

## LISBON, EARTHQUAKE OF 1755

### La réaction du système

#### Abstract

Since antiquity, Lisbon had been hit by numerous earthquakes, but never with the intensity of the one in 1755, which was between VIII and X on the Mercalli scale.

There are many descriptions of the 1755 earthquake, especially from British people who were living in the city at the time, and who attempted to describe the extraordinary phenomenon in letters.

This study attempts to synthesise objectively different descriptions.

The effect of the earthquake is generally believed to have been at its most intense in the city of Lisbon, which is not fact the case, the Algarve coast were harder hit as there were closer to the epicenter. Further more, as many cities were on the coast, they were hit more strongly by the huge waves that occurred, causing terrible destruction. The city of Lisbon, on the other hand, was more protected from the sea, due to its position on the river Tagus estuary. The 1755 earthquake is linked with Lisbon, in people's minds, because it was the capital of the country and it had a larger population than any other city.

The city was not completely destroyed by the earthquake, the area that had been built on top of unstable land, that had been reclaimed from an ancient branch of the River Tagus, was destroyed; for example the "Bairro Alto" (high quarter), the sloping down from the Castle and the other eastern quarters suffered little, if any, damage.

The earthquake caused more damage also because the down area had grown in a disorganised fashion, with narrow streets and tall buildings, making it virtually impossible for people to escape; what was worse was the fact that the biggest square was right beside the river, and lower than the level of the river, thus easily flooded by rough waters. Fire spread easily due to the narrowness of the streets and the profusion of candles lit on that holy day, though there were also many cases of arson. The fire, completely out of control, lasted several days and contributed to the destruction of many buildings which had withstood the tremors.

The authorities also did not respond in an organised way. The population, left to its own devices, interpreted certain effects of this type of earthquake, namely, the flow of sulphurous gases, jets of sands and roaring sounds from under the earth as well as the darkness caused by the thick dust from falling buildings and the resulting noise, as a divine punishment, which they faced with great fear. The earthquake was even exploited by some bandits who robbed, raped, set fires and even speculated for transportation of those in difficulty.

It was only the presence of mind of the Minister of the King, The Marquis of Pombal, in the days followed which made possible to reorganise, rescue people and ensure that survivors got the necessary help.

I hope that this study, which is precise and objective description of events, will contribute to a better understanding of the 1755 earthquake, and to a better preparation for any future earthquakes that may occur.

## I.- Introduction

In the year 1755, the lower part of the city of Lisbon was hit by a huge earthquake and destroyed immediately afterwards by a fire which lasted several days. (Fig.1).

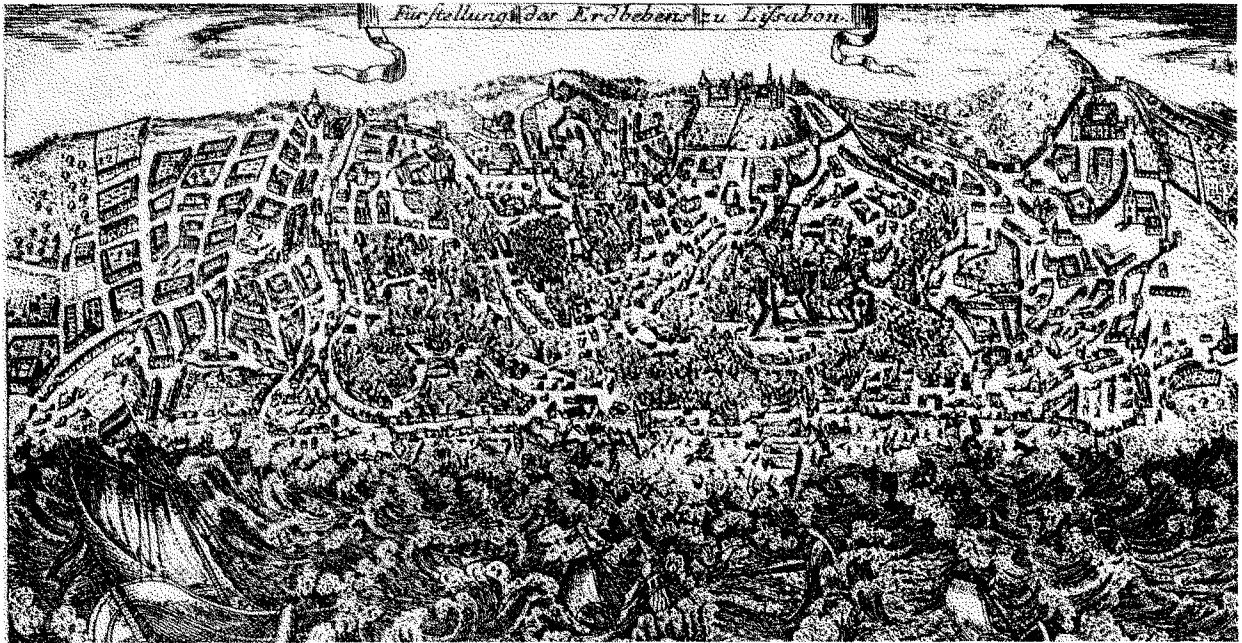


Fig.1-Panoramic view of the city during the earthquake.

The city that was destroyed was a mesh of numerous streets and alleyways, as it had grown in a piecemeal fashion according to the resident's needs or the whims of builders, on the unstable lands of an old creek, (Fig.2). The streets, which were unsafe and unhygienic were obstructed by buildings, making it difficult to reach the safety of the squares in the event of a tremor or a fire, (Fig.3).

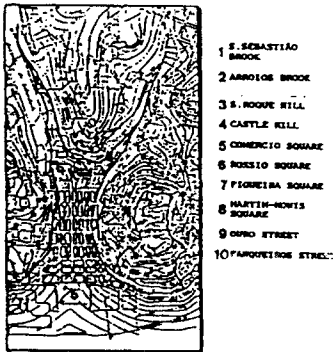


Fig.2-The creek and the old city.

Fig.3-A street before the earthquake.

Following the destruction of the city by the earthquake, which registered ten on the Mercalli Scale, and by the terrible fire which followed, it was decided that the best solution was to level the city completely and built a new city with a regular plan on top of the rubble.

## II.- The precursors

- Since Antiquity (Fig.4), Lisbon had always been subjected to seismic movements, the most important were:
- 60 B.C.-Accompanied by a tidal wave, destroyed entire townships on the coasts of Portugal and Galicia.
  - 47-44 B.C.-Tidal wave followed by earth tremors.
  - 33A.D.-Tremor caused great damage, submerging islands situated off the Cape of St. Vicente.
  - 22.2. 1279-Strong tremor felt throughout the country.

9.12.1321-Three violent earthquakes.

1344-Tremor accompanied by long subterranean sounds caused considerable damage in Lisbon area.

1355-Two major earthquakes registered: 11<sup>th</sup> July and 4<sup>th</sup> August.

24.7.1356-Quakes hit Lisbon of a similar intensity to that which was to occur in 1755

1504-Strong earthquakes throughout this year which destroyed whole townships.

1512-Lisbon experienced terrible earthquake which took around 2000 lives.

26.1.1531-One of the biggest earthquakes to affect Portugal, the epicenter of which was the Lisbon area. 1500 houses were levelled and seven people died.

27.12.1722-Very strong earthquake in the south of the country.

1750-On the day of D. João V's death.

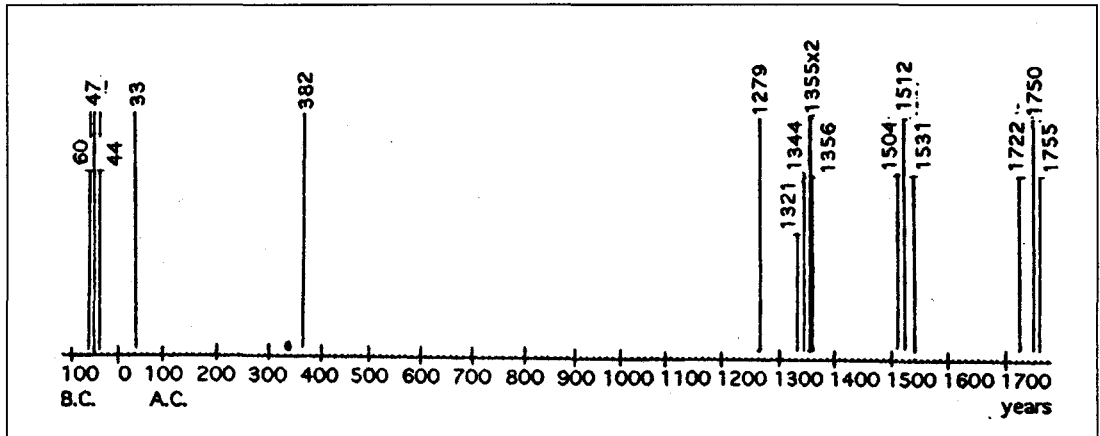


Fig.4-Seismic movements since antiquity in Lisbon.

### III.- Warning signs of the earthquake.

Abnormal rise in water level in springs and new springs appearing.

### IV.- The earthquake.

Date: 1<sup>st</sup> November 1755

Temperature: 17° C

weather conditions: clear sky, north-east wind

1st tremor, 9.40 a.m. (duration 1/2 mins)

-Loud underground noise which terrified people

-Vertical tremor

-Horizontal tremors in north-south direction.

-Water from the river flowed out leaving bed uncovered and numerous boats stranded.

-Huge waves.

Interval, 9.41,30 secs. (duration 1 min.)

-Loud underground noise.

-Huge waves on the river.

-People injured in the first tremor sought shelter in the buildings.

-Flight of population to Terreiro do Paço.

2nd tremor, 9.42,30 secs. (duration 2 1/2 mins)

Extremely violent tremors.

3rd tremor, 9.46 a.m. (duration 3 mins).

Interval, 9.45 a.m. (duration 1 min.)

2nd tremor, 9.42,30 secs. (duration  $2\frac{1}{2}$  mins)

Interval, 9.41,30 secs. (duration 1 min.)

1st tremor, 9.40 a.m. (duration  $1\frac{1}{2}$  mins.)

Interval, (duration 1h.14 min)

4th tremor, 11.00 a.m..

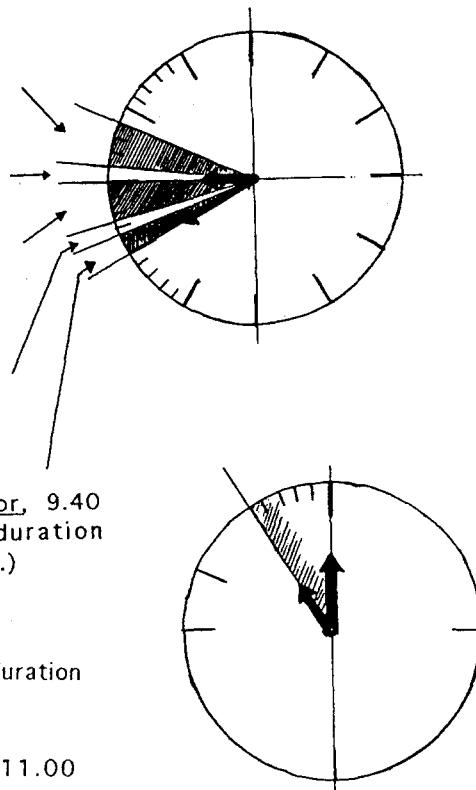


Fig.5-The earthquake had four tremors

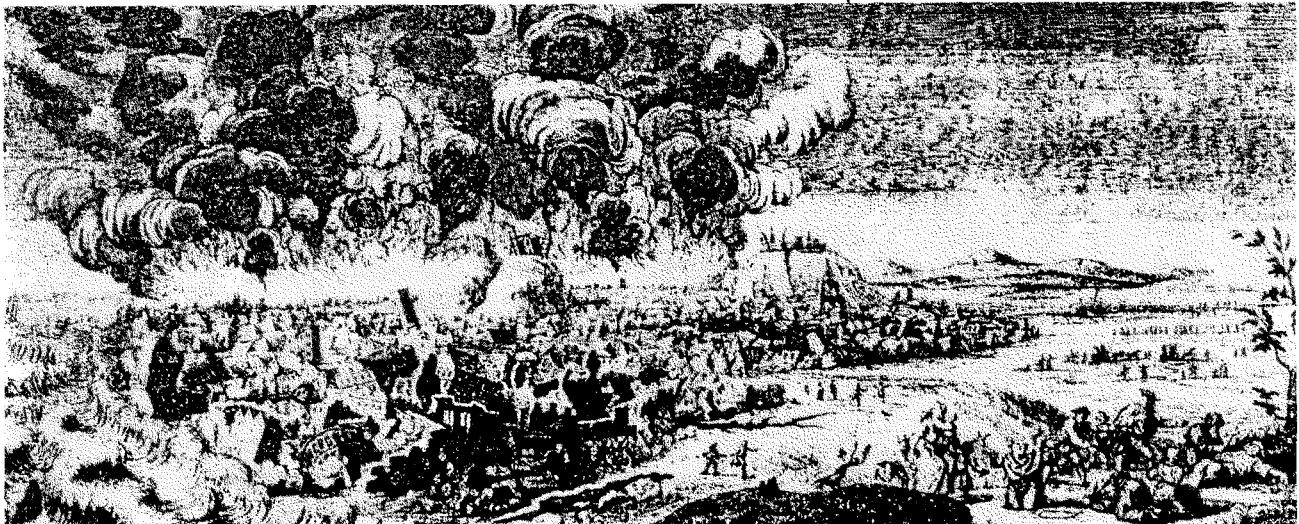


Fig.6-Lisbon seen from country side

Interval, 9.45 a.m. (duration 1 min).

3rd tremor, 9.46 a.m. (duration 3 mins).

Interval, (duration 1h and 11 mins).

4th tremor, 11.00 a.m., new tremor which brought down some buildings.

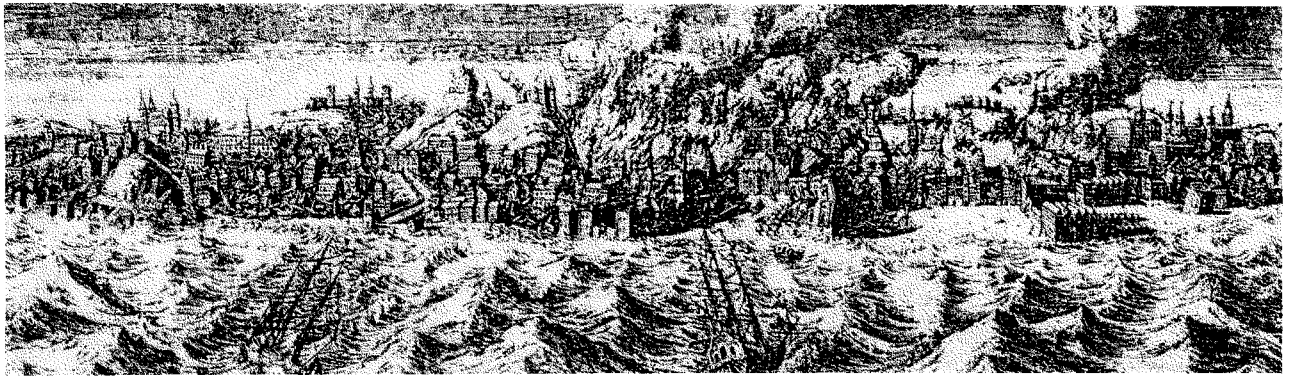


Fig.7-Lisbon after the earthquake.

During the first three tremors there was:

- A loud, continuous, underground noise.
- The water in the river flowing out and back in causing boats to be stranded or to collide with one another.
- Sixteen foot waves, three every five minutes rose over the city.
- Long, narrow cracks appeared in the streets.
- White sand and gases spurted out of the cracks.
- The atmosphere was darkened by sulphurous gases coming out of the ground.
- Dust and gases made the air impossible to breathe, causing suffocation.
- Dizziness, sickness and breathing difficulties, were experienced.
- Sudden rise in level of river upstream from Belém.
- Population fled in panic.
- People blinded by the dust.
- Haphazard groups formed running in no specific direction.
- The injured called out for help.
- Those running away found themselves surrounded by fire or trapped by buildings suddenly collapsing.
- Those who tried to save, were attacked by bandits.
- Those whose tried to escape near the river were swallowed up by violent waves.
- Those who were escaping from the flames boarded boats, which then sank under the weight of the load.
- The overloaded boats collided or disintegrated.

#### *Immediately after*

A huge fire started during the earthquake and blazed for five or six days. The fire is believed to have started in the Louriçais Ericeiras palace, on the northern limit of the city. Gradually the north-easterly wind grew stronger spreading the flames further afield. Bandits and military deserters started fires to facilitate looting. The flames reached a height of twelve leagues, (fathoms) and were sighted from Santarém. It was most vulnerable of the buildings were the more monumental ones: churches, convents and palaces.

#### *Later on*

For twenty-four hours the land moved in continuous vibration. There were alterations in the river bed and constant rises in the tides. The surrounding areas filled with people. Four tremors were felt up to November 18th 1755. Five hundred tremors were felt up to September 1756.

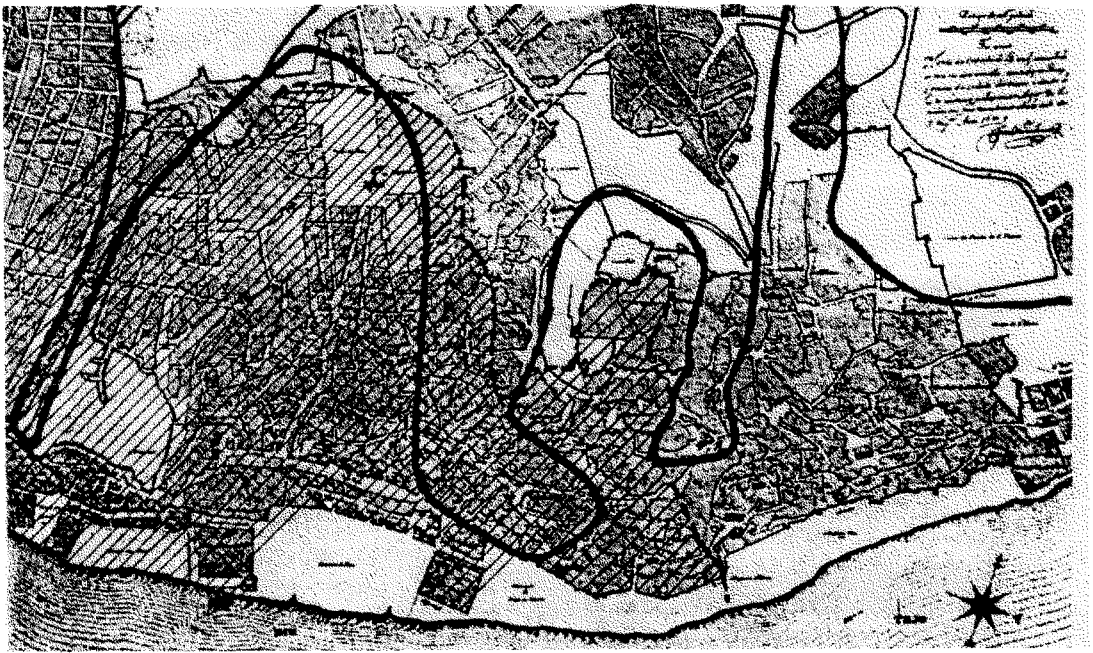


Fig.8-Extension of the earthquake (///) and the fire (—).

#### V.- The earthquake, observations:

X on the Mercalli Scale.

According to Prof. Pereira de Sousa it was the most extensive that science has ever registered.

It was felt in Lisbon at 9.57 a.m.

Long, narrow cracks appeared from which water, sulphurous vapour or air issued.

It was felt throughout from Finland to Italy.

In Portugal great damage was caused in the Algarve, Coimbra, Setubal, Azeitão and Santarém.

In Marrocco, damage was caused in Agadir and Rabat.

It was felt in the Azores, in Madeira and on the coast of Brazil.

In Cornwall the sea level rose in an irregular fashion.

#### VI.- Losses.

Twelve to fifteen thousand dead.

Two thirds of the streets were uninhabitable; seventeen thousand out of twenty thousand houses were destroyed.

Thirty-five out of forty parish churches were destroyed.

Eleven out of sixty-five convents were destroyed.

Thirty-three palaces belonging to the main families of the Court were destroyed.

Loss of the Paço da Corte, (The royal Palace).

Major losses in merchandise, libraries, furniture, paintings, tapestries, etc.

Loss of judicial records.

#### VII.- Survivals

The aqueduct was spared, otherwise the situation would have been even worse.

The court was in Belém and so was little affected by the disaster.

Many families, especially those of the nobility were away in their summer residences in the country, and so they were little affected.

The Belém Tower built on the river bed, withstood both the earthquakes and the tidal wave, (however, the quayside at the Terreiro do Paço Square, which was made of solid marble sank completely after the second tremor).

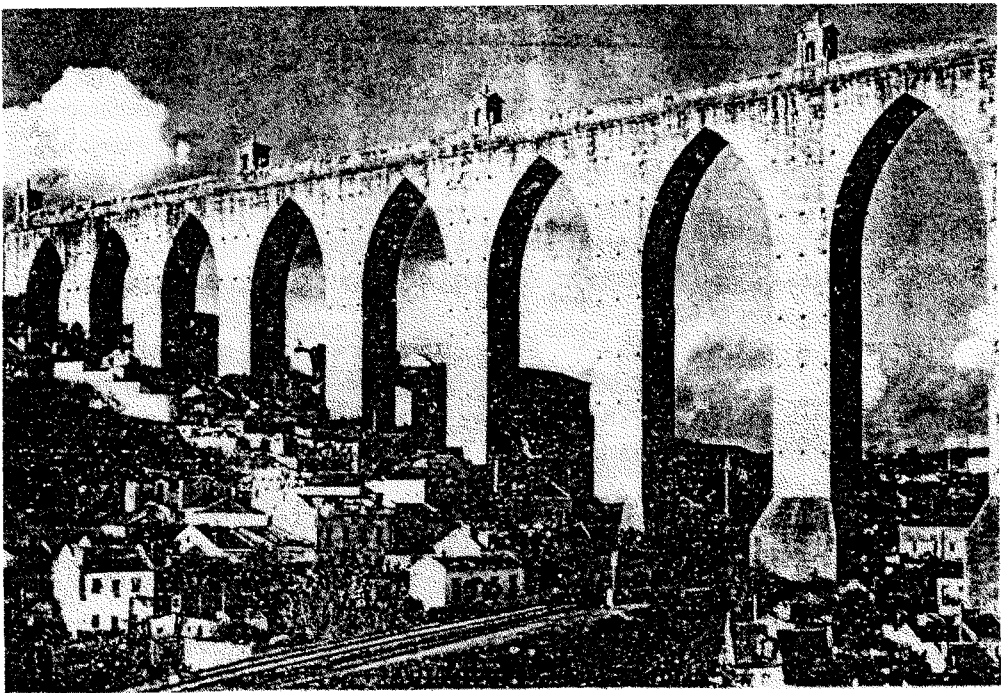


Fig.10-The aqueduct, "Aqueduto das águas livres".

### VIII.- Immediate consequences.

Residents fled from the city and later on refugee camps formed in squares and Convents grounds.  
There was a danger of plague because of the rotting corpses.  
Numerous bodies were buried under rubble.  
Numerous military deserters sacked the ruins.  
It was difficult to recognise some places and others were inaccessible.  
Construction materials were being sold at speculative prices.  
The king was afraid and would not return to the city.

### IX.- Immediate measures

#### *The administrators of the first measures.*

The Marquis of Pombal, Secretary of State for Foreign Affairs and War.  
The Duke of Lafões, Chief Administrator of Justice,  
The Marquis of Alegrete, President of the Senate,  
The Marquis of Marialva, the Governor of Arms.

#### *The first measures*

Looking after the living.  
Throwing of corpses into the sea.  
To prevent public disorder: prison, trial and hanging of looters and bandits, provincial regiments brought in to maintain order, distribution of judges throughout the city for trials to be held immediately.  
It was forbidden to leave the city without a pass.  
The parish priests encouraged the faithful to return.  
Taxes on foodstuffs were abolished.  
Prices of foodstuffs were fixed, salaries and rents on buildings were frozen on pain of confiscation.  
Provisions entering the city and their apportionment were controlled.  
Butchers and bakers were spread throughout the city  
Ships were not allowed to leave port without being well checked first.  
A questionnaire was sent out to all the parishes for details of their situation: physical and demographic losses, damage, help available and needed, etc.  
The streets were cleared and the debris was disposed of using prisoners as labour.



Stagnant water was drained away.  
 Property that had been destroyed was marked out.  
 Streets and buildings were measured and recorded.  
 It was forbidden to build outside the wall; shacks built within the city limits were demolished.  
 A four per cent tax levied on all merchandise despatched through the customs to pay for rebuilding of public building and structures.

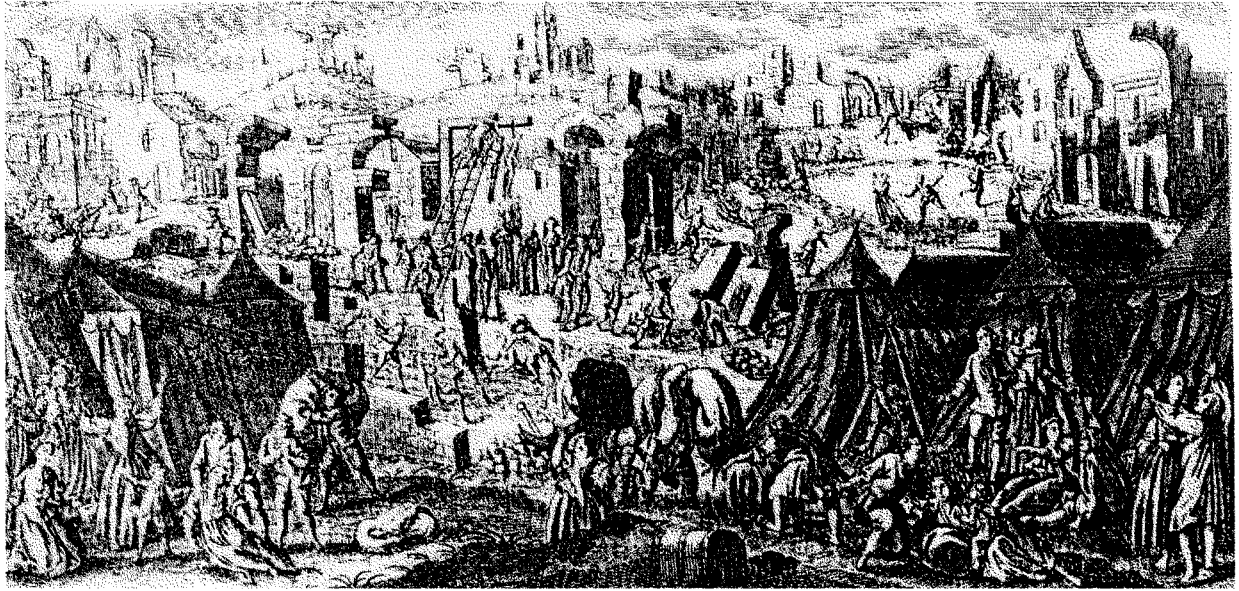


Fig.11-Camp of refugees and trial of criminals.

#### X.- External aid.

Gifts and promises from various courts in Europe and Brazil.  
 Provisions from England.  
 Building materials and money from Hamburg.  
 Three wagonloads of gold from Spain.  
 The help offered by France was refused.

#### Bibliography

This work was based on:

França, José-Augusto, "Lisboa Pombalina e o Iluminismo", 3<sup>rd</sup> edition, Bertrand Editora, Venda Nova 1987.

"The Lisbon earthquake of 1755-British Accounts", The British Historical Society of Portugal, Lisótima edições, Lisboa 1990.

#### Illustration references

Fig.1-"The Lisbon earthquake of 1755-British Accounts", The British Historical Society of Portugal, Lisótima edições, Lisboa 1990.

Fig.2a-Vieira da Silva, Augusto, "Dispensos" Biblioteca de Estudos Olisiponenses.

Fig.2b-João Nunes Tinoco, edition of XIX century, partial copy made by author from: França, José-Augusto, "Lisboa Pombalina e o Iluminismo", 3<sup>rd</sup> edition, p.26, Bertrand Editora, Venda Nova 1987.

Fig.3-Author's work.



Fig.4-Author's work.

Fig.5-Author's work.

Fig.6-"The Lisbon earthquake of 1755-British Accounts", p.84, The British Historical Society of Portugal, Lisótima edições, Lisboa 1990.

Fig.7-"The Lisbon earthquake of 1755-British Accounts", p.127, The British Historical Society of Portugal, Lisótima edições, Lisboa 1990.

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Fig.9-França, José-Augusto,"Lisboa Pombalina e o Iluminismo", 3<sup>rd</sup> edition, p.68, Bertrand Editora, Venda Nova 1987.

Fig.10-França, José-Augusto,"Lisboa Pombalina e o Iluminismo", 3<sup>rd</sup> edition, p.57, Bertrand Editora, Venda Nova 1987.

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