

DRAINAGE OF THE VALLEY OF MEXICO

REPORT  
OF  
THE WORK DONE UP TO

THE 1<sup>st</sup> OF OCTOBER 1892.



MÉXICO

IMPRESA DE FRANCISCO DIAZ DE LEON SUCS.,  
SOCIEDAD ANÓNIMA.

Esquina de los Rebeldes y San Juan de Letrán.

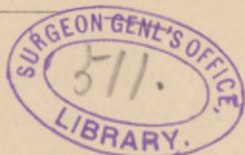
1892



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## THE DRAINAGE OF THE VALLEY OF MEXICO.



The Drainage of the Valley of Mexico is a work which has claimed the constant attention of the different Governments that have ruled over the Mexican Nation. Even in the time of the Spanish Government, several projects were prepared with the object of giving an outlet, outside of the valley, to a more or less considerable amount of the waters which fell within its circumference. Amongst these projects, the most famous was that of Enrico Martinez, under which the colossal cut of Nochistongo was excavated, and which up to the present date has served to carry of the waters of the River Cuautitlan, thereby diminishing to a very appreciable extent the dangers of inundation in our beautiful Capital.

The project which is at present being executed, is a modification of the ideas published in the time of the Spanish Government by Simon Mendez, and which in 1849 were also followed by Captain Smith, of the American Engineers.

The location of the tunnel is what gave rise to the greatest discussion, and it was ultimately located under the saddle and through the ravine, of Acatlan, the mouth of the tunnel being situated near the village of Tequixquiac.

The works were begun on several occasions, but unfortunately were also suspended without anything of importance being effected until the year 1879, when the Engineer, Don Luis Espinosa, the present Director of the Works and author of several important reforms which have been made in the original project, took charge of the undertaking. In the first period mentioned, the cutting of Tequixquiac was excavated, and the greater part of the shafts were also begun; but at that point the work was stopped on account of the unfortunate political agitations that for so many years have disturbed the country.

The work may be said to have been really commenced in the year 1885, when the City Council of Mexico initiated the project with the Federal Government, anxious to complete a work so indispensable to the City, and offering to contribute largely to the cost of the same.

The President of the Republic, General Porfirio Diaz, then named a Special Commission with ample authority to disburse the funds dedicated to the work, and this body it is, that up to the present date, has directed the execution of the Works. When the Commission took charge of the business, the amount of \$400,000 per annum was placed at its disposal, which the City Council had been able to provide, and this amount was increased by the Government to an amount sufficient to pay

the expenses. Two years after that, the City Council contracted a loan in London of £2,400,000, the proceeds of which, have been almost entirely delivered to the Commission, and have served to cover the cost of the work up to the present date, as well as to guarantee the realization of this important and magnificent undertaking.

In order that the City Council should be able to assume the entire responsibility of this important work, the Federal Government increased its resources by ceding to it a part of the taxes to be collected, and authorizing it to collect new taxes.

The project at present followed for the drainage, has two objects: first, to receive the surplus waters and sewage of the City of Mexico and carry them outside of the valley; and second, to control the entire waters of the valley, affording an outlet, whenever found necessary, to those which might prove prejudicial. This project consists of three parts: a canal which starts from the gate of San Lazaro and has a length of 47 kilometres, 580 metres, its line following on the eastern side of the Guadalupe range of hills and between that range and Lake Texcoco, changing its direction after arriving at the 20th. kilometre to a Northeasterly direction, so as to cross Lake San Cristobal diagonally, a part of Lake Xaltocan and another part of Lake Zumpango, afterwards arriving at the mouth of the tunnel close to the town of Zumpango.

The level of the bottom of the canal above the datum line adopted, is 2.25 m., and the mouth of the tunnel is 9.20 m., below the same datum, which is supposed to pass 10 metres below the bottom of the Aztec Calandar.

The level of the ground at the beginning of the canal is 8.94 m., and at the end of the same 15.86 m., above datum. The uniform slope of the canal, is at the rate of 0.187, per kilometre.

At its commencement, the canal has a depth of 5.50 m., which in the last few kilometres is increased to 20.50 m. The side slopes were projected with a batter of 45 degrees, the width of the bottom is 5.50 m., for the first 20 kilometres, and 6.50 in the rest of the canal. As can be seen by the accompanying plan, the first 20 kilometres may be considered as a prolongation of the net of sewers in the city, and will not receive more water than that which passes through them, the flow being calculated for an average of 5 cubic metres, although under special circumstances such as extraordinarily heavy rains they can receive a greater volume of water; the rest of the canal is in communication with the lake of Texcoco and is intended by the Government to be utilized in controlling the waters of this lake which is the lowest in the Valley, and which can be made to receive water from all parts of the same. For this reason the canal has been calculated to carry the largest quantity of water that could pass through the tunnel, which is 18 cubic metres per second.

The canal is being opened in a strictly clay formation, which is cut in some parts by thin strata of sand and sandstone.

In order to afford passage for the railroads, wagon roads and important water courses which require to cross the canal, it will be necessary to construct 23 structures, five of them being aqueducts to carry rivers, 4 of masonry and one of iron; four will be iron bridges for

the passage of railroads, and the rest will be dedicated to the passage of main roads and accomodation roads.

The tunnel has a length of 10,021.79 m., with a curved section formed by four curves which will have the following respective dimensions; the upper part will have a span of 4.185 m. and a rise of 1.570 m., the two lateral arches will have a chord each of 2.36 m., and a radier with a chord of 2.429 m. and a rise of 0.521 m.; the elevation will be 4.286 m., and the greatest width will be the span of the upper arch; the accompanying drawings will show this section. The tunnel is lined in the upper part with brick, with a thickness of 0.45 m., and in the lower part, over which the water will run, it will be lined with a thickness of 0.40 m., in the side arches and of 0.30 in the radier, this latter lining being constructed of artificial stone, which will be manufactured of sand and Portland cement. The elevation of the invert at the beginning of the tunnel will be 9.20 m., below datum and at the end of the tunnel 17.53 below datum. As before said, the length of the tunnel will be 10,021.79 m., with a grade of 0.00069 per metre for the first 2,170.74 m., and 0.00072 for the following 5,831 m., 0.001 for 5,100 m. and 0.00135 for the rest of the tunnel, these changes being due to certain reforms in detail which have been made on the original project, in some cases modifying the section and in other cases the lining. The tunnel is calculated for a current of 18 cubic metres per second; 25 shafts have been opened with a width of two metres and a length of three metres, at a distance of 400 m., from each other. These will serve to ventilate the tunnel and to push the work. The depth of the shafts varies according to the topography of the

ground; the deepest, which is situated on the saddle of Acatlan has a depth of 92 m., and the shallowest of 21 m.; the different shafts and the depths that they reach can be seen on the profile of the works which accompanies this paper. The ground in which these shafts have been sunk is of a variable formation, and composed of clays, marls, and tophus. The cutting at the mouth has been opened on the bed of an old stream; it is three kilometres in length with an average depth of 16 metres.

### EXECUTION OF THE WORK.

When first the Drainage Board took charge of the work, it was executed by day labor both in the canal and the tunnel, the latter having the larger amounts expended on it. But shortly afterwards, the contract for the tunnel was let to Messrs. Read & Campbell, who after having invested a considerable sum in the work, found themselves under the necessity of cancelling their contract at the beginning of the present year. These gentlemen have continued to manage the work, but as managers and under the direction of the Commission.

The excavation of the grand canal was originally contracted with the Bucyrus Company of the United States, of which Colonel Harris was the President. This Company brought two spoon dredges, capable of extracting up to 1,000 cubic metres per day, and with these it commenced its excavations at the 22nd. kilometre. After the lapse of a few months, the Commission desiring to push the work of excavation as much as possible, cancelled the contract celebrated with this Company, and exe-

cuted the one which is at present in force with the English Contracting firm of Pearson & Son, who have undertaken to complete the canal by the month of September 1894.

These Contractors are carrying out the work of the canal in two different manners; by hand work with centrifugal pumps to draw off the water which filters into the work; and by means of enormously powerful Couloir dredgers which have a capacity for 3,000 cubic metres of excavation per day, and which throw the excavated earth to a distance of more than 200 metres from the centre of the canal. They have at present five of these dredgers at work, and by means of them can excavate to a depth of 20 metres, raising the earth to an elevation of more than 16 metres so as to empty it into the shoots, along which it is carried by a stream of water and delivered at a considerable distance from the dredger.

The actual condition of the works at the end of September of the present year, was as follows:

#### GRAND CANAL.

Total excavation..... 6.666,000 c. m.

#### TUNNEL.

The shafts are all completed, with the exception of Nos. 8 and 11.

The headings have advanced to a total distance of..... 6,200 l. m.

The concluded part has a length of..... 5,520 l. m.



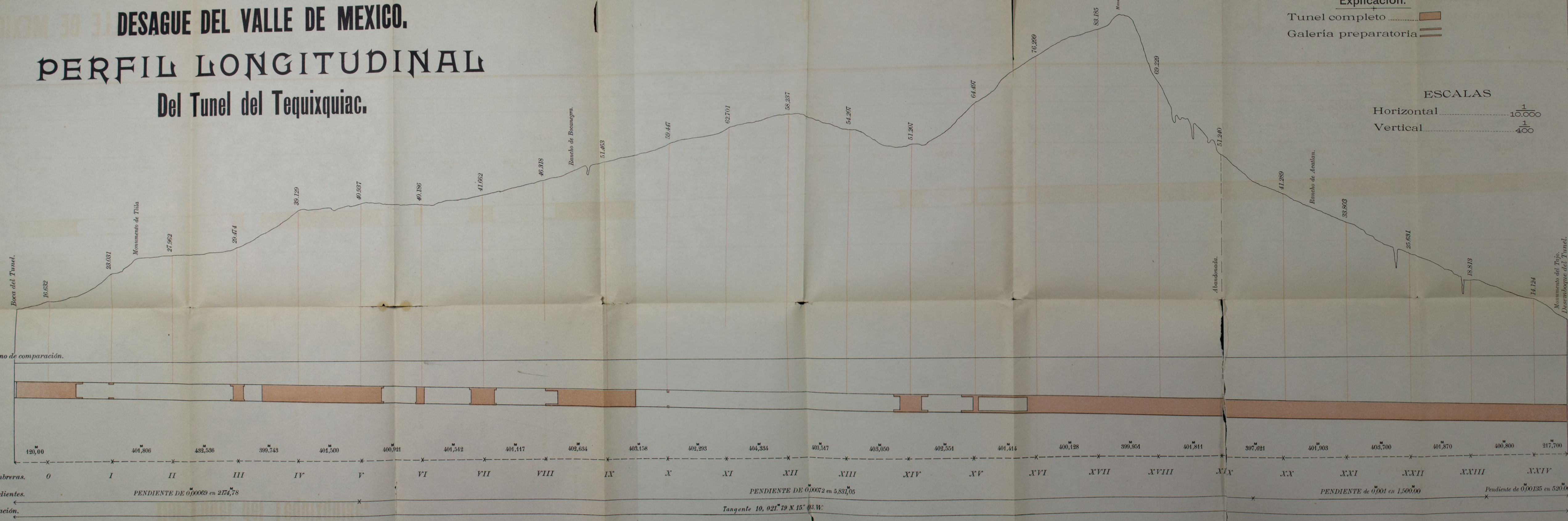
# DESAGUE DEL VALLE DE MEXICO.

## PERFIL LONGITUDINAL

### Del Tunel del Tequixquiac.

Explicación.  
 Tunnel completo .....  
 Galería preparatoria .....

ESCALAS  
 Horizontal .....  $\frac{1}{10,000}$   
 Vertical .....  $\frac{1}{400}$

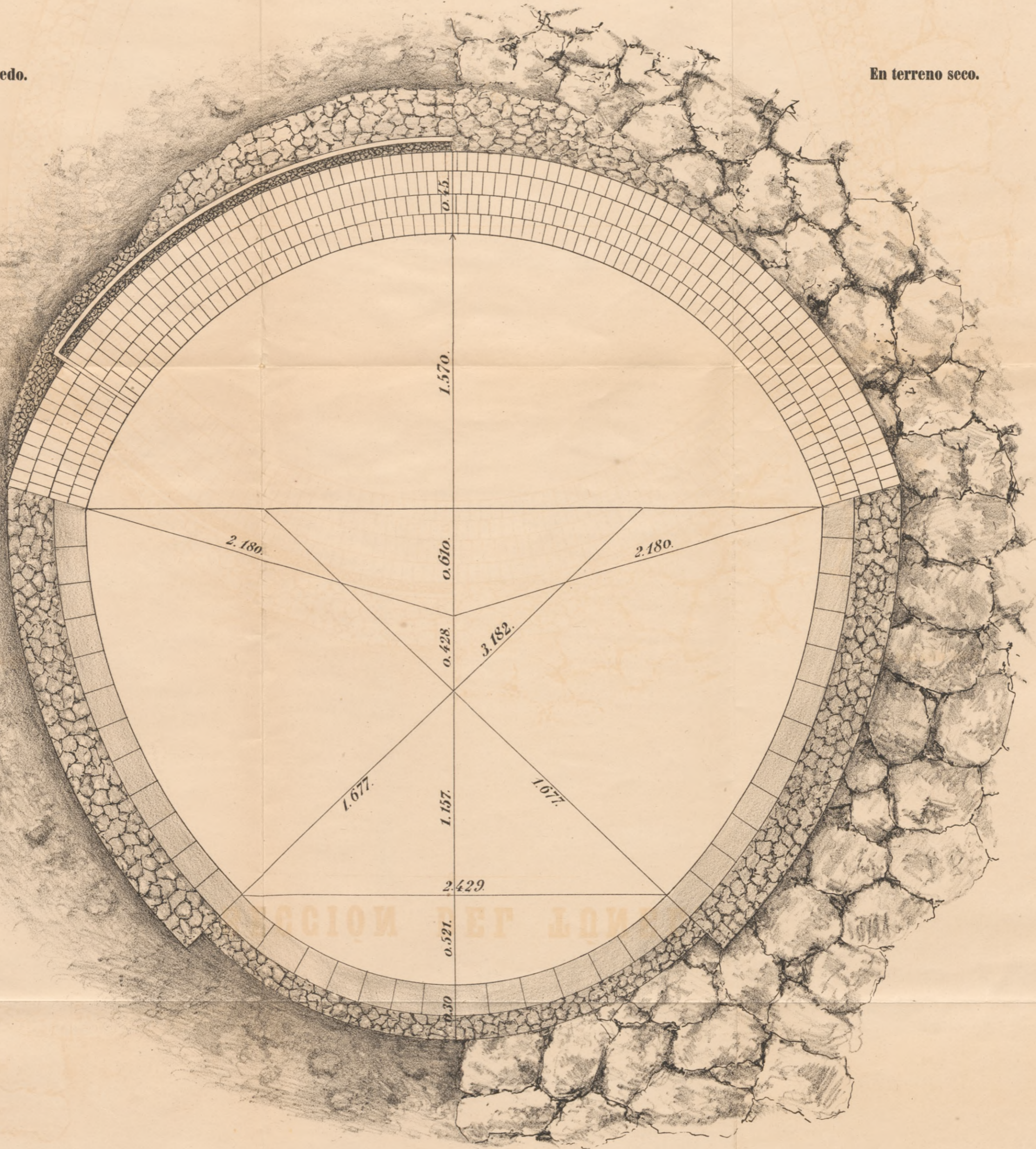


# DESAGÜE DEL VALLE DE MÉXICO.

## SECCIÓN DEL TÚNEL.

En terreno húmedo.

En terreno seco.



ESCALA: 0.<sup>m</sup>05 POR METRO.



# CARTA HIDROGRÁFICA DEL VALLE DE MÉXICO

CONTENIENDO

el trazo del gran canal y túnel para el desagüe del mismo Valle  
y de la ciudad de México, conforme al proyecto en ejecución.

1892.



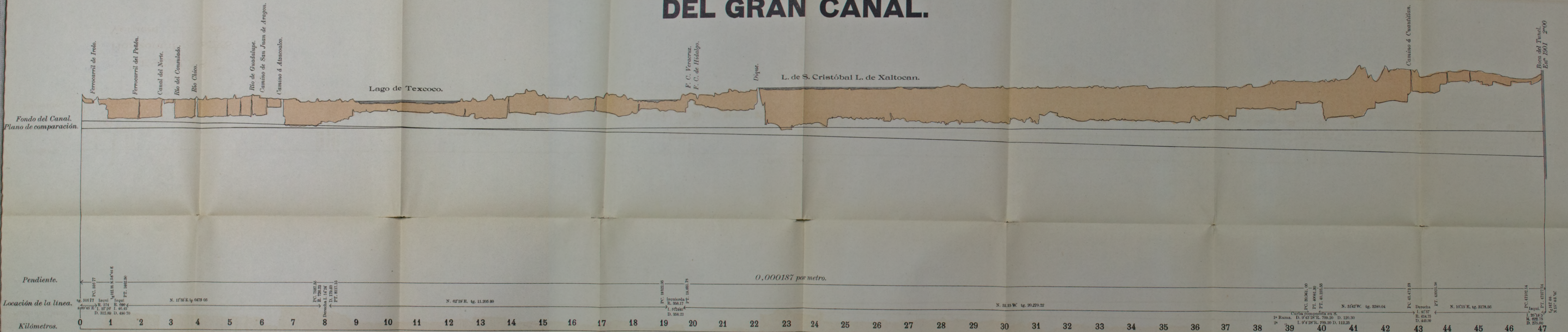
Referencias.

- Ciudad Cabecera de Distrito ..... ●
- Villa ..... ●
- Id. Cabecera de Distrito o Municipio ..... ●●
- Pueblo ..... ●●●
- Id. " " " " ..... ●●●●
- Hacienda ..... -
- Rancho ..... -
- Ferrocarril vía ancha ..... -
- Id. " " angosta ..... -

ESCALA 200000

# DESAGUE DEL VALLE DE MEXICO.

## PERFIL LONGITUDINAL DEL GRAN CANAL.



**ESCALAS**

Horizontal.....  $\frac{1}{50,000}$

Vertical.....  $\frac{1}{400}$



