rapid sealing, each mine is systematically divided into various "fire zones", each of which can be rapidly isolated by means of steel fire doors or previously prepared winze and shaft seals. Schemes are also drawn up for changing ventilation circuits during a fire so that vital points such as pumps, underground hoists, etc., may be kept in fresh air. A committee has been formed which carries out investigations, in collaboration with the Field Research Laboratory, into various aspects of fire-fighting and prevention.

Problem of rock-burst

As a result of the unusual physical characteristics of the rock at Kolar and of the great depths at which work is carried out, considerable difficulties are experienced in combating the tremendous pressure which is developed in the rock adjoining underground working places. These pressures frequently result in the rupture of the sides of an excavation often with such violence as to resemble a miniature earthquake. Such occurrences are known as 'rock-bursts' and have, on many occasions, had very serious results. Illustrative of the violent characteristic of these rock-bursts is the 'shock wave' which spreads from the focus of the burst and which may do considerable damage to surface buildings and be heard many miles away.

The Kolar Gold Fields Research Laboratory conducts a detailed investigation into the problem of rock-bursts. The work

now being undertaken involves extensive underground measurements of stress and strain in the rock, photo-elastic analysis of models, physical tests of underground rock specimens and several other allied methods of investigation.

As a result of these investigations, it is expected that still further improvement in the methods of mining and support will be developed and that the frequency and severity of bursts would be substantially reduced. The indications are that any such advances in mining technique will largely be achieved by careful planning of the "sequence" of stoping, that is to say, by designing the stopes in such a way that isolated pillars and promontories of unstoped ground are reduced to a minimum. This is necessary as it has been found that the rock pressure tends to build up in such localities. Careful thought has also to be given to the correct method of stoping ore in the neighbourhood of faults, dykes and other regions of weakness and to ensure that the various lines of underground communication are sited, as far as possible, in areas where high concentrations of pressure do not occur. On the whole, the various technical problems involved in ultra-deep mining, particularly the problems of ventilation and the control of rock-pressure, do not appear insuperable and it is thought that the ultimate depths to which man may penetrate below the surface of earth will be limited by economic rather than by technical factors.

It is interesting, indeed, to study the hard and intricate, and at the same time, dangerous processes involved in the mining industry. The gold-bearing ore is deep-seated in the earth's crust and it occurs in the form of reefs or veins of quartz which vary in thickness from a few inches to as much as thirty feet in rare instances. The average width of the quartz vein may be said to be approximately three feet and six inches throughout the field. The reef is intersected by country rocks and dykes of dolerite which vary in thickness from a few inches to over 100 feet.

Mining operations

The reefs are first explored at varying depths by sinking small shafts, dividing the ore body into workable blocks. The actual excavation of these blocks of ore consists of drilling holes in quartz by hand labour and blasting them by some explosives. The broken rock is loaded into trams at these depths and conveyed to the shaft for hoisting to the surface. In the course of actual processing in this way, it was realised that sinking of larger shafts would facilitate easy hoisting of the ore to the surface. Subsidiary vertical as well as inclined shafts have thus been sunk from convenient positions underground, fully equipped with electric hoists, etc. The shafts are lined with strong timber frames, which are placed a few feet apart, and in rectangular planks in order to prevent any loose rock from the walls falling into the shaft.

It has latterly been the practice to sink vertical and circular brick-lined shafts similar to those in use in the collieries in England. There are five such shafts in the Kolar Gold Fields, 18 feet in diameter, which have reached great depths, one attaining a depth of over 4,200 feet. The sinking of shafts and the driving of levels, etc., are accomplished by the aid of rock driller operated by compressed air and working at a pressure ranging from 60 to 90 lbs. per square inch. The compressed air is supplied by electrically driven machinery situated on the surface. The magnitude of the underground operations on the Kolar Gold Fields can be gathered by the fact that two mines, *viz.*, the Mysore-Champion Reef Amalgamated Mine and the Nundydroog Mine, have now been operating, reaching a depth of over 8,000 feet vertically below surface. The deepest point in the Champion Reef section of the Mysore-Champion Reef Amalgamated Mine had, on 31st March 1966, reached a depth of 10,598 feet below surface. Successful mining operations at such depths call for the highest degree of technical skill.

**Metal-
lurgical
process**

The ore drawn from the lode consists of quartz containing minor quantities of sulphide minerals together with hornblende schist wall rock. The gold is relatively coarse and, upto 80 per cent of the total value, is recovered by simple straking.

Then the ore from the mine is tipped over grizzlies and fed into trommels. The waste rock is picked from the belts, and is then reduced by jaw crushers set to a size suitable for stamp-milling. The crusher product, combined with the under-size, constitutes the mill feed.

In the new mill at Nundydroog designed and executed by Indian engineers, the ore from the jaw crushers passes through two further stages of crushing in 'Cone' crushers which reduce it to a suitable size for grinding without the intermediate stage of reduction by stamp-milling. The design of the plant is such that from the main ore storage bins, all movements of the ore to the mill are by conveyor belts, thereby eliminating the need of locomotives or trucks to move the ore. The new plant is designed for an average capacity of 1,000 tons a day.

The ground ore is classified by means of Caldecott Cones, one pair in series to each tube mill. The overflow of the primary cone feeds the secondary cone. The underflow from each feeds the tube mills. The overflow from the secondary cones, which averages between 80 to 88 per cent minus 200 mesh (Tyler), passes to the cyanide section for further treatment.

The slime product, after dewatering, is cyanided in agitators having capacities upto 150 tons of dry slime at densities upto 7.75

The agitation time varies from 12 to 16 hours, and then the filtered liquor passes through sand clarifiers to extractor boxes where the precipitation of gold takes place. The precipitate is treated with sulphuric acid with the addition of manganese-dioxide, when necessary, to assist in the removal of copper. This precipitate is filtered, washed and then roasted and smelted in lined pots to yield bullion of approximately 985 parts per 1,000 ozs. of gold and silver.

During the year 1965-66, a total of 3,94,730 tonnes of ores were milled with a resultant production of 30,24,162 grams (97,229 ounces) of gold. The working cost of production per tonne charged against the revenue account was Rs. 88.90 made up as follows :—

			<i>Cost per tonne</i>
			Rs.
Development	..	..	2.18
Stoping	..	..	32.65
Miscellaneous ore	..	..	2.29
Ore transport	..	..	1.48
Ore treatment	..	..	10.63
Total			49.23

Mining, non-productive costs	..	..	14.48
Surface costs	..	..	12.39
Administration and other costs	..	..	12.80
Grand total			88.90

The salaries and wages and terminal benefits constitute approximately 60 per cent of the above cost.

The following statement gives the details of gold production in the Kolar Gold Fields :—

Year	Tons crushed (Short tons= 2,000 lbs.)	Extraction dwt./ton	Gold produced	
			Ozs.	Grams
1	2	3	4	5
Before Nationalisation :				
From 1882 to 28-11-1956 ..	3,97,85,749		2,28,60,737	71,10,48,477
			(This excludes estimated gold of 2,00,000 ounces or 62,20,696 grams obtained from other mines in the early stages of gold mining).	
After Nationalisation :				
29-11-1956 to 31-3-1958 ..	8,76,912	4.97	2,17,938	67,78,630
1958-59 ..	6,36,181	4.74	1,50,781	46,89,814
1959-60 ..	6,47,369	4.74	1,53,442	47,72,579

1	2	3	4	5	
1960-61	..	5,81,801	4.81	1,39,854	43,49,955
1961-62	..	6,12,534	4.46	1,36,498	42,45,567
1962-63	..	6,43,065	3.97	1,27,570	39,67,865
1963-64	..	5,62,076	3.93	1,10,536	34,38,074
1964-65	..	5,38,155	4.60	1,23,655	38,46,104
1965-66	..	4,35,108	4.47	97,229	30,24,162
1966-67	..	4,12,396	4.08	84,164	26,17,785

Apart from gold, silver is also produced in the Kolar Gold Fields, though not on a very large-scale, and the following is the quantity of production of silver since 1947 :—

<i>Year</i>	<i>Ounces</i>	<i>Grams</i>
1947 to 28th November 1956 ..	1,40,685	43,75,794
29th November 1956 to 31st March 1958.	16,178	5,03,192
1958-59	10,922	3,39,712
1959-60	10,846	3,37,360
1960-61	10,129	3,15,046
1961-62	10,067	3,13,134
1962-63	9,134	2,84,110
1963-64	7,634	2,37,456
1964-65	9,431	2,93,331
1965-66	7,366	2,29,121
1966-67	6,757	2,10,156

**Develop-
mental
schemes**

A phased programme of development and expansion of the Mines under the II and III Five-Year Plans was drawn up after the acquisition of the Kolar Gold Mines by the Government of Mysore in November 1956. As stated earlier, the Undertakings were taken over by the Government of India on 1st December 1962. Under the II Five-Year Plan, six schemes estimated to cost Rs. 94.50 lakhs were undertaken and a sum of Rs. 64.26 lakhs was spent on those schemes. Ten schemes, involving a total outlay of Rs. 150 lakhs, were drawn up for implementation under the III Five-Year Plan. Only those schemes, which are essential for the maintenance of production at the present levels and those which assist the expansion of production and increase the returns wherever possible, were included in this plan. As against this outlay, a sum of Rs. 142.23 lakhs (including an expenditure of Rs. 1.43 lakhs committed during the II Plan period

and paid during 1962-63) was spent during the III Plan period as detailed below :—

<i>Year</i>			<i>Rs.</i>
1961-62	..	..	19.67 lakhs
1962-63	..	..	32.58 „
1963-64	..	..	29.67 „
1964-65	..	..	33.84 „
1965-66	..	..	26.47 „
	Total	..	142.23 lakhs

Detailed schemes involving a total outlay of Rs. 230 lakhs, to be undertaken during the IV Five-Year Plan period, have also been drawn up with the following priorities in view :—

1. Search for new sources of ore.
2. Maintaining output at or above the present levels, having regard to the possible depletion of available sources of ore in the Mysore Mine.
3. Increase in efficiency with a view to reducing cost of operations.

The IV Five-Year Plan Schemes are estimated to add ultimately reserves of about 3,45,000 ounces of gold, besides extraction of 53,000 ounces of gold during the development stage itself in respect of certain exploration works.

The Bharat Earth Movers Limited, Bangalore, is the first factory in India to undertake manufacture of heavy earth-moving equipment. With the increase in the tempo of development works and the launching of large irrigation and power projects, the need for modern heavy earth-moving equipment was more keenly felt. By the use of such equipment, it would be possible to turn out more work in a single day than a number of workers could accomplish in months by the manual method. The Government of India, therefore, decided to establish a large-scale factory for this purpose under technical collaboration with the erstwhile Messrs. Letourneau-Westinghouse Company, Illinois, United States of America, now called Messrs. Westinghouse Air Brake Company.

**Bharat Earth
Movers
Limited**

In pursuance of this decision, the Government of India formed a joint-stock company called the Bharat Earth Movers Limited, in the public sector and the company was registered under the

Indian Companies Act, 1956, on the 11th May 1964. This company, which is under the administrative control of the Ministry of Defence, Department of Defence Production, has its registered office in the Railcoach Administrative Building, Hindustan Aeronautics Limited, Bangalore. The authorised share-capital of the company as on 31st March 1967 was Rs. 10 crores, while its paid-up share-capital, as on that date, was Rs. 8.138 crores. The shares of the company are entirely held by the Government of India.

Initial phase The project of manufacturing heavy earth-moving equipment had been initially assigned to the Hindustan Aircraft Limited, Bangalore, now forming part of the Hindustan Aeronautics Limited, in December 1962, for taking necessary steps in processing the project pending formation of the new company. The Government of India decided that the facilities by way of accommodation, equipment, technical staff, etc., as were available in the Hindustan Aircraft Ltd., particularly in its Railcoach Division, should be made use of for the execution of the project. The expenditure incurred towards the initial activities was to be recovered from the new company in due course. Accordingly, a separate division called the BEML (Bharat Earth Movers Limited) Division was organised within the Hindustan Aircraft Ltd., to handle the preliminary work connected with this project.

At the instance of the Government of India, the Hindustan Aircraft Ltd., prepared and submitted a project report in October 1963. However, in view of the fact that the execution of the project involved considerable foreign exchange outlay, for which it was proposed to approach the Export-Import (EXIM) Bank for a loan, the Government of India considered it necessary that the economic feasibility of the project should be examined in detail by a firm of consultants. Accordingly, in October 1964, the Union Government appointed Messrs. A. T. Kearney and Company Inc., of the United States of America to submit a detailed project report. The terms of reference by the Union Government to the firm of consultants included submission of a report for the establishment of a combined factory for undertaking the manufacture of heavy earth-moving equipment of LW origin as well as of crawler tractors in collaboration with Messrs. Komatsu Manufacturing Company Ltd., Tokyo, Japan. The firm of consultants deputed a team of technicians and the latter submitted their report in May 1965.

Crawler Tractor Unit The crawler tractor manufacturing programme, which was originally being carried out by the Director-General of Ordnance Factories, Ministry of Defence, was entrusted, in December 1965, to the Komatsu Manufacturing Company of Japan. The Union Government decided that the manufacture of crawler tractor

equipment should be taken up in the first phase because of the anticipated earlier availability of Yen credit. According to the agreement with Messrs. Komatsu Manufacturing Company, the types of crawler tractors to be produced by the Company are: D-120, D-80 and D-50 or alternatively D-40 tractors, etc.

The Central Government sanctioned the project for a combined factory to be established in the Kolar Gold Fields area, involving a capital outlay of Rs. 19.56 crores, with a foreign exchange component of Rs. 7.65 crores, and a township at a cost not exceeding 7½ per cent of the capital cost of the project. A phased programme of construction of the factory buildings was approved in July 1965 and civil works of the factory, township as well as plant and machinery, estimated to cost, in all, about Rs. 550 lakhs, were commenced in the Kolar Gold Fields area towards the end of 1965. The Government of Mysore have given, free of cost, extensive lands measuring 1641.5 acres. By the end of 1966-67, the construction of the Tractor Fabrication and Assembly Shops, two store buildings for the Machine and Assembly Shops, etc., had been completed and the machineries were being erected. Work on the other common production shops like machines, tool-room, heat treatment etc., were under different stages of progress. It is expected that the construction of these buildings would be completed and regular production started early in 1968-69.

Along with their decision to form the new Bharat Earth Movers Ltd., as a joint-stock company for the manufacture of heavy earth-moving equipment and crawler tractors, the Government of India also decided to form a corporation called the Hindustan Aeronautics Ltd., composed of the various units engaged in aircraft production in the country and to bifurcate from it the units engaged in the production of items other than aircraft. In pursuance of this decision, the Union Government directed that the Railcoach Division of the Hindustan Aircraft Ltd., should be separated and merged with the new BEML Company. As the activities connected with the manufacture of heavy earth-moving equipment, entrusted to the Hindustan Aircraft Ltd., earlier, were closely linked up with the facilities available at the Railcoach Division, it was decided that the transfer of Railcoach Division as well as the Earth Moving Equipment Project from the Hindustan Aeronautics Ltd., should be effected simultaneously. Thus, although the new BEML Company was incorporated in May 1964, the activities in connection with the manufacture of rail-coaches and earth-moving equipment were transferred to it only on the 1st January 1965. With this transfer, the Bharat Earth Movers Ltd., *i.e.*, the new company, came to have three units, one for the manufacture of rail-coaches, another for the manufacture of earth-moving equipment and the third for the manufacture of crawler tractors. While the first unit continues to function in its

**Transfer of
Rail-coach
Division**

original location in the Hindustan Aeronautics Ltd., Bangalore, the other two units are being located in the Kolar Gold Fields area, about 60 miles from Bangalore.

Progress so far

In order to help undertake the initial phases of manufacture of heavy earth-moving equipment in the Railcoach Division, the Government of India released foreign exchange to the extent of Rs. 50 lakhs and a number of equipment were procured in knocked-down condition from the foreign collaborators and the manufacture commenced in May 1964. During the year 1966-67, the Earth-Moving Equipment Division assembled and sold 20 LW 'C' Scrapers and 11 Rear Dumpers on customers' orders. It had also received an order for the assembly and supply of 114 more LW earth-moving machines. As for crawler tractors, the assembly of the same had commenced at the new factory at the Kolar Gold Fields and the first tractor (D 120-6 type of 225 H.P.) was formally released in April 1967. About 200 machines, in all, were expected to be produced in the factory by the end of 1967-68. When fully established, various types of earth-moving machinery and tractors, such as, Motorised Scrapers, Motorised Rear Dumpers, Haulpak Truck Dumpers, Bottom Dumpers, Motor Graders, Crawler Tractors of various Komatsu models, etc., are expected to be manufactured. With a view to providing after-sales-service to the customers and looking after sales-promotion work, the Company has established its zonal offices at Kolar, Bombay, Delhi and Calcutta.

Training programme

The total labour strength of the Company in the present initial stage, *i.e.*, as on 31st March 1967, was 4,347. More number of workers would be employed gradually as the units develop. The Company has started a training scheme for workers under the Apprentices Act with effect from July 1965. During the year 1965-66, a batch of 89 apprentices were undergoing training under this scheme. For the present, arrangements have been made with the Technical Training Institute of the Hindustan Aeronautics Ltd., for training these apprentices. A building for a separate Apprentices Training Institute was under construction at the Kolar Gold Fields as a part of the new factory.

Gauribidanur Sahakara Sakkare Karkhane Ltd.

Another large-scale industry, which has been established in the district recently, is the Gauribidanur Sahakara Sakkare Karkhane Ltd., at Gauribidanur. This co-operative sugar mill, organised by the sugarcane cultivators of Kolar district, was registered on March 13, 1961, under the Co-operative Societies Act, 1959, with an authorised share capital of Rs. 65 lakhs. The State Government has given a financial assistance of Rs. 29.37 lakhs to this factory by way of contribution to the share capital, grants and loans. A licence to start production of crystal sugar has been

issued by the Government of India, the licensed crushing capacity being 1,200 metric tonnes of sugarcane per day.

After completing the construction of buildings and erection of machinery and equipment, the Karkhane started trial crushing of sugarcane during the sugarcane season of 1966. Regular crushing was commenced on 1st January 1967, but soon after, crushing had to be suspended for some time on account of poor supply of sugarcane as a result of failure of monsoon in the preceding months. With the improvement in cane supply, the Karkhane has resumed crushing from November 1967. During 1967, the factory had employed 205 workers and produced 1,026 bags of sugar.

SMALL-SCALE INDUSTRIES

Except for the gold mines and a few village and cottage industries referred to elsewhere, the Kolar district, in the past, had not made much headway in the field of industrial development. But in recent years, apart from the two large-scale units, *i.e.*, Bharat Earth Movers Ltd., and Gauribidanur Sahakara Sakkare Karkhane, Ltd., a number of units of various small-scale industries have come to be established in the district as a result of intensive encouragement being given by the Government.

With the various measures of Governmental assistance, such as, provision of cheap and enough power, supply of machinery on hire-purchase basis, financial and raw-material assistance, establishment of industrial estates and availability of technical and economic guidance from the Small Industries Service Institute, Small Industries Corporation, etc., the number of small-scale industries in the district has been steadily growing. During 1966-67, there were, in all, 137 registered small-scale industrial units in the district, their total capital investment and employment potential being roughly Rs. 31.13 lakhs and 1,820 persons, respectively. The number of units in 1965-66 was 110.

The small-scale industries in the district are, by and large, **Industrial Estates** concentrated in the urban areas like Kolar, Chikballapur and Chintamani towns and Kolar Gold Fields. With a view to providing suitable factory accommodation and modern facilities to the small-scale industrialists, the State Government decided to establish two Industrial Estates in this district, one at the Kolar Gold Fields and the other at Chikballapur, with twelve sheds each. The estimated cost of each of these Industrial Estates is Rs. three lakhs. Of these, construction of the Industrial Estate at the Kolar Gold Fields has been in progress, and by 1965-66, four sheds of 25 feet by 30 feet and two sheds of 30 feet by 50 feet had been constructed and allotted to prospective entrepreneurs, while the construction of the Industrial Estate at Chikballapur was yet to be taken up.

Training facilities

In addition to a Polytechnic at Chintamani which conducts 3-year diploma courses in electrical, mechanical and civil engineering, with an intake capacity of 120 candidates at a time, and a School of Mines at Coramandal (K.G.F.), which offers a 3-year diploma course in mining technology to 24 candidates at a time, the State Government have also set up several other training institutions for imparting training to candidates in various trades, such as, tailoring, carpentry, blacksmithy, weaving, leather-stitching, making of glass beads, sericulture, etc. There is also an Industrial Training Institute at the Kolar Gold Fields run by the Directorate of Training and Employment.

There is an Artisan Training Institute at Chikballapur which imparts training in carpentry, blacksmithy, weaving, leather-stitching and glass-bead making. The Institute has an intake capacity of 100 candidates at the rate of 20 for each trade and the duration of training is 1½ years. A stipend of Rs. 30 per month is paid to the candidates during the period of training.

Two Government Training-*cum*-Servicing Workshops for agricultural implements have also been functioning at Kolar and Gauribidanur for imparting training in servicing and repairing of agricultural implements. Each workshop trains ten candidates at a time, the duration of training being one year. A stipend of Rs. 30 per month is given to each trainee. There are also two Government Silk Farms, one at Kolar and the other at Sidlaghatta, which impart training in sericulture to interested candidates for a period of six months.

There is a Taluk Vishwakarma Training and Production Centre at Chikballapur which offers training in carpentry and blacksmithy to ten candidates in each trade giving a stipend of Rs. 20 per month. The duration of the course is two years.

Credit facilities

The Government of Mysore, in their declaration of industrial policy, had made it clear that all possible assistance would be given to help the growth of industries in the private sector also. Even as a princely State, Mysore was noted as a pioneer in the field of industrial expansion. On the 31st March 1959, the State Government established a corporation called the Mysore State Financial Corporation to provide financial assistance to industries in furtherance of this policy of industrial development. Prior to the establishment of this autonomous corporate body, the Mysore State Aid to Industries Act, which was enacted in May 1951, had been very helpful to the industrial entrepreneurs in the State. After the formation of the new Mysore State, a uniform and comprehensive Act, *viz.*, the Mysore State Aid to Industries Act, 1959, was enacted and brought into force throughout the new State.

Under the provisions of this statute, a number of small, medium and big industries in the State had been given financial assistance by the State Government, and many more still continue to get these benefits under the Act.

The Act, which is also applicable to the district of Kolar, has laid down the mode and method of advancing financial help for the establishment and development of industries. The Director of Industries and Commerce in Mysore, Bangalore, is the statutory authority to sanction advances to industries under this Act. In Kolar district, six small-scale industrial units were given financial assistance under the provisions of this Act during the period from 1964-65 to 1966-67 as shown below :—

	1964-65	1965-66	1966-67 (from April to Sept.)
Number of Units	.. 2	3	2
	Rs.	Rs.	Rs.
Amount sanctioned	.. 5,500	63,950	19,499

The Mysore State Financial Corporation also grants loans exceeding Rs. 10,000 to all categories of industries. During the period from 1963 to 1966, a total amount of Rs. 84,000 was sanctioned by the Corporation to four small-scale units in the district. The Corporation has also granted a loan of Rs. 20 lakhs to the Gauribidanur Sahakara Sakkare Karkhane under Government security. Besides, the State Bank of Mysore, which has its branches in almost all the taluk headquarters of the district, has also been extending credit facilities to different industrial undertakings in the district. During 1965-66, the Bank had advanced a total loan of Rs. 2.75 lakhs to 12 small-scale industrial units in the district.

With a view to providing similar credit and other banking facilities to the village artisans, industrial co-operatives and other small industrialists, a District Industrial Co-operative Bank was also established in the district at Kolar in the year 1963. The Bank had advanced loans amounting to Rs. 6,97,735 upto the end of March 1966, to 30 different small-scale industries in the district.

In addition, the National Small Industries Corporation Ltd. has given machinery valued at Rs. 1.65 lakhs on hire-purchase basis to 12 small-scale industrial units in the district during the three-year period from 1964-65 to 1966-67. The industries benefited by this scheme were tile-making, silk-twisting, saw mills, general engineering, etc. **Machinery on hire-purchase**

The important small-scale industries in the district relate to general engineering and automobile repairs, steel furniture and office equipment, agricultural implements, domestic utensils, tiles and allied products, slate pencils, cement pipes, soap, gum benzoine, pharmaceuticals, matches, plastics, wooden furniture and saw mills, stone polishing, confectionery, tamarind kernel powder, fertilisers, etc. Sericulture and *agarbathi* manufacture, which are two prominent industries in the district are concentrated mostly in Chintamani, Kolar, Chikballapur and Sidlaghatta taluks, more on a cottage than on a small-scale basis.

Small Industries Survey

According to a survey conducted in 1966 by the Small Industries Service Institute, Bangalore, there were in 1965-66, about 110 small-scale industrial units (excluding sericulture and *agarbathi* manufacturing units) in the district engaged in the manufacture of various industrial products. These units had together invested a capital of Rs. 30.8 lakhs and provided employment to about 1,100 persons. The value of the total annual production of these units was of the order of Rs. 40 lakhs. A brief account of some of the important small-scale industries that were functioning in the district in 1965-66 are given in the following paragraphs.

General Engineering

There were nine general engineering and automobile-repair workshops in the district, having a total investment of Rs. 1.9 lakhs and employing, in all, 42 persons in 1965-66. These undertook servicing and repair-works of the order of Rs. 1.21 lakhs annually. Two of the units were mainly engaged in automobile repairs, while the rest undertook repairs of irrigation pump sets, etc. But it has been found that these units are generally equipped with rather out-moded machines and, as such, cannot undertake precision work of a high order. They suffer from financial instabilities also. Now that a large-scale industry, *viz.*, the Bharat Earth Movers Ltd., is being established in the Kolar Gold Fields area, the scope for developing these units in the district appears to be bright. Some of these units can work as ancillary to this large-scale industry while some can undertake manufacturing lines instead of entirely depending upon job and servicing works.

Steel Furniture

There were five units engaged in the manufacture of steel furniture and office equipment, of which four were located at the Kolar Gold Fields and one at Mulbagal. These units had a total capital investment of Rs. 1.33 lakhs and employed 36 workers. They produced steel furniture and office equipment worth about Rs. 1.3 lakhs annually which were mostly sold within the district itself. Of late, there is an increasing preference for steel furniture. With the increase in development activities in various fields, there is a greater demand for office equipment. This offers a good scope for developing these units in the district.

The number of units engaged in the manufacture of agricultural implements in the district was 15, and the number of workers employed by them was about 200. These units had an aggregate investment of a little over two lakhs of rupees and produced implements of different kinds worth about Rs. 3.5 lakhs. The units were working mostly with hand-tools and implements, and were not equipped with enough and up-to-date machines to manufacture modern types of agricultural implements. Since more and more agriculturists are now switching over to the use of modern implements, it would be advantageous for these units to equip themselves better in keeping with the trend of the demands. The number of these units in the district had increased to 24 by 1967.

**Agricultural
Implements**

There was just one unit, located at Kolar, engaged in the manufacture of aluminium utensils in 1965-66. While the capital investment of the unit was Rs. 50,000, it produced utensils worth about Rs. 50,000 annually employing twelve workers. Lately, the unit was also attempting to undertake the manufacture of some other industrial products like electric fan parts, etc. Field investigations have revealed that the demand for different kinds of aluminium utensils in the district is of the order of about two lakhs of rupees per annum and this demand is expected to increase at the rate of 10 per cent per annum in future. Hence, there is much scope for further development of this industry in the district.

**Aluminium
Utensils**

The number of units engaged in the manufacture of tiles and wire-cut bricks in the district was five, most of them being located at Malur. These units together had invested about Rs. 3.5 lakhs and employed about 100 persons. Though these units had an installed capacity to manufacture tiles and bricks worth about Rs. 8 lakhs annually, their production during 1965-66 was of the order of Rs. 4.64 lakhs only. The reason for this low production is attributed to competition from the tile factories situated in Bangalore nearby and also due to change in the pattern of construction of houses in that more and more terraced houses are now being constructed eliminating the use of tiles. There is, therefore need for these units to switch over to such products as wire-cut bricks, stoneware pipes, etc., for which there is greater demand from all over the State, and good variety of clay is available in the district in abundance.

**Tiles and
Wire-cut
Bricks**

Although there were ten units manufacturing slate pencils in the district in 1965-66, only three came under the category of small-scale industrial units, while the others were cottage industries. The three small-scale industrial units had a total investment of about Rs. 60,000 and employed 235 workers. Of these, two units were situated at Bangarpet and one at Deshahalli in the same taluk, where good clay suitable for this product is available in plenty.

Slate Pencils

These units manufacture soft varieties of slate pencils of a good quality in different colours and sell them throughout Mysore State and also outside. Since these units are of a semi-mechanised nature, the present production-level can be well increased with the use of improved machines and equipment.

**R. C. C. Spun
Pipes**

There were two small-scale industrial units in the district engaged in the manufacture of R.C.C. spun pipes in 1965-66. One unit, located at Bangarpet, is comparatively better equipped and is manufacturing pipes of diameters of 6 to 48 inches. The other unit, located at Gauribidanur, has specialised in the manufacture of cement rings used in the construction of wells. The products are sold both within and outside the district. The total investment in these two units was of the order of about Rs. one lakh and they had a capacity to produce pipes and rings worth about Rs. 1.5 lakhs annually. Since the present demand for R.C.C. spun pipes in the district has been estimated at Rs. 6 lakhs annually and it is likely to increase further in the coming years, this industry holds good prospects for further development.

Soap

Three small-scale units, engaged in the manufacture of both toilet and washing soaps, were functioning in the district in 1965-66. Of these, one was located at the Kolar Gold Fields area and the other two at Bangarpet. The estimated capital investment of these units was Rs. 95,000 and the value of soaps manufactured, during 1965-66, was about Rs. 1.1 lakhs. In all, 26 workers were employed by these units. Since there is great competition in this field from far-bigger factories, both from within and outside the State, the scope for further development of this industry in the district does not seem to be very bright.

**Gum Benzoin
and Perfumery**

Two units, one located at Chintamani and the other at Kolar, are manufacturing gum benzoin and perfumery in the district. The total capital invested by these units was estimated at Rs. 1.9 lakhs and the total production, during 1965-66, was of the order of Rs. 1.5 lakhs, the number of persons employed being 24. The products of these units are being exported to different parts of the State and also to other States like Maharashtra, Andhra Pradesh, Madhya Pradesh, etc. Though the quality of these products requires to be improved, they are reported to be selling fast on account of their low price compared to the high prices of imported varieties. In view of this fact, this industry offers ample scope for further development.

Pharmaceuticals

There were three units engaged in the manufacture of medical tablets and ragi malt in the district. One of the units, located at the Kolar Gold Fields, was being run by a Missionary with foreign collaboration and was manufacturing various types of tablets and patented ointments. Another unit, located at Bethamangala, was

exclusively manufacturing ragi malt and malt-extract from barley. The total invested capital of the three units was about Rs. 2.5 lakhs, providing employment to 46 persons and producing pharmaceuticals worth about Rs. 5.20 lakhs per annum. As this industry holds good prospects for further development, manufacture of other items like patented drugs, vitamins and other food products can also be taken up by these units.

During 1965-66, there was just one unit manufacturing safety matches in the district. It had a capital investment of about Rs. 40,000 and had employed about 20 persons and produced matches worth Rs. 58,000. As the unit is facing keen competition from Sivakasi and other places, which flood the local market with matches of all kinds at cheaper rates, there is great difficulty for the development of this industry in the district. **Matches**

There were four units engaged in the manufacture of celluloid bangles in the district. Two of these units were also manufacturing nylon buttons. The total capital investment of these units was about Rs. 50,000 and they had employed 45 workers. The units manufactured goods worth about Rs. 50,000 during 1965-66 which was just 50 per cent of their total installed capacity. The paucity of raw materials like polythene films is said to be the reason for this low production during the year. However, as there is growing demand for different types of plastic articles, the units can advantageously switch over to the manufacture of other plastic industrial items, toys, etc., when the position in respect of the raw materials eases. **Plastics**

The district had, in 1966, 10 saw mills situated at Kolar, Chikballapur, Chintamani and Gauribidanur and undertaking mainly job sawing works. Two of them, however, were also making wooden packing cases, beams and rafters side by side. These units had, in all, invested about Rs. 2.9 lakhs, providing employment to 61 persons. Since the district is poor in forest resources, thus necessitating import of timber from outside, and also as the industry has become rather overcrowded already, there does not appear to be great scope for further development of this industry in the district. However, some of the units can switch over to some regular manufacturing lines like wooden packing materials, for which there is good demand, instead of entirely depending upon job orders for sawing of timber. **Saw Mills**

There was a solitary industrial unit in the district undertaking stone-polishing, in 1965-66. This unit, situated in Kolar town, had a capital investment of Rs. 67,000. It had employed 24 workers and its average annual output was estimated to be a lakh of rupees. One noteworthy feature of this unit is that it exports polished stone slabs to foreign countries like the United Kingdom. **Stone polishing**

Since suitable varieties of stones are available in the district and also as there is a good demand for polished stone slabs, there is much scope for further development of this unit.

Fertilisers

A proprietary concern, engaged in the manufacture of bone-meal and mixed fertilisers, was functioning in Kolar town with an invested capital of about a lakh of rupees. This unit, employing 16 persons, produced fertilisers worth about Rs. 6.50 lakhs during 1965-66 although its installed capacity was to produce fertilisers worth about Rs. 10.5 lakhs annually. Since the demand for fertilisers is on the increase, this unit can be further expanded with advantage.

Tamarind kernel powder

Three units, one at the Kolar Gold Fields and the other two at Bangarpet, were engaged in the manufacture of tamarind kernel powder. The product is used primarily as a sizing material in cotton textile and jute industry and also as an adhesive in the manufacture of plywood. As such, the product is sold in different parts of the country through established dealers at Bombay, Ahmedabad and Calcutta. The three units had invested a total capital of about Rs. 9.66 lakhs and had a total installed capacity to manufacture 2,100 tonnes of tamarind kernel powder per year. Out of the two units at Bangarpet, one was established only recently, while the other two units accounted for an aggregate production of 1,600 tonnes of powder during 1965-66. They had employed 44 workers. But in view of the keen competition from similar units in the neighbouring districts and also outside the State, and because of the shortage of tamarind seeds, further development of this industry in the district seems to be difficult.

Beedi

Beedi manufacture is also a notable small-scale industry in the district. During 1965-66, there were nine beedi-making units in the district with a capital investment of about Rs. 1.14 lakhs. They had employed over 120 persons and produced beedies valued at Rs. 3.12 lakhs.

Other small-scale industries

In addition to the above, there were five confectionary units, four units making wooden furniture, 11 units manufacturing domestic utensils and two steel-trunk making units in the district, which had together invested a capital of about Rs. 2.67 lakhs and employed 156 persons. A statement showing the category-wise break-up of the registered small-scale industries in the district as in 1965-66 is given at the end of this chapter.

Agarbathi

Agarbathi manufacture is another important industry in the Kolar district, which is run more on a cottage industry basis than on a small-scale industry basis. During 1966-67, there were 43 such units engaged in the manufacture of *agarbathis*, sandalwood

sticks, etc., more than half of which, *i.e.*, 23 units, were concentrated at Chintamani. Of the rest, 12 units were at Kolar and seven at Chikballapur. The total capital invested by all these units was over Rs. 14 lakhs, while the individual capital investment varied from Rs. 1,000 to over Rs. 1,00,000. The total number of persons employed by these units was over 920.

Agarbathis and sandalwood sticks are used as incense for worship and also on many festive occasions. Practically every household has a demand for this article, either in a smaller or bigger measure. Hence, this industry holds out great promise of development, provided it has the necessary financial and marketing facilities. The raw materials required for this industry are scent, sandalwood powder, charcoal powder, bamboo sticks, gum and wrapping paper. The process of manufacture consists in making a dough out of a mixture of charcoal powder, scent, gum and sandal powder in suitable proportions and pasting the mixture around thin sticks of bamboo of about nine inches in length. Though the process seems simple, it involves considerable skill.

The district of Kolar, since early days, has been famous for its village and cottage industries like cotton, woollen and silk weaving, sericulture and oil manufacture and a brief account of these industries is given below.

**Village and
Cottage
Industries**

Since nearly 30 per cent of the total cloth used in the country is produced on handlooms, this industry can be considered as playing a significant role in the national economy. Handloom-weaving is an important occupation of the rural population in this district. The total number of handlooms in the district in 1967 was 9,865 and that of the handloom weavers in the district was also about the same. The important centres of handloom-weaving in the district are Sulikunte and Badamakanahalli in Bangarpet taluk, Madivala, Lakkur, Malur and Chikka-Tirupathi in Malur taluk, Tayalur, Mulbagal and Tirumanahalli in Mulbagal taluk, Chintamani, Kanapalli, Kathariguppa, Venkatagirikote and Timmasandra in Chintamani taluk, Sidlaghatta, Nagamangala, Jangamkote, Mallur, Byappanahalli, Baluvanahalli and Venkata-pura in Sidlaghatta taluk, Chikballapur, Gunthappanahalli, Gundlurki and Thiranahalli in Chikballapur taluk, Gundlupalli and Mitemari in Bagepalli taluk, Kolar, Jodibyalahalli, Rajakallahalli and Padiganahalli in Kolar taluk and Namagondly, Bhaktharahalli, Nagargere and Gauribidanur in Gauribidanur taluk.

**Handloom
weaving**

Generally, fly-shuttle pit-looms are used. The antiquated throw-shuttle pit-looms are also used in woollen handloom-weaving in certain places. Dobbies are used according to the type of weaving. Frame-looms, take-up motion attachments and pedal looms are very rare. Raw materials such as cotton yarn,

art silk and silk for borders, colours and chemicals are mainly obtained from Bangalore by the wholesale merchants of the district and distributed among the weavers. Sericulture being an important industry in the district, silk is also available in the district itself. The main cotton handloom products of this district are sarees, *dhoties* and *dupaties* or bed-sheets. Good sarees are woven in almost all the centres of the district. *Dhoties* woven in the weaving centres of Gauribidanur taluk and *dupaties* produced in the weaving centres of Chikballapur taluk are of a good quality.

Wool weaving The quality of the Kolar wool is such that it is best suited for the manufacture of *kambli*s and rugs for which the district is justly famous. From time immemorial, the manufacture of blankets or *kambli*s has been an important cottage industry in Kolar district and it has earned a reputation in the outside markets also. Mysore-made *kambli*s had a good demand in the neighbouring Madras markets in the old days also and it is mentioned in the "Cyclopaedia of India" edited by Edward Balfour that at the Madras Exhibition conducted in 1885, various specimens of woollen manufactures were exhibited which were of Mysore origin.

According to a census of *kambli* looms conducted in 1931, there were 796 looms with 2,066 persons engaged in this industry in Kolar district. It is interesting to compare the number of woollen looms existing in the old days with the present available figures. The Mysore Gazetteer published in 1897 contains figures for 1893. In that year, Kolar district had 1,732 looms. This figure had greatly declined to 796 in 1931. According to the latest figures available, there were about 860 woollen handlooms in the district during 1967, thus showing a slight upward trend during the period from 1931 to 1967.

**Kambli
manufacture**

As a rule, the *kambli*-weaver does not buy yarn but buys only wool and prepares his own yarn. The weaver gets the supply of raw wool from the shepherds or the raw-wool merchants either by giving a good *kambli* as the price or for cash, respectively. This wool is cleaned, scutched and spun into yarn usually by the women and children in the house of the weaver. To keep a loom fully engaged, about three or four charkhas are required to spin the necessary quantity of yarn. But very few weavers have as many as four charkhas. A good number have two, while the others have only one charkha for each loom. Although *kambli* is a common term used to denote all blankets manufactured in these handlooms, there are different varieties of *kambli*s produced. In fact, there has been a sort of localisation of qualities and types. The *kambli*s produced in Kolar town and round about are of a fairly good quality and superior to the *Malnad kambli*s. The Kolar blankets vary in size between 6 by 3 cubits to 8 by 4 cubits and in weight range between 4 to 16 lbs normally. The price

quoted in 1935 was Rs. 3 to Rs. 5 per *kambli* and now the price ranges from Rs. 10 to Rs. 50 per *kambli* depending upon its quality and size. It is ascertained that at present more than 10,000 *kamblies* are manufactured in the district every year. The Kolar *kamblies* are sold not only within the district and State, but also in the neighbouring States. The important wool-weaving centres in the district are Kolar town, Venkatagirikote, Bhaktharahalli, Badamakanahalli, Mallur and Mulbagal.

The indigenous handloom industry in wool has survived the vicissitudes of time in spite of several adverse factors. The fact that handloom-weaving in wool is a hereditary occupation, the interest in the industry of the merchant who supplies the capital to the wool-weavers and the conservative nature of the *kambli*-weavers have all combined to help keep the industry alive. This industry possesses a rare and inherent vitality common to many of the age-long indigenous industries and given the proper help at the proper time, it would survive and fare well for a long time to come.

In order to help this traditional cottage industry and to encourage the wool-weavers of the area, the State Government at first established a Wool Spinning Sub-Centre in Kolar town and attached it to the Badanval Spinning Centre in Mysore district. But in view of the importance of the wool industry in the district and the large number of people engaged in wool-weaving, the Government decided to upgrade this Centre and make it a separate and independent unit. Accordingly, the Government Wool Spinning Centre came into existence in the year 1938 to serve as an experimental and demonstration centre for the weavers of the area. Though the Centre was working under loss for quite some time, in the interest of the wool weavers of the district the Government was maintaining the Centre and was striving to make it a paying concern. It is now being run on a commercial basis, both the production and marketing aspects being looked after by it. It is providing full-time work to piece-work weavers by providing them with sufficient raw materials, etc.

**Wool
Spinning
Centre**

This Centre is housed in a separate building on the Kolar-Bangalore road and it now manufactures several varieties of woollen fabrics of attractive designs and fine textures. They include hospital rugs, barrack blankets, nice and medium-type *kamblies*, mufflers, etc., in different sizes of marketable type. This is a certified institution of the Khadi and Village Industries Commission and, as such, all the processes of manufacture, from raw wool to finished fabric, are done by hand on khadi principles.

During 1965-66, there were 22 fly-shuttle looms of an improved type in the Centre, besides other equipments for carding, spinning, etc. It purchased raw materials worth Rs. 36,904 and produced

4,186 pieces of finished goods valued at Rs. 91,396. The value of goods sold during the year was Rs. 69,093 thereby earning a gross profit of Rs. 20,757. The Centre provided employment to about 250 spinners and weavers of the area. There is a proposal to develop the Centre further and increase its activities so as to make it more useful and also to provide more employment opportunities to the wool-weavers of the area.

Sericulture

The district is renowned for its sericulture industry, which besides giving occupation to a large number of people, is also of considerable importance in the economic development of the district. Silk has been hailed as the queen of textiles. It comes out of Nature's laboratory untouched by human hand. The human touch comes in only at a later stage to manipulate the material to suit different tastes, in twist, texture, colour and design. The two glands inside the body of the silk worm are engaged in throwing out unbroken threads continuously in surprisingly tiny and smooth filaments, and as they come out, the two threads are glued into one thread reinforced by a natural gum called 'bave'. During the rainy and cloudy weather, the worm 'urinates' and so the cocoons will not be of the first quality. It is purely a biological industry and hence the quality depends upon the life conditions to which the worms are subjected. It has been established by long processes of experimentation that rearing of silk worms is best suited to be undertaken as a cottage industry because of the immense human care and attention that has to be bestowed upon it. A person or a family can easily take to this industry with a little investment and make a living out of it.

Mulberry cultivation

Sericulture consists of a series of operations like mulberry cultivation, silk-worm rearing, seed preparation and reeling. Mulberry is the basic, and to a large extent the most important, factor in sericulture and essentially the costliest. The total acreage under mulberry cultivation in Kolar district in 1956-57 was 10,097 acres. By 1965-66, this acreage had risen to 16,200 acres. Mulberry can be grown on any soil, but it thrives well in drained sandy-loam soils situated in tracts of a height of 2,000 to 3,000 feet with an average humidity of 70 per cent, a rainfall of 25 to 30 inches and a temperature of 70° to 80°F. Selected seeds are used to grow 'mother' trees from which twigs are bent over and covered with soil and allowed to take root; twigs from the mother tree may also be cut and planted. The yield of mulberry in Kolar district has been very much improved both in quality and quantity by employment of up-to-date methods and it has been estimated that there are mulberry gardens in the district yielding as much as 20,000 lbs. of leaves per acre per year.

Cocoon rearing

While the rearing and reeling side of the silk industry may be called a cottage industry, the weaving side is termed as a small-scale industry. The work of rearing cocoons is also as important

as mulberry cultivation. The excellence and beauty of the silk and the price it will fetch depend upon the size, weight, shape, colour, uniformity of thickness and texture of the filament that the cocoon is made of, and the quality of the cocoon is controlled by factors like environmental conditions under which the worms are reared, the variety and quality of the leaves they feed on, the variety and character of the worms that spin the thread and the care bestowed on them. With the improvement of the quality of the mulberry, the size and quality of the cocoons are also improving.

The Government of Mysore are maintaining two silk farms (mulberry gardens) in the district at Sidlaghatta and Kolar where foreign race cocoons are produced. The following table indicates the actual production of cocoons in these Government farms during the years 1959-60 and 1965-66 :—

Name of Farm	Production of cocoons	
	1959-60	1965-66
Kolar ..	2,58,500	4,02,111
Sidlaghatta ..	1,10,065	1,25,295
Total ..	3,68,565	5,27,406

The maximum yield of cocoons per 100 disease-free layings is about 36,000 and the minimum 500, while the average comes to about 10,000.

Grainages for preparing layings are located at Sidlaghatta, Kolar, Malur, Hungenahalli, Srinivasapur, Chintamani, Chikballapur, Jangamkote, Settihalli and Thalagawara. The following table indicates the actual disease-free layings produced at these Government grainages during the years 1960-61 and 1965-66 :

Name of Grainage	1960-61	1965-66
1. Kolar ..	8,25,751	13,19,549
2. Malur ..	..	4,57,141
3. Sidlaghatta ..	5,28,698	10,51,049
4. Hungenahalli ..	..	3,81,521
5. Srinivasapur ..	16,682	4,00,510
6. Chintamani ..	1,81,529	5,06,455
7. Chikballapur ..	..	3,10,258
8. Jangamkote ..	..	2,94,248
9. Settihalli ..	..	59,061
10. Thalagawara ..	2,57,135	4,62,601
Total ..	18,09,795	52,22,393

Besides these grainages run by the Government, there are also about 80 aided grainages in the district. The layings produced by these aided grainages during 1960-61 was 100 lakhs. The production in 1965-66 was, however, slightly lower, *i.e.*, 98 lakhs. During 1961-62, the State Government enacted a legislation called the Mysore Silkworm Seed and Cocoon Act, requiring all the private and aided graineurs to obtain a licence from Government and to follow certain rules and regulations in preparing layings.

The prices of disease-free layings in the Government and aided grainages in the Kolar division range from Rs. 6 to Rs. 12 for 100 disease-free layings.

Silk Filature

The importance of the filature industry lies in the fact that it forms an important link between sericulture and the silk-weaving industry. It is also economically important as it is capable of restoring economic equilibrium between these two wings of the silk industry. There were two Filatures in Kolar district, one a branch of the Mysore Silk Filatures, T. Narasipur, situated at Sidlaghatta and the other called the Kisan Silk Filatures at Melur. The Sidlaghatta Filature, which came into existence during the second world war, when there was a large demand for parachutes, languished after the cessation of war and has since ceased working. The Melur Filature which was established in 1947 is working regularly and is considered as one of the efficient filatures in the State. It is engaged in weaving silk fabrics as also in filature silk reeling and silk throwing. It has provided employment to about 120 persons, its production capacity being 10,000 lbs. of filature raw silk per year. It also produces coloured and plain silk fabrics with or without gold thread. In 1965-66, it had 48 basins which produced about 3,450 kilograms of raw silk. In addition, there is a twisting (throwing) unit of 768 spindles attached to this filature.

Reeling is mainly done by country *charkhas* or basins. Though these *charkhas* are made locally, the silk produced from them is of good quality and fetch a high rate due to the skill of the workers. There were 1,200 such basins in the district in 1965-66. The Government have, however, a scheme to replace these country basins by a better basin called the 'domestic basin'. As the name implies, this basin can be worked in the villages by manual power. There were 75 such basins in the district in 1965-66. The quantity of reeling cocoons produced in the district during the year (1965-66) was 35 lakh kilograms as against 30 lakh kilograms in 1959-60.

Sericultural training plays an important part in the development of this industry. There are two sericulture training centres in the district attached to the Government Farms located at

Kolar and Sidlaghatta, where sericulturists are given training in the biological and practical aspects of this industry.

Almost all the weavers in the district possess their own looms, and the supply of raw material is made to them by local master-weavers or financiers, who take back from them the finished products and pay them the weaving charges. A very small number of the weavers are in a position to finance their own industry and are independent, while a large number of them depend upon master-weavers and other financiers for their capital. Generally there are two different systems of making these advances: either the master-weaver makes advances of money to the weavers on condition that they deliver a stipulated quantity of cloth of prescribed type and pattern within a fixed period, the price payable for the cloth having been fixed before-hand or he advances both cash and raw materials to the weaver, the price of yarn and other raw materials advanced as well as the price of the cloth being fixed before-hand. Thus, the only capital or asset that these weavers really possess is their inherent skill in this craft. The earnings of most of the weavers are low and they are generally poor.

**Weavers'
Co-operative
Societies**

Efforts have, of late, been made to free these weavers from the clutches and exploitations of master-weavers or middlemen by the establishment of a network of weavers' co-operative societies. This policy is now being actively pursued by the Government and by 1967, in all, 37 handloom weavers' co-operative societies had been organised in the district with a total membership of about 5,200 weavers. Of these, 21 were cotton weavers' co-operative societies, ten were silk weavers' co-operative societies and six woollen weavers' co-operative societies. These societies provide necessary raw materials, technical guidance, etc., to their members and thus help production; some societies also provide marketing facilities. The Government are granting loans and subsidies to these societies for the purchase of tools and equipment and also for their share and working capitals. The District Industrial Co-operative Bank also finances these societies. For purposes of marketing the handloom cloth produced by the weavers of the district, three handloom sales emporia have been also established, one each at Kolar, Kolar Gold Fields and Mulbagal.

The vegetable oil industry is fairly old in Kolar district. Prior to the establishment of oil mills, oil was being produced generally by means of *ghanas*. This village industry is still in existence and there were about 540 oil *ghanas* in the district during 1965-66. The *ghana* is an immense mortar and pestle of wood or stone. While the mortar is above ground, the pestle is let into underground. A wooden beam, about 18 feet long, pressing

Oil Industry

at one end closely against the foot of the mill, has an arm projecting upwards for about a third of its length, which is attached to the head of the pestle. The mill is driven by one or two oxen yoked at the farther end of the beam, by pulling it round and round.

The number of oil mills, which are small-scale units, in the district during 1965-66 was 34 ; three of these had registered themselves with the Department of Industries and Commerce under the Mysore Industries Development and Regulation Act, 1959. Besides, there were also 22 small oil expellers in the district. The machines and plant used in an oil mill generally consist of steam engines, boilers, expellers, rotary machines, filter presses and decorticators. Groundnut, sesamum and other oilseeds are crushed in these mills, groundnut constituting a major part. Groundnut being one of the main agricultural products of the district (89,200 acres were under this crop in the district during 1965-66), a large part of the groundnut grown in the district was being utilised by the oil mills to produce groundnut oil and oil cakes. The district is said to be one of the most important groundnut cake exporting areas in Mysore State. It was estimated that the value of oil produced in the district during the year 1966 was Rs. 18,14,000.

**Jaggery
manufacture**

Jaggery manufacture is another important village industry which has made certain taluks in the northern parts of the district famous for manufacture and export of this product. The Manchenahalli jaggery is well-known for its quality and refinement. It is largely exported to the Bangalore markets. The cane-growing areas in Gauribidanur, Chikballapur and Sidlaghatta taluks have a large number of crushing mills under the management of private farm-owners. Formerly, there were some establishments for producing local white sugar called 'claying sugar' in Sidlaghatta, Bangarpet and Mulbagal taluks. With the advent of refined sugar, the manufacture of this 'claying sugar' is not in vogue at present. In the 'claying sugar' process, the cane juice was being boiled down to a stage just prior to the jaggery stage and made into crystals. Then by a certain process, the syrup obtained was rubbed down into fine soft sugar which used to fetch a better price than the ordinary sugar.

In the manufacture of jaggery, the cane juice is boiled in an open iron pan kept over a specially prepared open hearth dug in the ground ; the crushed and dried canes, firewood and twigs are generally used as fuel. The pan can contain enough juice to produce nearly three maunds of jaggery. Slaked lime is added after one or two boilings. In Kolar, however, it was the usual practice to produce country sugar without adding any lime. As the juice heats up in the pan, the scum is removed. Brisk heating

is continued upto a stage and the pan is then removed from the fire; the boiled juice is stirred and poured into moulds for preparing jaggery. It is estimated that 150 to 200 maunds of jaggery are manufactured per acre of sugarcane. In recent years, many improvements have been noticed in the production of jaggery. Instead of the old wooden crushing mills, iron mills are in use. A small number of power driven crushers are also in use. This agricultural industry is in the hands of private owners and is scattered; hence precise figures of production and exports are not available.

A Rural Industrialisation Scheme was first started in Kolar district in 1950 with the object of developing production by recourse to rural industries as a supplementary source of income. Attempts were made to encourage initiative and enterprise among the rural population. Previously, some guide-lines had been provided in this respect by Dr. M. Visvesvaraya, the late engineer-statesman of Mysore, who saw the vision of a prosperous and contented rural life. The lines of development were wisely chosen so that with the minimum of expenditure and time, the needed target was achieved. The scheme pinpointed the urgent need for people to work harder and work with greater skill. It was designed to serve the interests of the largest section of the district's rural population. Industries were usually divided into two classes, viz., heavy and large-scale industries (class I) and small-scale or minor industries (class II). The former were treated as urban and the latter as rural. Even if there were heavy and large-scale industries in rural areas, they were regarded as rural because they provided employment to the village population and helped to promote their prosperity.

Rural Industrialisation Scheme

The district was treated as a standard unit for the purpose of the scheme and was divided into about 40 or 60 groups of villages, which were named as group circles. Each group consisted of 15 to 25 villages with a population ranging from 10,000 to 25,000. Among the villages of each group area, a central village, conveniently situated, was selected for the headquarters of the unit. So far as the industries were concerned, residents of the group circle were to select their own industries. To begin with, each working family had to choose its own industry. A Development Committee was responsible for the industrial development of the area and for all improvements connected with industries which required collective effort on the part of the local population.

This Scheme, which was put into execution during the First Five-Year Plan, was continued in the Second Five-Year Plan upto the end of December 1959 and from 1st January 1960, it was merged with the activities of the Industries and Commerce Department.

**Industrial
Co-operatives**

With a view to providing remunerative employment for artisans on the basis of self-help and mutual help, a number of Industrial Co-operative Societies have been organised in the district for different crafts such as handloom weaving, village oil industry, village leather industry, hand-pounding of paddy, fibre industry, gur and khandasari manufacture and pottery industry. Their membership is confined to workers or craftsmen engaged in a particular industry or craft. These societies get financial assistance and technical guidance from various sources including the State Government, Khadi and Village Industries Board, Handicrafts Board, Handloom Board, etc.

The subjoined table indicates the taluk-wise distribution of Industrial Craft Co-operatives in the district and their membership as in 1967 :—

<i>Sl. No.</i>	<i>Name of Taluk</i>	<i>No. of Industrial Co-operatives.</i>	<i>Membership (approximate).</i>
1.	Kolar ..	17	2,680
2.	Mulbagal ..	16	2,220
3.	Bangarpet ..	15	2,700
4.	Chintamani ..	16	3,070
5.	Srinivaspur ..	10	2,325
6.	Sidlaghatta ..	17	3,710
7.	Gudibanda ..	5	2,140
8.	Chikballapur ..	21	2,130
9.	Gauribidanur ..	15	3,600
10.	Malur ..	11	1,480
11.	Bagepalli ..	7	1,610
	Total ..	150	27,665

Of these, the Weavers' Co-operative Societies are the more important and they have been already dealt with. The displaced goldsmiths of the district have organised a Smithy-cum-Carpentry Co-operative Society, one each at Kolar Gold Fields, Chikballapur, Mulbagal and Srinivaspur for purposes of their rehabilitation. Of these, the first three societies have been given a loan of Rs. 40,000 each by the State Government. The Handicrafts Board has extended financial assistance to the extent of Rs. 11,900 in the form of loan and grant to a Sculpture Craft Co-operative Society, which is located at Shivarapatna, a place

renowned for its dexterous sculptors since very early days. In addition, Government have given a financial assistance of Rs. 1,07,832 to the Cobblers' Co-operative Society and Rs. 68,940 to the Carpenters' Co-operative Society, both located at Srinivaspur. In addition, the State Government have also extended financial assistance to some of the other handicrafts societies as shown below :—

	<i>Loan</i>	<i>Grant</i>
	Rs.	Rs.
1. Mat-Weavers' Co-operative Society, Chikballapur.	5,800	1,840
2. Mat-Weavers' Co-operative Society, Kallikere.	2,500	750
3. Mat-Weavers' Co-operative Society, Seegehalli.	2,000	600
4. Bamboo-Workers' Co-operative Society, Sidlaghatta.	2,400	1,000
5. Bamboo-Workers' Co-operative Society, Chikballapur.	1,000	250
Total	13,700	4,440

The Mysore State Khadi and Village Industries Board is also extending financial assistance, technical guidance and training facilities to some of the Khadi and Village Industries in the district through its district office located at Kolar. The following are some of the important schemes undertaken by the Board in the district :—

**Khadi and
Village
Industries
Board**

Ambar Charkha Parishramalayas have been established in almost all the taluks of the district and a number of persons have been trained in spinning of khadi from these charkhas. A scheme for the manufacture of gur and khandasari sugar has been introduced in Gauribidanur, Gudibanda and Chikballapur taluks. Twenty-one Palmgur Producers' Co-operative Societies, five Oil Ghana Industrial Co-operative Societies, three Potters' Craft Co-operative Societies, one Tanning Co-operative Society, two units for the hand-pounding of rice and a soap-making unit have also been organised in various parts of the district. A match-manufacturing unit, a fibre industrial unit and a bee-keeping unit, were also proposed to be started in the district.

The financial assistance given to various Industrial Co-operatives in Kolar district by the State Khadi and Village Industries

Board and the Khadi and Village Industries Commission during the period from 1957 to 1967 is detailed below :—

Sl. No.	Type of Industry	No. of Co-operatives	Financial Assistance		
			Loans	Grants	Working capital
(In Rupees)					
1.	Village Oil Industry ..	12	65,462	24,932	43,400
2.	Non-edible Oil Industry ..	5	64,304	23,875	29,000
3.	Hand-pounding of Paddy ..	8	65,037	9,400	25,800
4.	Khadi Industry ..	2	1,05,181	10,000	1,50,789
5.	Hand-made Paper Industry ..	1	..	1,800	..
6.	Fibre Industry ..	3	18,400	22,040	10,000
7.	Gur and Khandasari Sugar Industry ..	4	2,40,452	5,297	80,200
8.	Neera and Palmgur Industry ..	10	6,960	7,886	30,000
9.	Village Pottery Industry ..	10	33,722	21,940	30,100
10.	Village Leather Industry ..	7	6,418	11,700	10,000
Total ..		62	6,05,936	1,38,870	4,09,289

Industrial potential

The district offers ample scope for industrial advancement. The acreage under cultivation of mulberry, which is the basic and highly important factor in sericulture industry, can be considerably increased. Some places in the district have become centres for the cultivation of mulberry and the potentialities for development of the silk industry in the district are considerable. In Mulbagal taluk, there is wide scope for rug and carpet manufacture, preparation of foot-rugs from coir and embroidered articles.

The Bharat Earth-Movers, Ltd., which is being established in the Kolar Gold Fields area, is expected to offer opportunities for the setting up of some ancillary small-scale industrial units, mainly in respect of sheet-metal work, forged items, structurals, etc.

The district has a fairly good cattle population and it has been estimated that nearly 1.75 lakh pieces of raw-hides and skins are annually available from the 12 registered slaughter houses in the district. This number is expected to increase in the coming years. A major portion of the available hides and skins is being sent to tanneries at Bangalore and Madras for processing. Further, nearly 13,000 tonnes of raw-bones are also said to be available in the district, of which only a small portion is being made use of by the mixed fertiliser unit at the Kolar Gold Fields. Hence, there is a considerable scope for establishing one or two units each for leather-tanning and the manufacture of bone-meal, by making use of these surplus livestock resources.

Kaoline is available in some places in the district and the **Mineral-based Industries** quantum of deposit is reported to be sufficient to offer scope for setting up a china clay washery plant. New units for the manufacture of L. T. Insulators can also be established since the district abounds in feldspar and china clay. Close to these units, one unit for the manufacture of crockery can also be set up in the district since there is good demand for this product both from hotels and restaurants and the public in general. Two small units, one each at Sidlaghatta and Srinivaspur, can be run for the manufacture of yellow and red distemper, respectively, as several patchy deposits of yellow and red ochre are reported to be available around these places. The slime, which is available in the Kolar Gold Fields area, may well be used for the manufacture of bricks and also as a filter for oil-refining. This material can also be utilised for the manufacture of stone-ware pipes, since there is not a single unit manufacturing these pipes in the district at present.

There is great need for stepping up irrigational facilities in the district. There is, therefore, the possibility for setting up one or two units in the district for the manufacture of centrifugal pumping sets useful for irrigational purposes. There is no unit manufacturing paints and varnishes in the district at present, although there is a good demand for these items and a unit for the manufacture of these items can be set-up. Locks and padlocks are in good demand in the State and all the requirements are at present being obtained from Aligarh, Bombay and other places. Therefore, a unit for the manufacture of different types of locks, preferably in the Kolar Gold Fields area, can be founded since with the commissioning of the Bharat Earth Movers, Ltd., a good deal of ferrous and non-ferrous scraps and cuttings, which can feed such a unit, is expected to be available. As the demand for bicycle components is quite large throughout the State, there is also ample opportunity for opening a unit for the manufacture of bicycle components, such as chain guards, mud guards, stands, carriers, etc.

In addition to the above, establishment of a number of other units for the manufacture of items like phenyle, poultry equipment, mill stores, fountain pens, etc., can also be taken up by interested entrepreneurs since there is good scope for the development of these industries in the district.

LABOUR WELFARE

The population of the Kolar Gold Fields area consists mainly of the workers of this immense industry and their dependents. As **Kolar Gold Mining Undertakings** the direct result of the development of the mines, arose a prosperous township—one of the largest in the State—with most of

the conveniences and institutions of modern life. The fine roads, the protected perennial water supply, the electric distribution system, the railway, the hospitals, clubs, shops, cinemas, etc., have all resulted from the development of the mining industry.

Great importance is attached to welfare measures for the employees of the Kolar Gold Mining Undertakings who number over 13,000. In fact, the welfare amenities on the mines are of a high order. These facilities include provision of housing, well-run recreation and sports clubs, efficient sanitary and medical services, multi-purpose co-operative credit societies, educational facilities for children of employees, protected water supply and a dairy for the supply of milk and milk products to the employees of the Undertakings.

Realising the need for a healthy and contented labour force, large sums of money were ear-marked for housing, hospital and other welfare activities, involving, on an average, an annual expenditure of over Rs. 36 lakhs. The nationalised industry is endeavouring continuously to expand the welfare services.

There is a Central Social Welfare Committee, consisting of the Superintendents of each mine, the Chief Medical Officer, the Chief Electrical Engineer, and representatives of the Labour Associations, with the Managing Director as Chairman and the Secretary of the Kolar Gold Mining Undertakings as Secretary, which considers problems relating to the welfare of the workmen of the mines. Each mine, in its turn, has a welfare committee consisting of the Superintendent as president, heads of departments, the panchayat president, secretaries of sports clubs, representatives of labour associations, a part-time or full-time welfare secretary and welfare and labour officers.

Canteens

In the Mysore-Champion Reef Amalgamated Mine, there are one main canteen and four sub-canteens. All these are run departmentally. Besides providing the necessary buildings and equipment for running them, the management also subsidises them to the extent of Rs. 2,000 per month. These canteens, in all, have employed 46 persons. There is another main canteen and one sub-canteen in the Nundydroog Mine and yet another in the Electricity Department. These are run through contractors and they have employed, in all, 27 workmen. These canteens are also subsidised by the management and are provided with necessary accommodation, fuel, utensils, crockery and furniture, free of cost.

Co-operative Societies.—There are four Multipurpose Co-operative Credit Societies functioning in the Gold Fields area. Three of them were set up in 1957 and one in 1964. The total

membership of these societies in 1967 was 10,349 with a total paid-up share capital of over Rs. 7 lakhs and an average annual turn-over of over Rs. 45 lakhs. Besides granting loans to their members, these societies transact business in foodgrains, provisions, cloth and stationery.

Recreation.—It has long been recognised the world over that workers must have proper facilities for the healthy enjoyment of their leisure and the mines of the Kolar Gold Fields were amongst the first in India to provide such facilities. Each mine has its recreation centres, and sports clubs and grounds well-equipped for indoor and out-door games. Numerous tournaments, organised both on a mine and inter-mine basis, are held and there is keen competition for the many cups and medals that have been presented from time to time.

**Other
Amenities**

The cultural aspect is not overlooked, and facilities for staging dramas and holding *bhajan* sessions have been provided. Each mine has at least one drama hall, equipped with sets, stage property and electric lighting.

Educational facilities.—For many years the industry has helped to provide educational facilities for the children of employees and others living in the mining area and has maintained a number of schools and supported many others either by monetary grants or by assistance with building and other facilities. Education at primary as also high school levels is available and night schools are also being run for the promotion of adult literacy. During 1967, a long-felt need was fulfilled by the founding of a School of Mines on the Kolar Gold Fields. A three-year course was framed to provide a sound practical and theoretical training for intending mining apprentices and foremen and the facilities provided here for obtaining experience in all branches of metalliferous mining are probably unique in Asia.

Medical facilities.—For providing medical facilities to the workers and their families, the management has established a hospital with a bed-strength of 240, two dispensaries and four maternity clinics, with modern equipment. Free transport is provided to the employees and their families to and from the hospital and dispensaries.

Housing.—Nearly 75 per cent of the workmen have been provided with quarters at a nominal rent varying from 50 paise to three rupees per month. The housing colonies are self-contained and there are general community-type latrines, water-taps, *dhobi khanas*, shops, etc. In some cases, water-taps and latrines have been provided to individual houses.

Milk supply.—A well-maintained dairy is being run by the Undertakings to supply protected and wholesome milk and milk-products to the employees at reasonable rates.

**Bharat Earth
Movers Ltd.**

With a view to providing housing facilities to its workers, the Bharat Earth-Movers, Ltd., has proposed to construct a new township in the Kolar Gold Fields area near its new factory premises. The school-going children of the employees are provided with free uniforms and also pasteurised milk. Transport and medical facilities to the employees and their families have also been provided. Besides, other amenities like co-operative stores, canteen, sports club, welfare fund, etc., have also been provided, and such of the employees as are working on hazardous jobs, are supplied with free milk and vitamin tablets.

**Gauribidanur
Co-operative
Sugar Mill**

The Gauribidanur Sahakara Sakkare Karkhane, having been started recently, has been able to provide quarters to only a few of its employees. Housing facilities for a large number of employees and other labour welfare measures are expected to be implemented in course of time. (See also Chapter XVII.)

Statement showing the number of units, investment, employment and production of registered Small-Scale Industries in Kolar District in 1965-66

<i>Industries</i>	<i>No. of units</i>	<i>Investment (in Rs.)</i>	<i>Employment</i>	<i>Production capacity (value in Rs.)</i>	<i>Actual Production (value in Rs)</i>
1	2	3	4	5	6
A. Engineering Industries—					
1. General Engineering and Auto-repair Workshops.	9	1,87,000	42	2,53,500	1,21,000
2. Steel Furniture and Office equipment.	5	1,33,000	36	1,70,000	1,29,000
3. Steel Trunks ..	2	12,000	9	38,000	30,000
4. Agricultural Implements	15	2,06,750	119	3,97,000	2,35,424
5. Domestic Utensils ..	11	1,72,157	80	4,03,000	2,10,700
B. Tiles and Allied Products—					
1. Tiles and Bricks ..	5	3,50,000	169	8,00,000	4,64,500
2. Slate Pencil ..	3	60,000	35	1,90,000	95,000
3. Cement Pipes ..	2	1,00,000	28	1,80,000	74,000
4. Glass (Mirrors, etc.) ..	2	8,000	5	25,000	15,000
C. Chemical Industries—					
1. Soap ..	3	95,500	26	3,32,000	1,10,000
2. Cosmetics/Perfumes (excluding Agarbathies).	3	1,97,300	24	1,90,000	1,56,000
3. Pharmaceuticals ..	3	2,55,000	46	5,45,000	5,20,000
4. Matches ..	1	40,000	19	1,20,000	58,000
5. Plastics/Celluloid/Nylon	4	56,000	45	1,75,000	88,000
D. Wood-Based Industries—					
1. Furniture and Frames ..	4	24,000	31	1,05,000	84,500
2. Saw Mills ..	10	2,81,600	61	2,98,400	2,18,900
E. Miscellaneous—					
1. Khandasari sugar ..	1	3,00,000	50	1,20,000	60,000
2. Sugar-candy ..	1	1,000	4	5,000	5,000
3. Confectionary ..	5	59,000	36	1,64,000	95,000
4. Electric Clock ..	1	70,000	10	6,00,000	Defunct
5. Stone-polishing ..	1	67,000	24	1,75,000	..
6. Packing Material ..	1	45,000	5	Defunct	..
7. Fertiliser (bone-meal, etc.)	1	1,00,000	16	10,50,00	6,50,000
8. Beedi ..	9	1,14,000	122	3,65,000	3,12,000
9. Wafers (Vermicilli and Samia).	1	28,000	5	60,000	50,000
10. Printing Press ..	6	1,07,000	39	1,50,000	1,03,000
11. Paint ..	1	7,000	12	40,000	12,000
Total ..	110	30,76,307	1,098	69,50,900	39,92,024