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Canal of Isabella II., at Madrid.

We herewith present to our readers a view of a portion of one of the most remarkable works in hydraulic engineering of modern times.

It is called the "Canal de Isabella II.," and was originally designed to supply the city of Madrid with water. It has, however, also been employed for irrigating the vegetable gardens in the environs of the Spanish capital.

This canal and the magnificent works connected with it were sanctioned by the Spanish Government in 1851, and the work was brought to completion in 1858. Its cost was 57,897,368 francs, over eleven and one half millions of dollars in gold.

The engineer who designed this immense work was Don Lucio del Valle, engineer-in-chief to the Spanish Government. For his services he received the honor of the order of Charles the Third. He was assisted by the present engineer of the works, Don Jose de Morer.

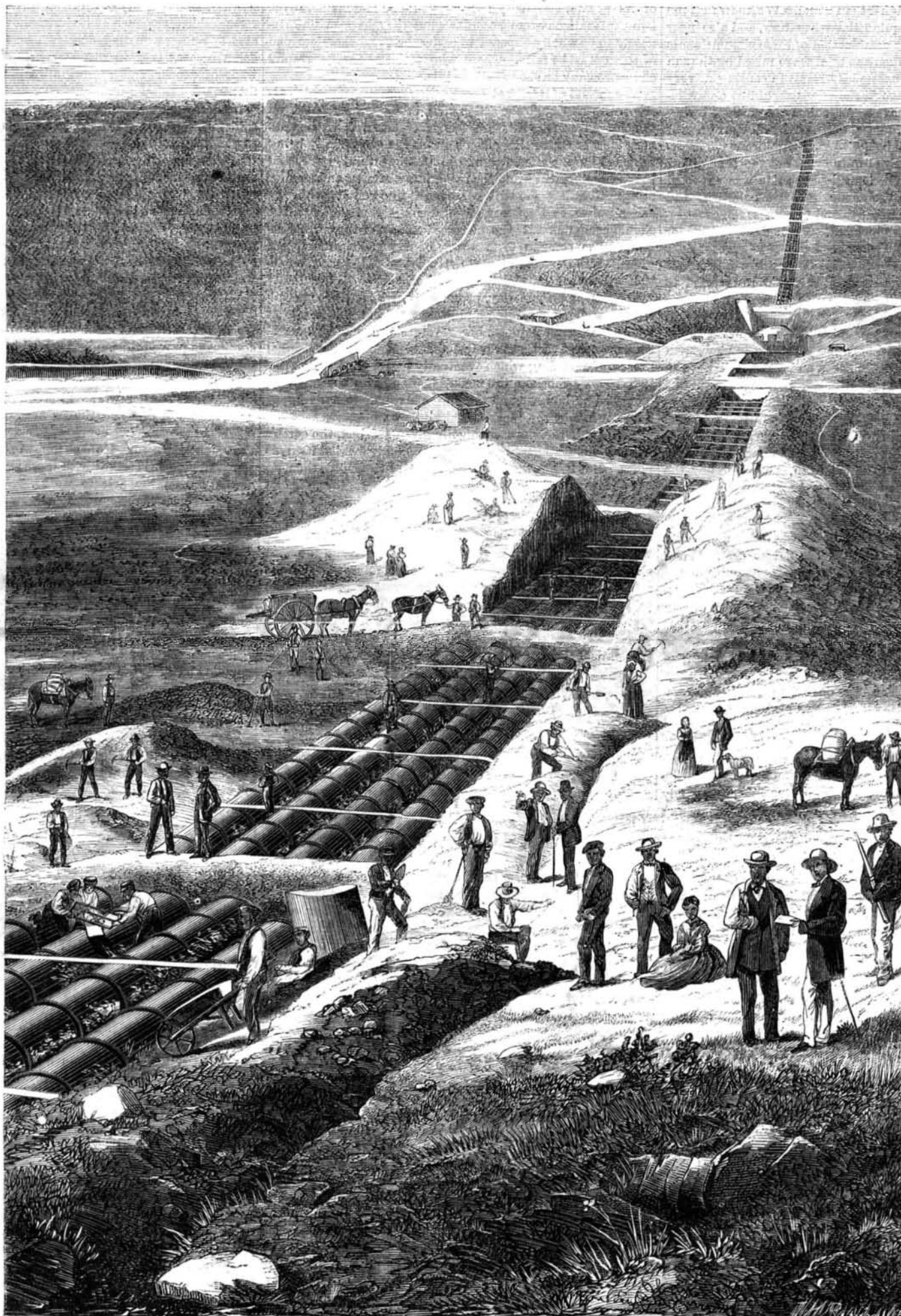
The total length of the canal is over forty-seven miles. In this length there are seven miles of subterranean galleries, four thousand six hundred feet of aqueducts, and eight thousand six hundred feet of siphons.

There are also many remarkable trenches, retaining walls, etc., and excepting the aqueducts, the entire canal is arched over.

The water is brought from the river Lozoya, where it emerges from the Guadarama Mountains to the north of Madrid. A dam, ninety-eight feet in height, is erected at this point, abutting on the rocks which form the banks of the river. This dam is built of cut stone, and the lake formed by it contains one hundred millions cubic feet of water.

The two principal siphons are those of Guadalix and Bedonal. The latter is the subject of the engraving which accompanies this sketch. It is about four thousand six hundred feet in length.

The transverse section of the canal has an area of about twenty square feet, and it discharges about six millions six hundred thousand cubic feet of water per day. Only about



BEDONAL SIPHON OF THE "CANAL DE ISABELLA II.," SPAIN.

one fifth of this supply is used for the town service, the rest being employed for irrigation.

The water, on emerging from the lake, passes through a tunnel, and between this tunnel and the city of Madrid there are thirty-one tunnels, thirty-two aqueducts—among which are some about ninety feet in height and nearly three hundred feet in length—and three great siphons, besides the enormous one shown in our engraving, employed to carry the canal across valleys, each of which is composed of four pipes about

ing engines at great expense. The works we have described, now furnish water at no cost except the interest on the cost of the works and the maintenance of repairs. The head is ample to throw water over the highest buildings in the city.

Hitherto the construction of such works has been opposed by the millers upon streams, who were reluctant to surrender their rights unless exorbitantly paid. Under the new law regulating such matters, they are compelled to sell their privileges at a price fixed by appraisal.

three feet in diameter.

The water for purposes of irrigation is drawn off before the canal finally discharges itself into the reservoir del Campo Guardias, which occupies the highest ground in the vicinity of Madrid.

The lands irrigated comprise four thousand four hundred and forty-six acres.

The town service comprises over sixty miles of cast-iron pipes, and over forty-five miles of subterranean canals lined with brick and cut stone. The smallest of these are sufficiently high for workmen to stand upright.

In addition to the private service in the city, thirty-five public fountains are supplied, and three thousand orifices for irrigation and extinction of fires.

Of all the aqueducts, those of La Sima and Colmenarejo are the most noteworthy. It was first intended to carry the canal at La Sima across in a siphon like those described above, and one was commenced in accordance with that design, but it was subsequently decided to erect an aqueduct. This aqueduct is two hundred and fourteen feet long and eighty three feet high. It has an arch at the bottom of fifty-five feet span, above which are seven arches of about twenty-four ft. span.

The Colmenarejo aqueduct is three hundred and eighty-four feet long and sixty feet high. This aqueduct has fifteen semicircular arches of over twenty-five feet span, built of cut limestone and granite.

Previous to the erection of these works the city of Madrid depended for its water supply partly on wells and partly on a small stream which flows into the town; the water was raised

by two large pumping engines at great expense. The works we have described, now furnish water at no cost except the interest on the cost of the works and the maintenance of repairs. The head is ample to throw water over the highest buildings in the city.

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