

Art

The Leaning Campanile of Pisa

THE debated question as to the accidental, or constructive, bend in the leaning Tower of Pisa has engaged the attention of architects, engineers, artists, and even poets; but the humble bell-ringer whose practical experience in the belfry has taught him certain facts bearing upon the stability and behavior of masonry has not as yet ventured to intrude his views on the matter. An attempt to contribute towards the solution of the problem from this novel point of view may therefore be of interest.

A rare volume entitled "De Tintinnabulis," published 1664, by Hieronymus Magnus, contains a chapter about inclined towers, in which appears the only allusion, so far as I know, to the hypothesis of earthquakes to account for their irregularity—a theory condemned by him in strong terms. Indeed, if any such violent disturbance of the earth's crust had actually occurred at Pisa, some trace of the accident would doubtless have been left either in fracture of stonework or signs of masonry repair; while a record, or the legend, of so unusual a phenomenon would have survived.

The following is a translation of the observations of Magnus:

There are those, however, who maintain that towers of this anomalous design were not originally constructed in the form now presented, but nodding, have become deflected and inclined as the result of damage by earthquake. Such persons, however, are convicted of unpardonable error by the very thresholds and doors; also the sockets at the various floors on which the scaffolding was sustained during the process of construction; for these parts are all level, not sloping, and stand true to the spirit level.

The highly improbable story attributed to Vasari, referring the deflection of the Tower of Pisa to gradual soil settlement during the work of construction, seems not to have reached the ears of Magnus, or else he deemed it unworthy of notice. Nor is it likely that this idea would ever have been seriously entertained had not Vasari given it the weight of his authority. As sailors do not add freight to a sinking ship, so artisans do not imperil their lives by piling additional weight upon a collapsing fabric.

Rehault de Fleury states that the foundations were exposed in 1838 by means of soundings and seem to rest on an infinite number of piles strongly buttressed; but no notice seems to have been taken by the laborers of the level of the walls. Inasmuch as the site of cathedral, baptistry, and campanile was a recognized marsh, it may be assumed that the artisans of that period made no botch of the job of pile-driving, which had then attained in Italy the highest standard, as shown in the public and private buildings of Venice. Indeed, there can be no question as to the efficiency of their work in the other adjacent structures whose foundations have been demonstrated by Goodyear to be level, notwithstanding curves and bends in the upper walls now known to have been purposely designed for optical illusions or perspective effects.

It is pertinent to inquire whether we possess means of determining the opinion of the architect and local officials as to the stability of the campanile at the time when it had reached its maximum height (178 feet), many years before its actual completion in 1350. To this question an unequivocal answer is embodied in the decision to install

an exceptionally heavy peal of seven bells, of which the seventh, or largest, weighed about six tons. And hereby is revealed a factor incident to the matter of stability which has hitherto escaped attention. These bells were hung, five in the upper arches (one arch being left for thoroughfare) and the two smaller bells in embrasures above. Of these original bells the first, second, and fourth are still preserved. The latter is inscribed with the date, MCCDLXII, and is one of the oldest dated bells extant. It is important to observe that these bells were not affixed rigid to a beam, as American chimes are treated, but were fitted with headstock, wheel, and other appurtenances to provide for swinging. The bell ropes were brought down through mouseholes in the stone work to the ground floor, and the grooves, inches in depth, worn by friction in these holes, indicate centuries of use.

Lofty structures such as towers and steeples are usually held to be sufficiently secure if built to withstand the lateral pressure exerted by the strongest gales. A more powerful force, however, is induced by the action of swinging bells; and this force is projected not only laterally, but to a much greater degree vertically, governed by a law of physics but recently comprehended.

To a series of experiments conducted by E. H. Lewis, M.A., we are indebted for the evolution of an algebraic formula by means of which can be calculated with considerable accuracy the horizontal and vertical reaction of a rigid body revolving around a fixed horizontal axis under the influence of gravity. By applying this formula to the action of a bell weighing six tons, its horizontal thrust is shown to be about thirteen tons, while its vertical force would be no less than twenty-three tons. It may be assumed, therefore, that neither architect nor bell founder would have ventured to jeopardize the integrity of so unique a monument by subjecting it to this prodigious battering strain had they entertained the slightest doubt as to its absolute safety; and the correctness of their judgment has been confirmed by its subsequent history.

Standing beside one of these ponderous bells when being rung at a canonical hour, I was able to discern, to my surprise, but slight vibration of the masonry, indicating a stability rarely met with in towers of similar dimensions.

In conclusion, this record of the bells, apart from all other evidence, justifies the assertion that no appreciable structural change has taken place in this edifice since its completion; while the supposition of accidental settlement during the work of construction, always rejected by the local inhabitants, and unsupported either by authentic documents or demonstrable facts, is not only untenable, but indeed has not even had the merit of plausibility. Bellringers, ever conscious of the possibility of disaster from fragile walls, do not undertake the management of swinging bells until assured of the stability of the tower in which they are suspended.

This mute testimony of the bells, therefore, chimes in accord with the opinion of Goodyear, the recognized authority on the asymmetry of mediæval buildings, that the obliquity of Pisa's campanile is one of many examples of intentional avoidance of regularity, a constructive *tour de force* for bizarre or picturesque effect, analogous to that conceded in case of the Leaning Tower of Bologna, and more recently shown by him to have been purposely designed also in the Baptistry of Pisa and in towers of Florence and Ravenna.

ARTHUR H. NICHOLS

Drama

The First American Play

IN view of the increasing attention which the dramatic literature of America is attracting, one turns with curiosity to the first play to be written and printed in this country. Its title-page reads: "Androboros A Biographical Farce In Three Acts, Viz. The Senate, The Consistory, and The Apotheosis. Printed at Moropolis since 1st August, 1714." (Moropolis means Fool's Town, which is to say New York.) The sole surviving copy of which there is any trace is now in the possession of Mr. Henry E. Huntington, of New York city. Among its previous owners were David Garrick, John Philip Kemble, and the Duke of Devonshire. From the fact that the words "By Governour Hunter" have been written on the title-page in an antiquated hand, it is agreed that the author of the sketch was Robert Hunter, Governor of the Colony of New York from 1710 to 1719.

Hunter was one of the most able of the Colonial Governors, but he was not without enemies, and in "Androboros" he took occasion to pillory them ruthlessly. Before coming to America, his keen mind had won him the friendship of Addison, Steele, and other wits of his day, and in this satire he displayed a caustic and trenchant mode of attack of which the author of "The Dunciad" himself would not have been ashamed. The two persons most distinguished by the writer's ridicule were Colonel Francis Nicholson, formerly Lieutenant-Governor of the colony, and Dr. William Vesey, Rector of Trinity Church. At the very beginning of his administration Hunter, though a good Anglican, ran foul of the Established Church by refusing to obtain for it grants of land, and by a seeming lukewarmness towards its interests. Dr. Vesey, pious but bigoted, charged him with plotting to turn the control of affairs over to dissenters, and used his influence to embarrass and oppose the Governor wherever possible. Vesey's chief abettor was the arrogant and overbearing Colonel Nicholson, whom Hunter accused of attempting to usurp his power. In the spring of 1714 Vesey, at Nicholson's suggestion, went to England to secure governmental support against his antagonists. It was probably this hostile act that called forth "Androboros."

The Huntington copy of the play, which Kemble conjectured to have been Hunter's own, contains a key to the *dramatis personæ*. From it we learn that the four main characters, Androboros (man-eater), Fizzle, the Keeper of the Senate, and Solemn are disguises respectively for Nicholson, Vesey, Hunter, and Lewis Morris, who was Hunter's ally and may have had a hand in writing the sketch.

The first two acts reflect a number of contemporary events and conditions. At the outset we find the loquacious and incompetent Senate in session under the sufrage of the Keeper, whose domineering attitude recalls Hunter's tendency to dissolve the Assembly whenever it proved unruly.

Subsequently the Senate forms itself into a Consistory, presumably for the purpose of defying the Keeper. This body, as it sits in grave deliberation, is startled by the sudden appearance of Fizzle, who has intentionally besmirched his robe and comes before the Consistory, blaming the Keeper for the outrage, and threatening dire punishment with

the aid of Androboros. This episode was based on one of the numerous skirmishes between Hunter and the church party. In February, 1714, Trinity Church was broken into and the vestments were torn and defiled. In proclaiming a reward for the apprehension of the culprits, the Governor took a covert fling at the reputation of Dr. Vesey by declaring that the act must have been performed by "such as are avowed enemies of religion in general, or to the civil and religious constitution of England in particular, or such as for filthy lucre, or worse purposes, may have in appearance conformed to, or complied with either, but by their unchristian and lewd conversation, and their disloyal and seditious conduct, sufficiently manifest their aversion to both." In their wrath at this attack, the churchmen addressed a condemnation of Hunter to Nicholson.

While the Consistory is discussing the indignity which Fizzle has suffered, an important message is received from Androboros. Earlier in the play he had blusteringly announced his intention of making war upon the traditional enemy of his countrymen, but now his dispatch states that the expedition has been abandoned, the foe having shown his friendship by offering to resign the two poles to the New Yorkers and to retain for himself only that which lies between. For this triumph the Consistory votes Androboros a statue. In these scenes the author was lampooning Nicholson's ill-starred attempt in 1711 against the French in Canada, with whom the colonists had been frequently embroiled. This expedition, which the Colonel had strongly advocated, and in which he led the land forces, proved a failure, for after the disaster which befell the fleet he retreated without striking a blow.

In Act III the playwright beguiled himself by depicting the complete discomfiture of his opponents. The Keeper's friend, Solemn, tricks Androboros into thinking himself dead. While under this delusion, he is made the victim of much horse-play; he is knocked from a chair, he is covered with floor-sweepings, he is sprinkled with water, and he is blinded with snuff. Thus deprived of his sight, he comes charging into the Senate room and runs upon the Keeper's chair. Now Fizzle has so contrived it that this seat will sink through the floor when the Keeper takes his place. But the treachery proves a boomerang, for the weight of Androboros springs the trap, and both he and Fizzle are swallowed up. Solemn pronounces their obituary in these words:

In former Ages virtuous Deeds
Rais'd Mortals to the blest Abodes,
But Hero's of the Modern Breed
And Saints go downward to the Gods.

The sketch, which in all probability was never acted, is obviously the work of a man who was not experienced in play-writing. None the less it possesses, especially in the third act, some ingenuity and effectiveness. Delicate the humor certainly is not, but it is abundant and at times has satiric point. The misreading of Fizzle's petition by

Amusements

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