

WILL THE LEANING TOWER FALL AS DID THE CAMPANILE?

By Gualtiero Campino.

ROME, Aug. 25.—I was once asked why a certain charming American Contessa, well known in Roman society, was like the Campanile of Pisa. I gave it up. The answer was: "She is always leaning, but never falls." I trust that the analogy may stop there, for unless Signor Sacchi, the Minister of Public Works, or Cardinal Maffi, the Archbishop of Pisa, bestirs himself Pisa will shortly suffer an artistic catastrophe similar to that which agitated the foundations of Venice on July 14, 1902, when the Campanile di San Marco crumbled up and fell into the famous Piazza.

The Royal Commission which was appointed some months ago to examine the foundation and the stability of the Campanile of Pisa has handed in its report to the Government, but only part of it has been made public. The intelligence commented on by the Italian press that "La pendenza del Campanile di Pisa aumenta" generally receives a reassuring clause in the fact that the original leaning above the third story had been skillfully provided for by the fourteenth century builders, as had any possible subsequent derangement of the perpendicular. This is found to be a mere legend, and for that reason the fact that "the leaning of the Campanile is increasing" should be regarded with more apprehension by the press, especially as owing to the nature of the soil a surface remedy of the increasing inclination is scarcely possible. Indeed, the Royal Commissioners admit as much.

"Our investigations," declare the Commissioners, "have led to the wholly unforeseen and distressing discovery that, instead of being founded upon a massive and spacious base, as was generally believed since Grassi, in 1831, and Rohault de Fleury, in 1859, published their col-

lection of plans, the real foundation simply consists of a ring of masonry exactly corresponding in girth to the huge cylindrical mass superimposed thereon. In fact the diameter of the inner ring of foundations is 7 metres 40 centimetres, which is precisely that of the space inside the tower.

"This discovery, taken together with the further astonishing fact that the foundations are merely three metres beneath the surface constitutes incontrovertible proof that the Campanile was originally built perpendicularly, and that its leaning propensities, which are becoming more and more accentuated, are due to other causes than the intention of its constructors."

In order to prove that the inclination of the tower has steadily increased through the centuries, possibly with a disproportionate acceleration during the nineteenth, the Commissioners have the evidence of the two English architects, Messrs. Cressy and Taylor, who examined the tower in 1817. At that date it was 4 metres 388 millimetres, or about 12 feet 7 inches out of the vertical line, but during the last eighty years the Commission affirms that the tower leans an additional 5.5 millimetres for every metre of its 54 metres in altitude. In other words, the inclination has increased about one foot during the last ninety-three years, and is now 13 feet 7 inches from the perpendicular, or, inclusive of the cornice, 15 feet 11 inches. It is interesting to note that the figures obtained by Cressy and Taylor were furnished by the Italian

Only the Excellence of Its Masonry, Which Makes the Walls One Mass, Has Kept the Structure From Collapsing Long Ago.

Embassy at London from a rare volume in the British Museum, "Architecture of the Middle Ages in Italy," published in 1829.

The Commissioners have found that the reasons for this dangerous incline are principally that the base of the tower has always been immersed in water, and that a deep cistern to drain off this water, dug in 1840, has made matters worse owing to the general character of the subsoil, which extends to the bed of the Arno, but more especially to seismic movements. Unfortunately, no measurements were made immediately after these movements, and all evidence bearing upon the point has to be taken from local chronicles. Thus, it is stated that Galileo, who swung his pendulum from the overhanging south cornice in 1615, in his experiments to confirm the laws of gravitation, found nine years later that his pendulum reached further from the base by several inches. In the meantime, there had occurred the earthquake of 1620. It is also stated that after the earthquakes of 1834 and 1859 the tower showed a very perceptible increased inclination, but the figures given are the result of

the imagination and not of measurements, and are, therefore, useless from a scientific point of view.

With the exception of the evidence drawn from the Cressy and Taylor volume, there is none that can be relied on, it all being the result of careless observation and tradition. The comments of famous travelers have been consulted in vain by the Commission. Here are two extracts, one drawn from John Evelyn, the celebrated English essayist, who visited Pisa in 1644, and the other from John Chetwood Eustace's "Classical Tour," published in 1813, and remorselessly criticized by Lord Byron:

"The Campanile, or Settezonio, built by John Venipont, a German, consists of several orders of pillars, 80 in a row, design'd to be much higher. It stands alone on the right side of the Cathedral, strangely remarkable for this, that the beholder would expect it to fall, being built exceedingly declining, by a rare address of the architect; and how it is supported from falling I think would puzzle a good geometrician. The Domo, or Cathedral, standing neere it, is a superb structure, beautified with 6 columns

of greate antiquity; the gates are of brasse, of admirable workmanship.

"We now proceed to the Campanile or belfry, which is the celebrated leaning tower of Pisa. It stands at the end of the cathedral opposite to the baptistery, at about the same distance. It consists of eight stories, formed of arches supported by pillars, and divided by cornices. The undermost is closed up, the six others are open galleries."

A learned Frenchman of the eighteenth century even suggested—and quite seriously—that the architect was a hunchback, and made the tower crooked to resemble himself.

Thus, where the Commissioners expected to find a store of valuable data they met nothing but a mass of curious tradition, inadequate observation, and misinformed. Indeed, the popular error indulged in by Evelyn as to the design of the architects is even to be found in some modern guide books. It is a matter of present observation, however, rather than of record, that when the tower was begun, in 1174, after the plans of the architects, Bonannus of Pisa and William of Innsbruck, the structure was intended to

stand erect. The third story, however, had scarcely been reached when it was found to incline toward the south. Work was stopped, and for nearly a century it remained as it was. The five additional stories, completed in 1350, show a slight inclination of structure in the northerly direction, and this added to the fact that the two heaviest bells of the seven in the tower are hung on the northern side shows the attempts that were made in the fourteenth century to maintain the equilibrium of the tower if not its permanent stability. These bells weigh 12,000 pounds, and are named the Assumption and the Crucified Christ.

The Commissioners also found that the modern guardians of the tower had kept it in a deplorable condition, and that several of the 294 steps which lead to the platform of the belfry, 179 feet above the ground, are in danger of displacement and of falling with disastrous results. They suggest that the Government give immediate attention to the condition of the tower with a view to prevent its further leaning and also to repair the interior. The former, they think, can be easily remedied if the tower be properly propped up with timber and a new foundation be built on the southern side resting on piles driven into the subsoil.

It is now seven weeks since the report of the commission has been handed in, and so far the Government has given no sign. On the other hand, Cardinal Maffi, himself an illustrious mathematician, has urgently offered to co-operate with the Government in every possible way for

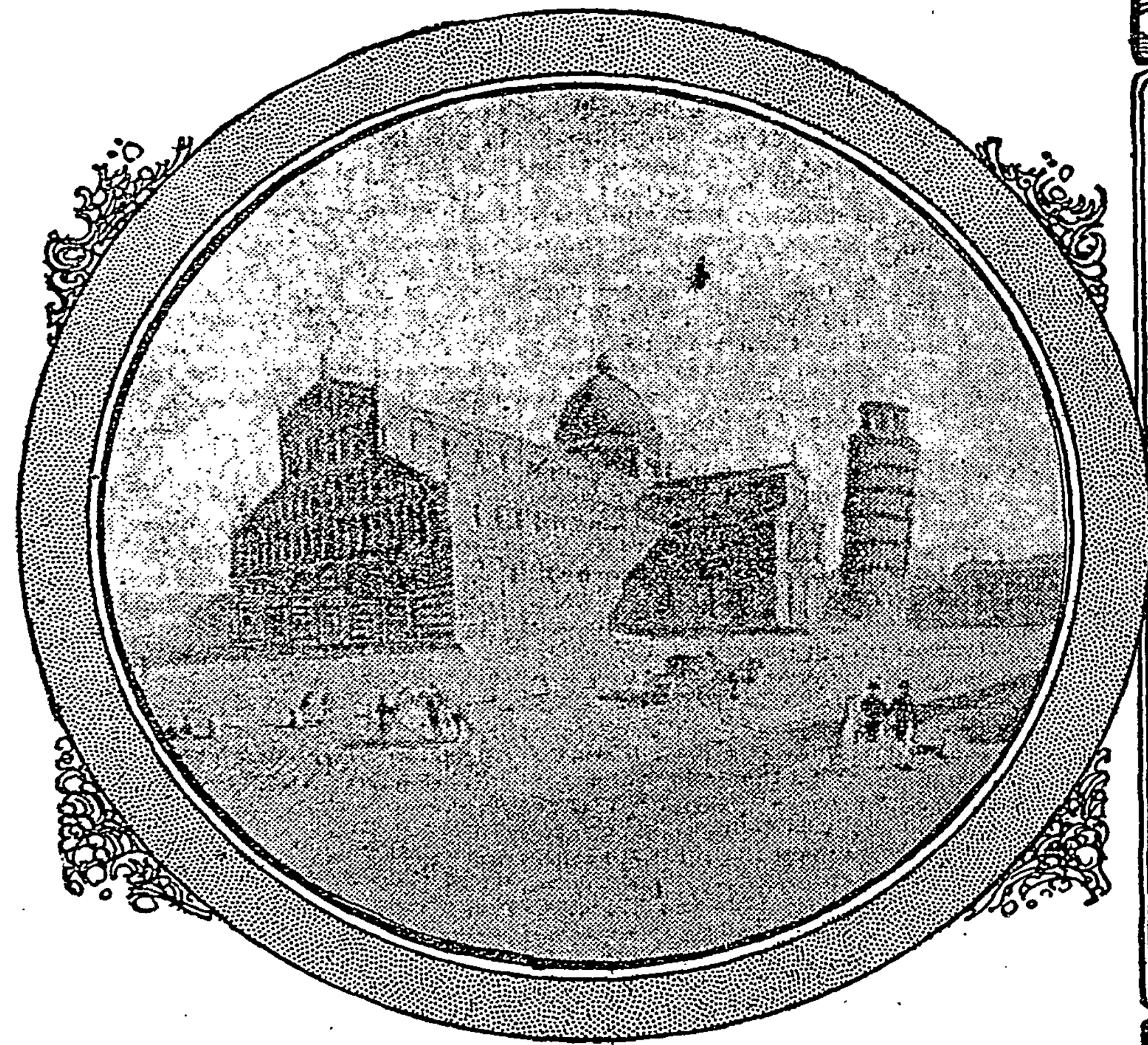
the preservation of this fifth among the seven wonders of the mediaeval world. The Cardinal has already given orders to suspend the ringing of the Assumption and the Crucified Christ, and the ringing also of the smaller bells, which in the future are merely to be tolled.

I have interviewed two members of the commission, Signori Cuppari and Bernieri, both well-known engineers. Signor Bernieri said:

"The situation is certainly grave, but we still have plenty of time in which to prevent a calamity. Engineer Cuppari has made an exhaustive study of the conditions of stability and of the material of which the tower is composed, and has found that it is held together much firmer than was the material of which the Campanile di San Marco was composed, although no one can tell what effect a sudden oscillation might produce.

"The first thing to do is to prevent the possibility of all oscillation, brace the tower up from the southern side, support the southern wall by a temporary foundation, and then repair the foundation there by driving piles, on which a new and substantial foundation could be built."

The conversation that I had with the engineer Cuppari was to the same effect. Both vociferously condemned the shortsightedness of the authorities of seventy years ago in attempting to drain the subsoil of the foundation by building a dike. Neither believed that the work of repair should cost more than \$20,000. Indeed, I am privately informed that an American firm of builders has offered to do the work much cheaper and to insure the permanent stability of the tower within six months. Cardinal Maffi is much perturbed over the apparent dilatoriness of the Government.



The Best View of the Tower Emphasizing Its "Leaning."

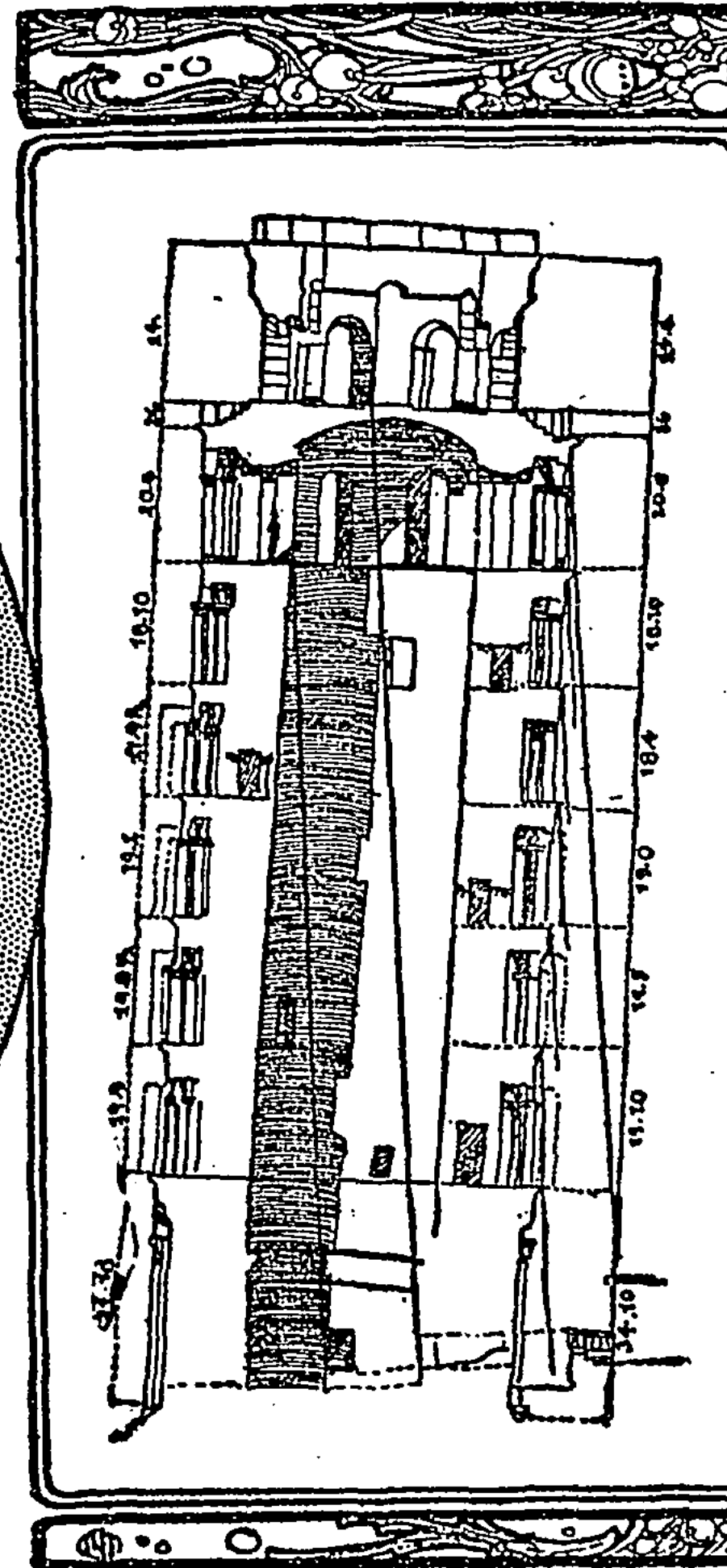
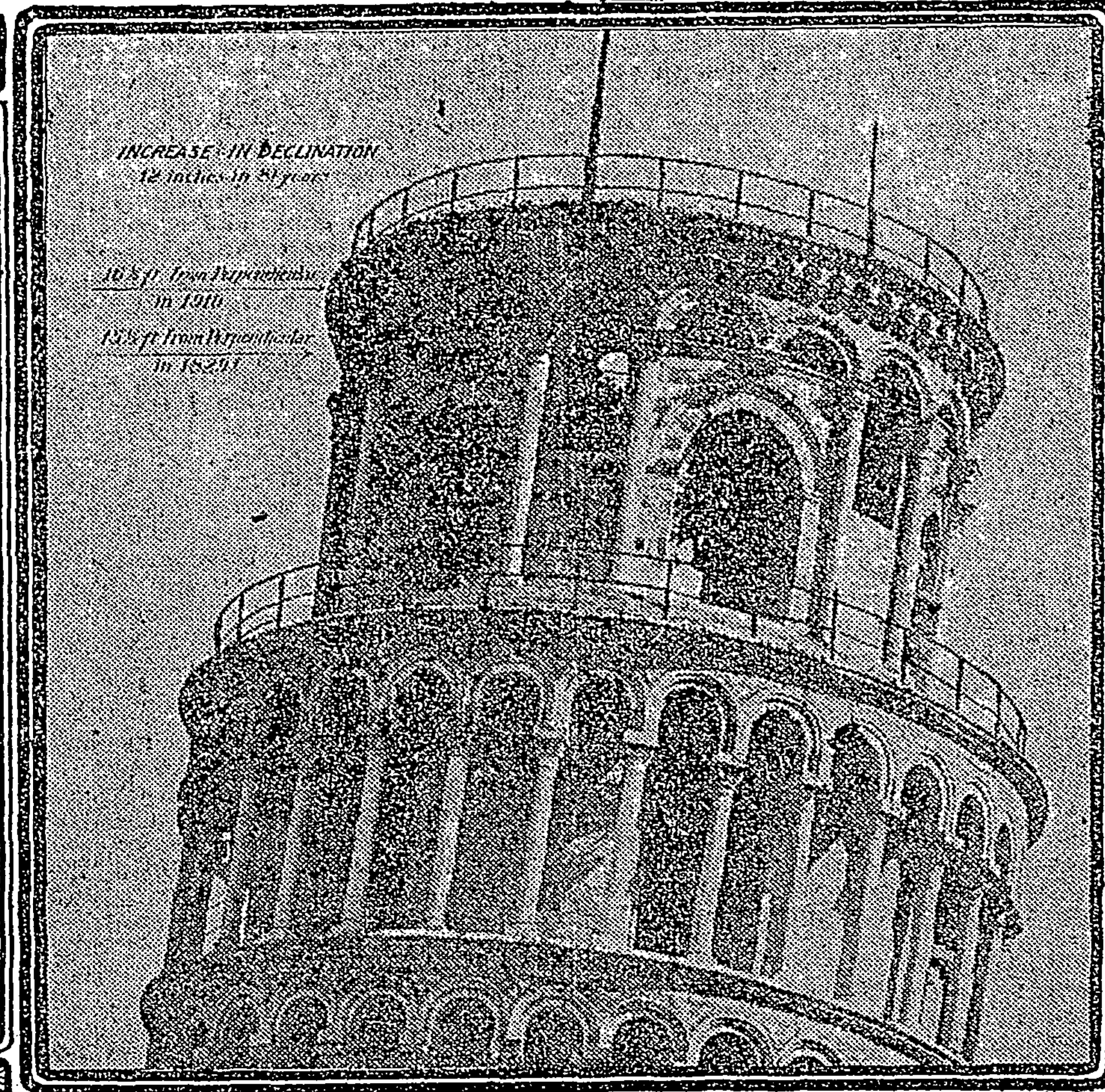


Diagram Showing How Far Out of Plumb the Tower Is.



The Top of the Tower with Measurements Taken in 1817.

Mandy's Trial

THE guests at a dinner party were telling stories about queer uses of words and phrases when a woman from Chicago spoke of the efforts of the Scandinavians in the Northwest to get on intimate terms with the English tongue. "They pick up the slang first," she said, "and use it indiscriminately. I was in Wisconsin last Summer, near a place where there had been an outbreak of typhoid fever, and I asked a Swedish woman who was doing some work for me if her family had suffered from it. 'Ay ban lost,' she replied, wiping the tears from her eyes, 'my fader, my husband, my sister, all in one month, and I tink dat wass going some, eh?'"

"That reminds me," said a woman who had lived in the South, "of an old mammy down in New Orleans who told me once a most pitiful tale of how she had lived through one of the yellow-fever epidemics. One after another the disease had swept away her relatives, while she cared for them as best she could. Her father and mother, her husband, three children, a brother, two sisters, she had watched over day and night, and finally had seen them die. My heart ached and my throat filled up with sympathy and pity for all that she must have suffered. 'Oh, Aunt Mandy,' I exclaimed, 'how dreadful it must have been! How did you ever live through it!' 'Yessum,' she replied, 'it was teejus.'"