is worthy of figuring beside the most advantageous that even nations with the most substantial credit have been able to carry through. Our credit is so firmly cemented that a few months later the bonds of the new debt were already above par, in spite of the unfavourable conditions of the European markets."

There is nothing eloquent in these two sentences quoted from his speech to Congress, but what an epitome they are of his country's advancement. A little while back the memory recalls the arrival of foreign squadrons at Vera Cruz to collect by force the repudiated debt. Mexico was divided, distrusted, dishonoured, bankrupt, sunk below the position occupied to-day by the most turbulent of the Central American Republics. Foreign credit is a most delicate instrument for measuring a nation's stability. It is affected by every ill-wind that blows. When Diaz was able to speak of a financial operation successfully accomplished with the Mexican Debt, "worthy of figuring beside the most advantageous that even nations with the most substantial credit have been able to carry through," he gave the best testimony that could be advanced of the entire regeneration of his native land.

Some may say that Diaz is inconsistent. The twenty-two years of continuous power he has enjoyed is a denial of his own convictions. He who, in war and peace, placed it in the forefront of his political creed that a President should not be eligible for re-election, has not himself been replaced. This is quite true. Time, however, has taught Mexico a good many things, and one of them is that this disability, which was deemed so essential to prevent usurpations of power in days of national turmoil, is no longer necessary in a period of peaceful development.

It had outlived its usefulness. To construct a bulwark against tyrants had been the aim of its designers. In the altered condition of affairs it served rather as a drag upon the nation's progress. A compulsory change of Presidents each four years threw the machinery of government out of gear.

So it came about that before Diaz' second period of office

expired in 1888 the nation decided to so amend the Constitution as to allow the President two consecutive terms. Four years later, when the dismissal of Porfirio Diaz in the midst of his great work for Mexico, still uncompleted, again agitated the country, Congress solved the question for all time by abolishing every limitation whatsoever.

In 1892, in 1896, in 1900, and again at the election of 1904, there was no other candidate for the Presidency. Porfirio Diaz has been allowed to build up the modern State of Mexico on the lines that he himself laid out, undisturbed by the rivalries of other would-be constructors, and it will be an imperishable monument of his fame.

His administration has been one of peace. Long as his term of power has drawn out, the foreign relations of Mexico under his rule will afford little matter for the future historian. He has laboured to be on good terms with all, and especially with his great neighbour in the north; and by commercial treaties and legations established in the capitals of both hemispheres has sought to make Mexico favourably known and to increase her trade. But the work that has made him great as a statesman, and by which he will be remembered, has been done at home.

The schools and libraries, public institutions and hospitals one meets with everywhere are all evidences of his fostering care. Nothing is too small or too big for his attention, and where he has himself set the example he has taught others to follow. Education, as has before been emphasised, is his ruling passion. He told Congress:

"The instruction of the people is so essential to democratic life that its progress and perfection, which monarchical governments regard as a charity, is with us one of our greatest duties."

This passage is characteristic of the great Republican.

Mexico's phenomenal development, amidst which the country has become rich and the people have learnt to be contented, must be attributed in no small measure to the railways, which carry its commerce to the United States and to the coast. They are from an engineering aspect some of the most wonderful

lines in the world, climbing to heights over 10,000 feet, and surmounting natural barriers which might well seem impassable. The railways in turn owe almost everything to the energy and initiative of President Diaz, who has been their stoutest champion. There were projects before Diaz came into power; companies had been formed, charters obtained, surveys completed, and in places a commencement had been made. The railway policy, cautiously begun by Juárez, and set back in the troubled time of his immediate successor, had never, however, much life in it until Diaz climbed to power, set about restoring order, and gave the foreign investor some sense of security.

In Mexico the great line, the one of which the people are themselves most proud, is the Mexican Central. There are others, the first of which was the English-built line to Vera Cruz—many others, and fine lines they are too; but the Mexican Central goes through the heart of the country, and carries a large proportion of its commerce. Its origin dates back to 1874, when a line from the capital to the city of Leon was approved. Funds for its construction could not be found, and the project lagged.

President Diaz enlarged the charter, giving powers of construction up to the Texan frontier. Shortly before he left office in 1880, he had granted the concession to the Mexican Central Railroad Company, Limited, which had been incorporated in the State of Massachusetts, U.S.A., for the purpose. The grant was liberal, providing for a subsidy of $15,200 per mile, the right of free importation of materials for construction, repair, and operation for fifteen years, and exemption from all taxation until after the expiration of fifty years from the completion of the line. It authorised the building and operation for ninety-nine years of a standard gauge railway and telegraph line from the capital through all centres of population of Central Mexico to Paso del Norte, with branch lines to the Gulf and Pacific Coasts.

In the middle of October, 1880, operations were begun in Mexico City. The construction of the international bridge over the Rio Grande at El Paso was commenced shortly afterwards.

The line was built in two sections, one extending from the capital north, and the other from El Paso south. These two parts were joined near the city of Fresnillo, State of Zacatecas, in 1884, completing 1,224 miles of railway. Branches have since been thrown out in every direction, smaller companies bought up and amalgamated, and now the Mexican Central controls 3,300 miles of railroads.

The gross earnings for 1884, the first year after the main line was completed, were $3,742,221.21.

The gross earnings for 1902 were $21,132,226.87.

In 1884 the gross earnings per mile were $2,648.33.

In 1902 they were $8,062.47, showing an increase in business per mile of over three hundred per cent. Over 70 per cent. of the population of Mexico inhabits the States which are served by the Mexican Central Railway. Of the great cities of the Republic there are but five of over 35,000 inhabitants which are not reached by the rails of this company. The great mineral belt of Mexico, which has produced nearly one-half of the silver now existing in the world, extends from south-east to north-west parallel to the main line, and has contributed directly or indirectly more than fifty per cent. of the Company's revenue.

To such an extent has the influence of improved transportation facilities been felt that many of the mines abandoned by the Spaniards on account of difficulties of operation are now Bonanza mines.

Other of the principal Mexican railways are:

The Mexican Southern.
The National.
The Mexican International. } Government Railways.
The Interoceanic.
The Tehuantepec.

All these lines, and their projected extensions, can be traced on the folded map at the end of this volume. A complete network of railways already covers the country. When all the branches and new lines now under construction are completed, Mexico, which lies between the eastern and western continents, will be crossed by seven great railroads, that will connect

its ports on the Pacific and the Atlantic. She will also have seven lines crossing the frontier into the United States at seven different points—not a bad record in railway development in thirty years.

Another of the most important public works fostered and encouraged by President Diaz has been the completion of the drainage of the valley in which Mexico City lies. Although standing at an altitude of 7,349 feet above sea level, the capital is completely surrounded by mountains, two of which are amongst the highest volcanoes in the world. It is probable that in dim and distant ages, millions, aye, billions of years ago—for time counted little in the making of the world—the whole of this valley was one vast lake. To-day some straggling lakes or lagoons still exist.

The legend of the Aztec foundation of the city is as follows :

They were a mighty people of vast numbers, immense wealth, and considerable artistic talent, living in crude luxury and employing slaves.

One fine day, maybe two or three thousand years ago, they came down to the shores of Lake Texcoco, which from its dimensions must have appeared to them a huge sea. They were pleased at its appearance, and, finding a high rocky prominence upon its shores, camped. Here an unexpected sight met their eyes. Perched on the stem of a large prickly pear, or cactus, stood a golden eagle of great size and beauty ; the wings of the bird were extended towards the rising sun, and in his talons he held a wriggling serpent. The Aztecs took this as a good omen, and at once decided to build a city on the spot.

The tradition of the eagle has descended through all times, and is preserved on the banner of Mexico to-day.

As the bird perched on the cactus was the origin of the city, the Aztecs called their new camp " Tenochtitlan," from " tuna," a cactus. But in later years the name was changed, in honour of the great war-god of the Aztecs, to " Mexitli."

Naturally in those early days houses were very primitive. They were covered with reeds, cactus, palms, or like materials, supported on poles cut in the neighbouring forests ; just as huts

in the tropical parts of Mexico are made to-day. But it was not long before these rude dwellings were replaced by more substantial erections, and the great *teocali*, or temple of the Aztec gods, was built—a pyramid over a hundred feet high, approached by one hundred and forty steps.

When Cortéz came to the country he stood on this pyramid and gazed on the wonderful scene below and around him. Here he decided to build his capital. At the close of the century which witnessed the Spanish Conquest there were only 10,000 Indians surviving in the valley of their forefathers, and about as many foreigners had arrived.

But this population soon increased, and for two hundred and fifty years Mexico had the honour of being the largest city on the great Western Continent.

It must not be imagined that Mexico City is in the middle of the Republic, although it was probably nearly central in Aztec territory. It is 1,500 miles from the north-western boundary of Mexico, two hundred miles from the Gulf, four hundred from the Pacific coast, and six hundred from the boundary of Guatemala. These figures give some idea of the vastness of the country which General Diaz governs.

Now this swampy lake was a ridiculous place by which to build a town, because, being completely surrounded by high land, there was no outlet whatever for the water which poured down from the mountain sides and lay, as it were, at the bottom of a basin. So long as the level of the lake remained fairly stationary this was all very well ; but when the fearful floods of summer swamped the valley, there was nowhere for the water to flow, and consequently, the city was continually submerged. Two of the most terrible floods occurred in 1552 and 1629.

As early as 1607 works for the relief of the city from floods were undertaken by the Spanish Viceroys. To-day the Mexican Central Railway runs along a huge cut through the mountain ridge a dozen miles in length—the Tajo de Nochistongo—which Enrico Martinez (originally written Maartens), a famous engineer, Dutch by birth, began in that year with the object of affording an outlet for the waters. Fifteen thousand Indians were kept

employed on the excavation. It was attended by frightful mortality, thousands of labourers perishing by neglect and disease. The treasure of the country was freely poured out upon the undertaking.

As originally designed it was partly tunnel and for a time water ran through, but, owing to imperfect acquaintance with the engineering problem presented, this herculean dyke never really answered its purpose.

General Diaz had ample opportunity for considering the problem. Little of his early life had been spent away from the South, but the prospect of a flooded capital was never absent from the mind of a Mexican, and the desirability of overcoming nature's obstacles had appealed to him with especial force when he was besieging the Imperialists in Mexico City. It was one of the first matters to which he turned his attention as President in 1884. The plan finally carried out was the result of long study of the subject by a Mexican Indian, Don Luis Espinoza, an engineer of remarkable power and brilliant gifts. Work was begun in 1885—a furtive start was made six years before—and though subject to delays from lack of funds, especially at the outset, the scheme was completed in 1900.

What Espinoza has done is to form a drainage system by canals and conduits collecting much of the flood-water from the upper levels of the valley and leading it away from Mexico City to the mouth of a tunnel. The drainage from the city itself is brought to the same point, and the tunnel is cut six miles through the mountains and discharges into the Tula River. This daring and colossal undertaking, carried out with complete success, cost Mexico $16,000,000.

The great cut of the Tajo de Nochistongo has not been utilised; indeed, the Mexican engineers have chosen to find their outlet in another direction. Espinoza began to carry out the work for the Government himself. Afterwards it was given into the hands of contractors, but he continued as chief engineer and inspector of the tunnel for the Government until its completion, and at present occupies the important position of engineer and architect to the Government Board of Public Works.

General Diaz took the greatest personal interest in the enterprise, and aided it by every means in his power, appointing a *Junta Directiva*, or special board of management, whose members were Don Pedro Rincón Gallardo (the present Minister in London), Don Casimiro Collado, Don Agustín Cordon, Don Francisco Rivas Gongora, and Don José Yves Limantour (for several years the Chairman of the Board). As a proof of these gentlemen's devotion to the duties they had undertaken, it may be mentioned that out of one thousand seven hundred and eight meetings held during the fifteen years the drainage scheme was under construction

Don Pedro Rincón Gallardo	attended	946	meetings.
Don Casimiro Collado	,,	1,477	,,
Don Agustín Cordon	,,	584	,,
Don Francisco Rivas Gongora	,,	1,257	,,
Don José Yves Limantour	,,	1,052	,,

Of this patriotic band only two are now alive, viz: General Rincón Gallardo and Señor José Yves Limantour, both of whose names occur frequently in these pages.

As this is probably the largest drainage scheme in the world and the tunnel was, at the time it was cut, one of the longest in existence, some particulars of the engineering work should be of interest. I am indebted for them to Mr. J. Fletcher Toomer, A.M.Inst.C.E., the chief engineer and general manager for Messrs. Reid & Campbell, who contracted for the work.

Nearly six and a quarter miles of tunnelling were built through a mountain in six and a half years. The tunnel still ranks fifth in the world in order of length, as the list below shows:

Simplon	12	miles,	444 yards.
St. Gothard	9	,,	564 ,,
Mont Cenis	7	,,	1,730 ,,
Arlberg	6	,,	404 ,,
Tequixquiac (The Desaque, Mexico)	6	,,	288 ,,
Hoosac (United States of America)	4	,,	685 ,,
Severn (Great Western Railway)	4	,,	624 ,,

A canal about 35 kilometres long has been cut from Mexico City north to the foot of the mountains. At this point the tunnel begins, and keeps due north under the mountains, coming out in the valley of Tequixquiac. Its exact length is 10 kilometres 14 metres. It has been built on designs furnished by the Mexican Government's engineers, and the materials used were chosen by them. The fall is 1 foot in 1388.88 feet. The chord of the arc of the tunnel and the height are each nearly fourteen feet. The arch of the tunnel is composed of four concentric rings of hard brick, and the invert with cement blocks, both backed by volcanic stone.

Water existed in nearly the entire course of the tunnel in large quantities. In the softer parts the ground always swelled, whilst in the harder parts, if not supported, it invariably cracked off.

On the line of tunnel are twenty-five shafts, 400 metres apart, having an inside measurement of 7 feet by 10 feet (corner measurement, the sides being curved), lined with 18 inch brickwork; the depth of the shallowest being 66 feet and of the deepest 301 feet. From north and south of each of these shafts the tunnel was constructed. When the piercing of the mountain was completed daylight could be seen through from end to end.

The quantity of water encountered in the shafts varied from 350 gallons to 1,000 gallons per minute, the total discharge at the mouth of the tunnel being 6,000 gallons per minute, the surrounding country being gradually drained as the construction of the tunnel proceeded.

The following data will give some idea of the vastness of the undertaking.

One hundred and eight engines were employed in pumping, winding, ventilating, sawing, mortar-making and brick-making.

Five locomotives were used to haul material.

The materials used in the construction of the tunnel were 22,000,000 bricks, all made on the works at the rate of 30,000 daily; 1,000,000 artificial stone blocks, made at the rate of 1,000 daily; 20,000 cubic metres volcanic stone; 25,000 cubic metres mortar; 5,000,000 B.M. of lumber; 20,000 tons of coal

were burned in the engines and forges; 10,000 cords of oak wood were used in lime-burning.

Three thousand people were employed during those six and a half years, and it is greatly to the credit of the Mexicans that during the last four years of this period, with the exception of a small handful of heads of departments, the entire work was accomplished by Mexican operatives and peons themselves.

From the point of discharge of the tunnel into the Tula River the water brought down from the Mexico Valley flows many miles to the coast, and finally empties itself at the Gulf port of Tampico.

It was a great day when the advance gallery was finished, and there was a hole from the mouth of the tunnel to where it was to join the canal. General Diaz, some of his Ministers, and all the members of the Drainage Board were present. Many of them descended through No. 1. shaft into the tunnel. They found their way to a point where only six feet of earth remained to be removed.

President Diaz was gleeful. He had come from the city to open the communication himself. A pick had been already prepared, with a silver plate on its polished handle, suitably inscribed for the occasion.

Mr. Toomer, who was standing beside him, handed him the implement, and held the coat of which the President quickly disencumbered himself. With might and main he picked away the earth, and then stepping through the hole he had himself made, exclaimed jubilantly:

"There now, the tunnel is at last a fact."

What a contrast this modern engineering is to the primitive old arrangement, when a stone wall was built round Mexico City, so that when the town became flooded by rain, the residents might pump the water up over the wall until they made the basin dry! In the chief thoroughfare—San Francisco Street—there is a mark on one of the corner houses showing where the last flood reached, and that is about ten feet above the pavement.

The tunnel and canal have been finished, and have proved that they are more than equal to the work for which they were

constructed. This great engineering feat has turned the swampy Valley of Mexico into fertile and well-drained land, and from a fever-stricken city laid out on a quagmire has evolved a healthy capital standing on dry foundations. It has done much more than remove the evils and risk of flood. Now, for the first time in all the centuries that the Valley has been peopled, an outlet has been provided, Mexico City has been able to lay down the most perfect system of sewerage and sanitation, and halting at nothing, has spent six million dollars on the work. That the city should have been able to exist so long under the old conditions is a tribute to the qualities of the Mexican climate at these high altitudes, and a defiance of everything that the sanitarian teaches. Epidemics have at times brought fearful punishment for the neglect of hygienic laws, but all that is now happily past.

When I was first there in 1900 all the drains were up—they had been up for a year, and seemed likely to be disturbed for several more. Dreadful smells issued, and it was little wonder that the death-rate averaged sixty per thousand. Looking down the new sewers one could see water four feet below the surface—black, filthy-smelling water. The natives did not seem to mind odours and want of sanitation, or the extraordinary sights one saw at every street corner would not have been permitted.

On one occasion I actually heard a military band giving an afternoon concert round an open sewer! It was their habit to play every Thursday in that thoroughfare, and although the entire street was up, and black mud and drain-pipes littered the pathway, the band found standing room among the débris, and, unhindered by awful odours, gave their usual concert, the Mexican Indians thoroughly enjoying the combined music and smell.

Mexico is built more or less on piles, no longer sticking up above the surface as in old Aztec days; thus it happens that many of the houses and churches are crooked. The foundations being swampy and insecure, earthquakes upset the perpendicular. It is a city of crooked perpendiculars.

When digging at the back of the Cathedral, where the great Aztec Temple once stood, some wonderful remains were unearthed. I saw an altar just as it was found in the black mud. It weighed some tons, and was almost perfect; indeed, it is now one of the most interesting relics in the Museum hard by. Skulls, cross-bones, and other devices are carved upon it, forming a frieze a yard wide. It is one metre ninety-two centimetres wide in front, and the sides are one metre sixty-five centimetres in length. There are four rows of skulls, each row composed of seven skulls and six pairs of cross-bones. The skulls are in profile, and the cross-bones are short and thick. They alternate, instead of the cross-bones being placed under the skulls as we are accustomed to see them.

In this chapter we have seen how modern Mexico, by modern Mexican finance, has been built up on the very spot chosen by the Aztec people of old for their home.