

hear the clashing noise made by all the candles hung up in his shop.

This is all that I have any certain information of, and it shews, that our country had some share in the general agitation. Many other things are reported, but not sufficiently attested.

The accounts brought from Norway inform us, that the same observations were made there, almost at the same time.

LIX. *An Account of the Earthquake, Novem. 1, 1755, as felt in the Lead Mines in Derbyshire; in a Letter from the Reverend Mr. Bullock to Lewis Crusius, D. D. F. R. S.*

L E T T E R I.

Rev. Sir, Ashford, near Bakewell, Derbyshire, Mar. 3, 1756.

Read March 11, 1756. **I** Here send you an account of the earthquake, which happened at the lead mines on Eyam-edge in the peak of Derbyshire, on Saturday the 1st of Novem. 1755, about 11 o'clock in the forenoon. I made a strict inquiry at the mines, on the 21st of February last, both for my own and your satisfaction; and can assure you, that the circumstances related may safely be relied upon as matter of fact. If there be any thing in my power, which you would chuse to have explained

more particularly, please to communicate, and it shall be done with the greatest pleasure by,

S I R,

Your most obedient and

obliged humble servant,

Wm. Bullock.

Francis Mason, overseer, says, That he sat in a little room, which he uses to write in: it stands about forty yards from the mouth of one of the engine shafts. He felt one shock, which very sensibly raised him up in his chair, and caused several pieces of lime or plaister to drop from the sides of the room: the roof of it was so violently shook, that he imagined nothing less than the engine shaft was run in; whereupon he immediately went out to see, and, contrary to his expectation, found the shaft open, and all things about the spot in their proper order.

Upon inquiry, I was informed by the aforesaid Francis Mason, that in a field about 300 yards from the mines, there had happened a chasm or cleft on the surface of the earth, which was supposed to be made at the same time he felt the shock, for the following reason: It lies close by a road, which he uses daily to and from the mines: in the morning when he came, there was nothing uncommon to be seen, but on his return at evening he observed a cleft about one foot deep, and six inches in diameter; its continuation from one end to the other, was near 150 yards.

yards, being parallel to the range of the vein on the north side. When I examined it, which was upwards of three months after the shock happened, the length of it was not much more than 60 yards, though I could perceive some vestiges of its farther continuance: the depth of it was about eight or nine inches, and its diameter four. As the soil was very light, and the season has been remarkably wet, it is highly probable, that the fissure is considerably closed since it was first made. These were the most remarkable circumstances, which happened upon the surface of the earth. Though my inquiry was of every one in particular, that was there employed about the mine, the concurrence of whose testimonies might seem more strongly to confirm the account; yet I look upon it as unnecessary to trouble you with every man's story, which would be only a repetition of, or something similar to, what has been before related.

William Hallom, and Jo. Howson, miners, say, That at the aforesaid time they were employed in carting, or drawing along the drifts the ore and other minerals to be raised up the shafts. The drift, wherein they were working, is about 60 fathoms, or 120 yards deep, and the space of it from one end to the other 50 yards, or upwards. Hallom was at the end of the drift, had just loaded his cart, and was drawing it along, but was suddenly surprised by a shock, which so terrified him, that he immediately quitted his employment, and ran to the west end of the drift to his partner, who was not less terrified than himself. They durst not attempt to climb the shaft, lest that should be running in upon them, but
con-

consulted what means to take for their safety. Whilst they were thinking of some place of refuge, they were alarmed by a shock much more violent than the former; which put them in such a consternation, that they both ran precipitately to the other end of the drift. There was a miner working at the forfield, or east end of the vein, about six fathoms below their level, who called out to them, imagining they were in danger of being killed by the shafts running in upon them, which he supposed was the case; and told them, if by any means they could get down the shaft to him, they would be more secure, because the cavity, where he was working, was encompassed with solid rock. They went down the shaft to him, where, after observing they had neither of them received any misfortune, he told them, that the violence of the second shock was so great, that it caused the rocks to grind one upon another. His narration was interrupted by a third shock; and, after an interval of about four or five minutes, was succeeded by a fourth; and about the same space of time after, by a fifth; none of which were so violent as the second. They heard after every shock a loud rumbling in the bowels of the earth, which continued for about half a minute, gradually decreasing, or appearing at a greater distance. They imagined, that the whole space of time, from the first shock to the last, was about twenty minutes; and they tarried about ten minutes in the mine after the last shock; when they thought it adviseable to examine the passages, and to get out of the mine, if possible. As they went along the drifts, they observed, that several pieces of minerals were dropped from

the sides and roof, but all the shafts remained intire, without the least discomposure.

The space of ground at the aforesaid mines, wherein it was felt, was 960 yards, which was all that was at that time in workmanship.

L E T T E R. II.

An Account of the Earthquake at Lisbon *, Nov. 1. 1755, in *Two Letters from Mr. Wolfall, Surgeon, to James Parsons, M. D. F. R. S.*

Dear Sir,

Lisbon, Nov. 18, 1755.

Read Dec. 18,

*1755.

AS some years ago I had the pleasure of occasionally meeting you at Dr. Hill's house, I venture to take the liberty of sending you an account of the terrible earthquake, which has so lately destroyed this city. If you have any

* This city suffered greatly by an earthquake in 1531, thus described by Paulus Jovius. Hist. L. 29. fol. 180. Nec multo post sequenti mense Januario, par prope exitii clades Lusitanis in ipsis proculdubio visceribus terræ furente debacchanteque Æolo illata est, ejus impetu urbs Ulyssipo in primis incomparabile detrimentum sensit, & post eam coloniam, Sanctæarenæ & Azumbugeræ, Almerinique urbium publica privataque ædificia, inusitato terræ motu conqussata proscissaque magnam vim mortalium ruinis oppressere, & nonnulla etiam navigia turbulento inflati maris hiatu absorpta sunt, sicut Tagus insanis allidentis maris fluctibus repulsus, discedentibus in utranque ripam suis undis sicca in medio vada obstupentibus cunctis ostenderet, nemoque jam tota prope Lusitania tectis suis confideret, subfultante scilicet solo, ideoque non cito deserturam terræ motus vim ita præmonstrante, ut regis & reginæ exemplum sequuti universi fere incolæ tabernacula apertis in locis castris in more erigere cogerentur; neque in his tamen soluti metu pernoctarent, quum repentinum aliquem terræ hiatum, quo absorberi possent, non temere extimescendum arbitrarentur.

other.

other correspondents in this place, I doubt not but they are able to give you a more satisfactory relation of it than I will pretend to: but, if you have not, such an account, as the present hurry of my spirits will permit me to send you, will doubtless be more agreeable to you, than the uncertain reports, that you will find in the news-papers. All that I can pretend to at present is to communicate to you “a round unvarnish’d tale”; and that I will do with all the truth and candour imaginable.

It perhaps may be necessary previously to tell you, that since the beginning of the year 1750, we have had much less rain than has ever been known in the memory of man, excepting the last spring, which gave such a supply of rain, as has produced very plentiful crops: the summer has been cooler than usual, and for the last forty days, fine clear weather, without being remarkably so. On the first instant, about 40 minutes past nine in the morning, was felt a most violent shock of an earthquake: it seemed to last about the tenth part of a minute, and then came down every church and convent in town, together with the King’s palace, the magnificent opera-house, joining to it; in short, there was not a large building in town that escaped. Of the dwelling-houses there might be about one-fourth of them that tumbled, which, at a very moderate computation, occasioned the loss of thirty thousand lives. The shocking sight of the dead bodies, together with the shrieks and cries of those, who were half buried in the ruins, are only known to those who were eye-witnesses. It far exceeds all description, for the fear and consternation was so great, that the most resolute person durst not stay a moment to remove a few stones

off the friend he loved most, though many might have been saved by so doing: but nothing was thought of but self-preservation; getting into open places, and into the middle of streets, was the most probable security. Such, as were in the upper stories of houses, were in general more fortunate than those, that attempted to escape by the doors; for they were buried under the ruins with the greatest part of the foot-passengers: such as were in equipages escaped best, though their cattle and drivers suffered severely; but those lost in houses and the streets are very unequal in number to those, that were buried in the ruins of churches; for as it was a day of great devotion, and the time of celebrating mass, all the churches in the city were vastly crowded, and the number of churches here exceeds that of both London and Westminster; and as the steeples are built high, they mostly fell with the roof of the church, and the stones are so large, that few escaped.

Had the misery ended here, it might in some degree admitted of redress; for though lives could not be restored, yet the immense riches, that were in the ruins, might in some part have been digged out: but the hopes of this are almost gone, for in about two hours after the shock, fires broke out in three different parts of the city, occasioned from the goods and the kitchen-fires being all jumbled together. About this time also the wind, from being perfectly calm, sprung up a fresh gale, which made the fire rage with such fury, that at the end of three days, all the city was reduced to cinders. Indeed every element seemed to conspire to our destruction; for soon after the shock, which was near high water, the
tide

tide rose forty feet higher in an instant than was ever known, and as suddenly subsided. Had it not so done, the whole city must have been laid under water. As soon as we had time for recollection, nothing but death was present to our imaginations.

For 1st, the apprehensions of a pestilence from the number of dead bodies, and the general confusion, and want of people to bury them, were very alarming: but the fire consumed them, and prevented that evil.

2d. The fears of a famine were very great; for Lisbon is the store-house for corn to all the country, for fifty miles round: however, some of the corn-houses were happily saved, and though the three succeeding days to the earthquake an ounce of bread was worth a pound of gold, yet afterwards bread became moderately plenty, and we were all happily relieved from our starving condition.

The 3d great dread was, that the low villainous part of the people would take an advantage of the confusion, and murder and plunder those few, who had saved any thing. This in some degree happened; upon which the King gave orders for gallows immediately to be placed all round the city; and after about a hundred executions, amongst which were some English sailors, the evil stopp'd. We are still in a state of the greatest uncertainty and confusion, for we have had in all twenty-two different shocks since the first, but none so violent as to bring any houses down in the out-skirts of the town, that escaped the first shock; but nobody yet ventures to lie in houses; and though we are in general exposed to the open sky, for want of materials to make tents, and tho' rain.

rain has fallen several nights past, yet I don't find but the most delicate tender people suffer their difficulties with as little inconvenience as the most robust and healthy. Every thing is yet with us in the greatest confusion imaginable: we have neither cloaths nor conveniencies, nor money to send for them to other countries. All Europe is deeply concerned in the immense riches and merchandizes that are lost, but none so much as our own nation, who have lost every thing they had here. Few English lives have been lost in comparison of other nations, but great numbers wounded; and what adds to the misfortune is, that we are three English surgeons, but neither instruments, bandages, nor dressings, to relieve them. Two days after the first shock, orders were given to dig for the bodies, and a great many have been taken up, and recovered. It is amazing some instances of recoveries, that I could send; in short it is amazing, that we are not all lost. I lodged in a house, where there were thirty-eight inhabitants, and only four saved. In the city prison 800 were lost, 1200 in the general hospital, a great number of convents of 400 in each lost; the Spanish ambassador with 35 servants. It would be too tedious to enter into particulars, for I procured this paper by mere accident, and I write this on a garden wall. If you are pleased to communicate the contents to your Society, I beg you will first please to dress it up in different language. It fortunately happened, that the King and the Royal Family were at Belime, a palace about a league out of town. The palace in town tumbled the first shock, but the natives insist, that the Inquisition was the first build-

ing that fell down. The shock has been felt all over the kingdom, but along the sea-side more particularly. Faro, St. Ubals, and some of the large trading towns are, if possible, in worse situation than here; though the city of Porto has quite escaped.

It is possible, that the cause of all these misfortunes came from under the western ocean, for I have just been in conversation with a captain of a ship, who seems a very sensible man, who tells me, that he was fifty leagues off at sea; that the shock was there so violent as greatly to injure the deck of his ship; it occasioned him to think, that he had mistaken his reckoning, and struck upon a rock, and they instantly hawled out their long-boat to save themselves, but happily brought the ship, though much injured, into this harbour.

If there are any further particulars, Sir, in which I can gratify your curiosity, I will most gladly endeavour to do it. And I hope my future correspondence will be more clear and correct than this confused letter I send at present. If in any thing I can give you pleasure, please to address to me, Surgeon, at Lisbon. I am

Your most obedient and

most humble servant,

Richard Wolfall.

L E T T E R I I I.

Dear Sir,

Lisbon, Nov. 22, 1755.

Read Dec. 18,
1755.

A Few days ago, when 'I did myself the pleasure to communicate to you an account of the terrible earthquake, that has destroyed this city, I omitted a very material circumstance; which was to acquaint you of the time that it lasted, which was between five and seven minutes. The very first shock was extremely short, but then it was as quick as lightning, succeeded by two others, which, in the general way of speaking, are mentioned all together as only one shock. About twelve o'clock we had a second shock. I was then in the 'Terra do Paço, or King's palace-yard, and then I had an opportunity of seeing the walls of several houses, that were standing, open from top to bottom, more than a quarter of a yard, yet close again so exactly as to leave no signs of injury. I am,

S I R,

With great esteem,

Your most obedient humble servant,

Richard Wolfall.

P. S. Since my last we have had some very heavy rains, and had only one shock, and that not violent, the last four days.

L E T T E R

LETTER IV.

A Copy of Part of Two Letters, written by John Mendes Sacchetti, M. D. F. R. S. to Dr. De Castro, F. R. S. dated from the Fields of Lisbon, on the 7th of November, and the 1st of December, 1755.

Read Jan. 15, 1756. I Cannot, at present, give you a proper account of the first day of this month of November, the most unhappy and fatal day for this court and kingdom, the cause of our total ruin, and general loss of so many nations, connected with the flourishing condition of the commerce of this great capital ; because I am, and have begun, to write the natural, philosophical, and meteorological history of this tragical event, with a design to publish it, by the particular desire of his excellency the secretary of state Diego de Mendoca Corte Real, and some other noblemen, which, as soon as finished, I shall take special care to send it to you, and communicate it to our Royal Society. Therefore now I shall only inform you, in a few words, that *cecidit Babylon*, and that there is no more to be seen than *Campus ubi Troya fuit*. Lisbon, the great city of Lisbon, was at once tumbled to the ground, burnt to ashes, and plundered ; reducing this court, and the most part of the realm, to inconceivable misery, and deplorable condition. The third part of its inhabitants was buried in the ruins, and the other two thirds wandering, scattered, and full of misery in their tents. I have miraculously escaped with a friend and family, where I lodged, and all retired to his country-

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country-house, where we do not know yet, as every body else, friends of their friends, fathers of their children, husbands of their wives; because every one fled away from their habitations, full of terror, confusion, and distraction.

This year has been with us very rainy and wet; the three preceding ones excessively dry, insomuch that some springs, formerly very plentiful of water, were dried, and totally lost; at the same time the predominant winds were east and north-east, accompanied with various, though very small, motions or tremblings of the earth, and, in the year 1750, we had a very sensible one.

The day before the fatal earthquake the atmosphere, and light of the sun, had the appearance of clouds and notable offuscation, and more strong and visible at the actual time of the great shock, which was by undulation, and lasted from six to eight minutes. The weather was rather warmer than commonly we have it at this time of the year, and had continued so for several days before. In all this time were predominant the east and north-east winds.

It ruined not only this populous city, but all the southern part of the county of Estremadura, and a great one of the kingdom of Algarve.

I am almost positive, that the earthquake was progressive, and that this place was the center of it. Its direction, according to my own observations, from north-west to south-west.

The earth opened in fissures in several parts, but neither fire or visible smoke came out of it.

The water in the sea rose several times, and in a few minutes made three fluxes and refluxes, rising
above

above the greatest spring-tides two spawns, or fifteen English feet. This phenomenon happened three days before the new moon, and the earthquake, when the high tide had run up three parts of it.

Extract of LETTER V.

From Mr. J. Latham, dated at Zúsqueira, Dec. 11, 1755, to his Uncle in London. Communicated by Peter Daval, Esq; Secret. R. S.

S I R,

Read Jan. 15,
1756.

PERhaps you may have heard of the dismal calamity, that befel the city of Lisbon, by an earthquake and fire, which laid the whole city in ruin. I was on the river on Saturday the 1st of November, with one of my customers, going to a village three miles off. In a quarter of an hour the boat made a noise as if on the shore or landing, though then in the middle of the water. I asked my companion, if he knew what was the matter? He stared at me; and, looking at Lisbon, we saw the houses falling, which made him say, *God blefs us, it is an earthquake.* About four or five minutes after, the boat made a noise as before, which was another shake. We saw the houses tumble down on both sides of the river. In Lisbon, a convent on a high hill fronting the river, the most part of it came down, a great many were killed, and buried in the ruins; many tumbled neck and heels in the water, others ran down to the river, up to their middle and necks. A strong northerly wind blew from shore, which covered the water with dust, and in

our boat we could scarce see one another ; and it intirely hid the sun from us for some time, though as fine a morning as ever was, and as warm a sun as is with you in the month of July. The wind soon disperfed the dust, the shaking seemed over. In about three quarters of an hour we came to the village, where we were called ashore, and met several gentlemen, who came out of the city on horse-back, but so frightened, that they did not know what it was : we told them what we had seen, and in a quarter of an hour after our landing, the village was alarmed with another shake. We got down to our boat, in order to get in ; in a moment's time the river rose so high, as obliged us to take to our heels, and run for our lives, into the fields and high ground, the water flowing across the road, which, from the low tide, was above a quarter of a mile: the ships were whirl'd about, and several people taken into the water, others driven ashore, and dashed to pieces. From the high grounds we could see the sea at about a mile's distance come rushing in like a torrent, tho' against wind and tide. A fine new stone quay in Lisbon, where the merchants land their goods, where at that time about three thousand people were got out for safety, was turned bottom upwards, and every one lost ; nor did so much as a single body appear afterwards. It being a holy-day, great numbers of the natives being at their devotion in convents and churches, whose large buildings suffered most, it is computed about sixty thousand souls, and a hundred and odd of the foreigners, and all sorts of cattle, perished. The religious houses being illuminated with wax-lights, and the images drefs'd, by the shakes
were

were set on fire by night, in several places, and by Monday morning intirely consumed, with the rich furniture of convents, nunneries, and nobility's houses, and all the merchants and tradesmen's goods, besides jewels, gold, plate, and coined money. There have been a great many shakes by nights and days : even on the 8th of December was felt a strong one ; it was much more violent in some places than others. The ground was opened ; in some places you might put your hand down broad-ways, and not feel the bottom with a long stick. A sea port, called St. Ubal's, was intirely swallowed up, people and all. It is thought Lisbon would have shared the same fate, had it fronted the sea. The greatest factory belonging to Great Britain was ruined in 24 hours ; the merchants, who used to vie with our principal gentry in house-keeping, equipage, and dress, are so reduced, that ten or twelve live in a small house, others seek for lodgings, or make what shift they can, while a great many are gone to their own countries.

L E T T E R VI.

*Observations, made at Colares *, on the Earthquake at Lisbon, of the 1st of November 1755, by Mr. Stoqueler, Consul of Hamburg. Communicated by Mr. Henry Baker, F. R. S.*

Read Feb. 5, 1756. **T**HE 31st of October the weather was clear, and uncommonly warm for the season ; the wind north, from which quarter,

* It is about twenty miles from Lisbon, and lies behind the lock, about two miles from the sea»

about four o'clock in the afternoon, there arose a fog, which came from the sea, and covered the valleys; a thing very common in the summer, but rare in this season of the year. Soon after the wind changing to the east, the fog returned to the sea, collecting itself, and becoming the thickest I ever saw. As the fog retired, the sea rose with a prodigious roaring.

The 1st of November, the day broke with a serene sky, the wind continuing at east; but about nine o'clock the sun began to grow dim, and about half an hour after we began to hear a rumbling noise, like that of carriages, which increased to such a degree as to equal the noise of the loudest cannon; and immediately we felt the first shock, which was succeeded by a second and third; on which, as on the fourth, I saw several light flames of fire issuing from the sides of the mountains, resembling that which may be observed on the kindling of charcoal.

In the spot, on which I remained till the third shock was over, I observed the walls to move from east to west. Removing from thence to another situation, from whence I could discover the sea coast, I observed from one of the hills called the Fojo, near the beach of Adraga, that there issued a great quantity of smoke, very thick, but not very black; which still increased with the fourth shock, and after continued to issue in a greater or less degree. Just as we heard the subterraneous rumblings, we observed it would burst forth at the Fojo; for the quantity of smoke was always proportioned to the subterraneous noise. This I saw continue till the noon of the 2d of November, when I retired from
the

the place where I had observed it. It continued to smoke some days longer, more or less, according to the subterraneous rumblings.

When I returned to Colares a fortnight after, I saw no smoke ; neither was there any sign of it, even when the noise was to be heard ; but I could meet with no-body, who could inform me when the smoke had ceased.

The 20th in the afternoon, being on the former spot, I saw a small fog coming from the sea (from the same quarter whence the smoke appeared), which smelt of sulphur ; and the wind returning to the east, the fog retired to the sea ; and in the morning of the 21st, about nine o'clock, we felt two shocks of an earthquake sufficiently violent, but no more smoke was seen. I cannot say, whether the same phenomena preceded the earthquake of the 11th, because I was not at the place, nor had I any-body there to make the observation.

I went to examine the place, from whence I saw the smoke arise, but I did not discover from whence it could have issued ; nor did I find any signs of fire near the place : from whence I infer, either that the smoke exhaled from some eruption or volcano in the sea, which the waters soon covered, or that, if it issued from some chasm in the land, it closed afterwards. I rather incline to the former opinion, because it is natural, that the water should retire from the place of the eruption : besides, the sea having risen in some places, it is probable, that it fell in others ; and indeed it has visibly retired there, for you may walk on the dry shore now, where before you could not wade. And the second conjecture
may

may be true, as some chasms on the dry land are now almost closed up, and others intirely so.

Particular Observations.

In the afternoon of the 31st of October, I observed, that the water of a fountain was greatly decreased : on the morning of the 1st of November it ran very muddy, and after the earthquake it returned to its usual state, both in quantity and clearness. Some fountains, after the earthquake, ran muddy, some decreased, others increased, others were dried up; and one, that with the earthquake was dried up intirely, returned two days after to its usual state. In some places where there was no water, springs burst forth, which continued to run. On the spot of Varge, and river of Macaas, at the time of the earthquake, many springs of water burst forth, and some spouted to the height of 25 palms *, throwing up sand of various colours, which remained on the ground. On the hills, numbers of rocks were split, and there were several rents in the ground, but none considerable. On the coast, pieces of rock fell, some of them very large, and in the sea sundry rocks were broken : the most noted are those called by the sailors Sarithoes, or Biturecras, of which one was only broken off at the summit, the other all to pieces.

N. B. Between these rocks and the main, the coasting vessels failed at low water ; and now you may

* The Portuguese palm is about nine inches.

go to them at low water, without wetting of your feet. From the rock called Pedra de Alvidrar (situated where the smoke issued), a kind of parapet was broke off, which issued from its foundation in the sea. In a swamp or lake, which received a good deal of water in winter, and was not dry in summer, the earth rose; for there is now scarcely the appearance of a hollow, which was before to the depth of six or seven palms; it now remains even with the adjacent ground. In other places, by the change of the currents it appears, that the earth was moved, so that some spots are more elevated, others more depressed than before.

In the afternoon of the 24th I was much apprehensive, that the following days we should have another great earthquake (from which it pleased God to preserve us), for I observed the same prognostics as in the afternoon of the 31st of October; that is, the weather being pretty serene, the wind northerly, the fog came from the sea towards the vallies, and the wind changing to the last, the fog retired to the sea; however not so thick as that of the 31st of October. The sea was soon in great agitation, and roaring. And I further observed, that the water of a fountain began to be disturbed to such a degree, that in the night it ran of a yellow clay colour; and from midnight to the morning of the 25th, I felt five shocks, one of which seemed to me as violent as that of the 11th of December.

I was informed, that there was some bituminous matter, but could find none. Indeed I once picked

up a stone split through the middle, whose edges seemed to me to have sulphur lodged on them ; but I was then in a hurry, and never could find the place where I had taken it up.

Extract of LETTER VIII.

To Tilman Henkel, Esq; Merchant in London, concerning the Earthquake at Oporto in Portugal, Nov. 1, 1756. Communicated by Mr. John Ellicot, F. R. S.

Read Nov. 27, 1755. **T**HIS goes by Captain Richard Knowler, and serves chiefly to acquaint you, that last Saturday, the 1st instant, we had such a terrible earthquake here, that all of us were afraid of being swallowed up alive, tho', thank God, it did but very little damage ; and now, I hope, it is quite over. It began about half an hour past nine o'clock in the morning, just like thunder, or rather the rattling of a coach over stones ; and my own house, as well as most other people's, during the first shock, which was a very terrible one indeed, was just as if it was in a convulsion, which lasted, without exaggeration, at least seven or eight minutes, and every thing shook and rattled in it all the while, exactly as if it was coming down, which frightened people so much, that a great many ran, with all their family, into the streets, where I plainly saw the earth heave, with people walking upon it, just as if it was in labour, and as it really was, the like never known in this country before. At six o'clock
at

at night there was another great shock ; but that was soon over, and there were several inferior ones before, and the next day likewise ; but all last night, thank God, every thing was very quiet. What frightened people likewise very much, was the river, which rose and fell surprisngly every quarter of an hour, for upwards of four hours at least, four or five feet, and sometimes more ; and some saw the river in some places open, and throw out a vast deal of wind, which was very terrifying, as nobody could tell what would be the end of it. In short, for my part, I must confess, I never was so much frightened in my life ; and the description I have given you of it, I can assure you, is not near so shocking as the thing really was itself ; and I pray God we may never have such another.

L E T T E R IX.

Extract of Two Letters to Mr. Plummer, Merchant in London, from Oporto, concerning the Earthquake felt there. Communicated by Mr. John Ellicot, F. R. S.

Novem. 1, 1755.

Read Nov. 27, ^{1755.} **T**HIS morning, betwixt nine and ten o'clock, this city was alarmed with the terrible shock of an earthquake, which lasted violently the space of five or six minutes, but has done no further damage than the overturning some pedestals from the tops of some churches, and cleaving the walls of some old houses. While it lasted, the city was all in consternation, and the shock

H h h 2

was

was perceived in the river, among the shipping, by a sudden flux and reflux of the tide, but no damage. Pray God defend us, on our guard, in all his judgments, and avert them from us.

The earthquake, violent as it was, I don't hear has done any very great damage: four or five boats were overfet by it on the bar, but no one drowned; some vessels were drove from the moorings, but received no hurt: several large stones were thrown from the tops of buildings, but without touching anybody; but some, through mere fear, have died: amongst these is N. Webber, who was let blood about five, and went off in the night: others too received hurt by crouding out of churches, which were much thronged, it being a mass-day. Had it happened in the night, instead of nine in the morning, short as the duration was, I fear the consequence would have been very fatal; for even as it was, several people were for throwing themselves from their windows, to get into the streets, which they would undoubtedly have done, if in the night; and in the hurry, even down stairs, many would have broke their limbs, and perhaps lost their lives. So strongly has the shock affected the minds of some, that they imagine six or seven more have been felt since; but, for my own part, I know of one only, and trust in God I shall never experience the like, for it was really very terrible.

I forgot to observe to you, that, during the time of the earthquake, and indeed preceding it, was heard a hollow dreadful noise, but I did not observe any disagreeable smell, or alteration in the air, the sky being as serene as usual, and the after-part of the day without a breath of air.

Extract

Extract of LETTER X.

From Oporto, dated Novem. 1, 1755.

Read Nov. 27, 1755. **W**E have been greatly alarmed to-day by an earthquake; the shock was so great that really it was terrible: we all ran into the street, the churches were also deserted, and every body seemed frightened out of their senses, as if they thought the world was at an end! It began about ten o'clock in the morning, and continued ten minutes; but, thank God, I do not hear of any considerable damages done; which, considering the violent manner in which the houses were shaken, and the continuance of it, is very providential. God grant it may have a proper effect on the minds of all. It was equally felt on the river, and, I am told, was rather more in Villa Nova, and in Gaya: and two Brazil ships, that had just got over the bar, were all at once forced into the harbour again, and very narrowly escaped being lost.

Extract of LETTER XI.

From Oporto, by the Western, Captain Knowler, dated Novem. 1, 1755. Communicated by Theodore Jacobson, Esq; F. R. S.

Read Nov. 27, 1755. **I** Was never so alarmed in my life, as this morning, between nine and ten o'clock, when we were all at breakfast: the house began

began to tremble in such a manner that we all started. I ran down-stairs, and, when I came into the street, I saw all the world running out of their houses, and crying out, An earthquake. I made for the water, and in my way I thought the last day was come, by the the cries of the people, and the hurly-burly about the church door, where many had like to be lost, endeavouring to get out: it lasted for about six minutes, and in a quarter of an hour after, we had a second, and in about an hour a third. These two last were nothing equal to the first, and the water rose and fell about four feet every minute for a considerable time, but now runs its natural course, and we begin to be ourselves again. Several chimnies fell, and some towers, and a great many walls cracked in the city, but at a league distance several houses fell, and we fear we shall hear of a good deal more damage from the country. This moment we have had another shock, and it is now six in the evening.

Extract of L E T T E R XII.

From Mons. Muysson to Mons. Bazin, concerning the Earthquake at Oporto, Nov. 1, 1755. Communicated by M. Maty, M. D. F. R. S. Translated from the French.

Oporto, Nov. 2, 1755.

Read Nov. 27, 1755. **Y**esterday at nine in the morning we felt here a terrible earthquake, which continued near six minutes, and, as you may imagine, threw us all into a great consternation. Two other shocks were felt afterwards, but less violent

lent than the first. The river swell'd considerably, and two ships, which were at the bar, going out, were driven back into the port.

Extract of L E T T E R XIII.

From Madrid, to the Spanish Consul, residing in London. Translated from the Spanish. Communicated by Mr. John Ellicot, F. R. S.

Madrid, Nov. 3, 1755.

Read Nov. 27, 1755. **T**HE only motive of my writing is to give you an account of the terror and astonishment, with which we were seized at Madrid. On the day of All Saints, in the morning about ten o'clock, and some few minutes more (five by two of my watches), there was very sensibly felt a great earthquake: according to the common opinion, it lasted five or six minutes. Every body at first thought, that they were seized with a swimming in their heads; and, afterwards, that the houses, in which they were, were falling. The same happened in the churches, so that the people trod one another under foot in getting out; and those, who observed it in the towers, were very much frightened, thinking, that they were tumbling to the ground. It was not felt by those, who were in their coaches, and very little by those, who walked on foot. No remarkable accident happened, excepting that two lads were killed by the falling of some pieces of a cross, which was over the door of a church belonging to a monastery. Every body is much frightened, and there are a great many indisposed by

by the fright. It was felt in most of the houses, without receiving any remarkable damage, excepting the churches of St. Philip, St. Thomas, Portaceli, and towers of St. Trinity, and St. Millan, which will require to be examined by skilful workmen. In the bishop's chapel, in the parish of St Andrew, and in the new palace, although it was much felt, it did not the least damage. It is said, that it was felt more in the Escorial; and, to increase their fright, a fire broke out at the same time, in the kitchen belonging to the body guards. Their Majesties immediately gave orders to come to Madrid. They arrived, accompanied by only one or two coaches, at Retiro, about eight at night, where they put up tents for that night, and in the morning went to Atocha, to a tent, where they staid till noon. We are very anxious to know how far it extended itself.

L E T T E R XIV.

An Account of the Earthquake at Cadiz, Novem. 1, 1755, in a Letter from Mr. Benjamin Bewick, Merchant there, to Mr. Joseph Paice, Merchant in London.

Cadiz, Nov. 4, 1755.

Read Dec. 18, 1755. **I** Shall remember this week a long time, for that and something of another nature, I am going to relate, as you may not have so faithful a relation from the news-papers.

The 1st instant, just before ten, the whole town was shook with a violent earthquake, which lasted, as far as I can gather from the curious, above three minutes

minutes and an half. To give you an idea of its violence, the water in the cisterns (which are underground) washed backwards and forwards so as to make a great froth upon it. Every body ran out of the houses and churches, in a terrible consternation, but no damage was done, as all the buildings here are excessively strong. We thought ourselves very safe when this was past, and people recovered a little the fright. An hour after, looking out to sea, we saw a wave coming at eight miles off, which was at least sixty feet higher than common. Every body began to tremble; the centinels left their posts, and well they did. It came against the west part of the town, which is very rocky: the rocks abated a great deal of its force. At last it came upon the walls, and beat in the breast-work, and carried pieces of eight or ten tun weight, forty and fifty yards from the wall, and carried away the sand and walls, but left the houses standing, so that only two or three persons were drown'd. Every one now thought the town would be swallowed up; for although this was run off, yet with glasses we saw more coming. The people were in the utmost consternation, and ran some one way, some another. The governor ordered the gates to be shut, that people might not go out of town, as the land was lower than the town; by which means he saved the lives of thousands, who wanted to fly, they did not know where. When the wave was gone, some parts, that are deep at low water, were quite dry, for the water retired with the same violence it came with. These waves came in this manner four or five times, but with less force each time; and about one the sea grew more calm, but

was still in a boiling motion. Every thing was washed off the mole. The bay was full of barrels, and boats, and timber; but no damage was done to the shipping. The walls have suffered very much. There is a neck of land, that goes from thence to the island of Leon, open to the ocean on one side, and to the bay on the other, but very narrow: upon this was a very strong causey, which the sea has washed away, as if it was nothing, that in some places you cannot say, here is the road. It has almost opened a communication between the sea and the bay, which will be a great misfortune to the town, as it will spoil the bay, now become a small island. It is to be hoped the governor will endeavour to prevent that. There were about forty or fifty people drowned on the causey, and a great many beasts. Some of the towns about us have suffered a great deal more than we, by the falling of houses and towers, but we have not yet got an account of what damage has been done; and it is believed, by the course of the earthquake, that it did not go to Gibraltar. The whole day the weather was extremely serene and pleasant. Since the sea is come to itself, and nature seems to be recovered from her convulsions. We had rain, and a fresh wind, so that it is hoped we shall have no more of these dreadful calamities, which are shocking to human nature. God grant it may be so. These phenomena are very uncommon here. About 25 years ago there was a small shock of an earthquake, but not attended with these horrid risings of the sea. Should they be frequent, there would be no living here; the town would even be destroyed, and we
have

have no place to fly to, unless it is aboard the ships, which are at a distance. Thank God it is no worse. Adieu : believe me ever yours.

N. B. The day of the earthquake the weather was as clear and serene as the finest summer-day in England.

Benjamin Bewicke.

LETTER XV.

An Account of the Earthquake at Cadiz, in a Letter to the Spanish Ambassador at the Hague, from Don Antonio d'Ulloa, F. R. S.

Read Dec. 18, 1755. **O**N the first of this month [November] we had here an earthquake, the violence of which was not inferior to that, which swallowed up Lima and Callao, in Peru, towards the end of October 1746. It happened in very fine weather, at three minutes after nine in the morning, and continued five minutes, and consequently near twice as long as that of Peru, the duration of which was only three minutes. If every thing was not destroyed here, it seems particularly owing to the solidity of the buildings. The inhabitants had scarce begun to recover from their first terror, when they saw themselves plunged into new alarms. At ten minutes after eleven they saw rolling towards the city a tide of the sea, which passed over the parapet of sixty feet above the ordinary level of the water. At thirty minutes after eleven came a second tide ; and these two were followed by four others of

the same kind, at eleven o'clock fifty minutes; twelve o'clock thirty minutes; one o'clock ten minutes; and one o'clock fifty minutes. The tides continued, with some intervals, till the evening, but lessening. They have ruin'd 100 toises of the rampart, part of which of three toises length, and of their intire thickness, were carried by the torrent above fifty paces.

The ships were exposed to eminent danger; the greatest part of them were driven afloat; but most of them fortunately were saved, some by veering their cables, others by securing themselves by new anchors; so that only one Swedish ship and some boats were lost. A great number of persons perished on the causey, which leads to the isle of Lesu. Seville has been greatly damaged. St. Lucar and Cheres have likewise suffered much; and Conel is said to be intirely destroyed.

L E T T E R XVI.

An Account of the Earthquakes, that happened in Barbary, inclosed in a Letter from General Fowke, Governor of Gibraltar, to the Right Honourable Henry Fox, Esq; one of his Majesty's principal Secretaries of State: Communicated by the Right Honourable Philip Lord Viscount Royston, F. R. S.

Tetuan.

Read March 4,
1756.

THE earthquake began the 1st of November, at ten in the morning, and lasted between seven and eight minutes; during which space the shock was repeated three different

different times, with such violence, that it was feared the whole city would fall down: but the only damage, that resulted, was the opening or parting of some of the walls of sundry houses. It was likewise observed, that the waters of the river Chico, on the other side of the city, and those of a fountain, appeared very red.

Tangier.

The earthquake began about the same time, but lasted longer than at Tetuan; the trembling of the houses, mosques, &c. was great, and a large promontory of an old building near the city gate, after three shocks, fell down to the ground, by which five shops were demolished: the sea came up to the very walls, a thing never seen before, and went down directly with the same rapidity as it came up, as far as the place where the large vessels anchor in the bay, leaving upon the mole a great quantity of sand and fish. These commotions of the sea were repeated eighteen times, and continued till six in the evening, though not with such violence as at the first time. The fountains were dried up, so that there was no water to be had till night: and as to the shore side, the waters came up half a league inland.

Arzila.

It happened about the same time, but the damage was not great. At the coming up of the sea seven Moors, who were out of the town walls, were drowned; and the waters came in through one of the city gates very far. The water came up with
such

such an impetuosity, that it lifted up a vessel in the bay, which, at the water's falling down to its center again, fell down with such a force upon the land, that it was broke to pieces; and a boat was found at the distance of two musket-shots within land from the sea.

Salle.

There happened a very great damage, several houses having fallen down. The waters came up with such a rapidity, that they came into the city, and at their falling down, great quantities of fish were found in the streets, and many persons were drowned: two ferry-boats overset in the river, and all the people on board were also drowned; and a large number of camels, that were just then going for Morocco, were carried away by the waters.

Fez.

Vast numbers of houses fell down, and a great many people were buried under the ruins. At the Scloges (a place where the Barbarians live, not far from Fez), a mountain broke open, and a stream issued out as red as blood.

Mequinez.

Vast number of houses fell down, and a great many people of both sexes were buried under their ruins; the convent of the Franciscan friers fell down to the ground, but the friers were saved.

Saffe.

Several houses fell down, and the sea came up as far as the great mosque, which is within the city, and at great distance from the sea.

Morocco.

Morocco.

By the falling down of a great number of houses many people lost their lives ; and, about eight leagues from this city, the earth opened, and swallowed up a village, with all the inhabitants (who were known by the name of the sons of Bufunba), to the number of about 8 to 10,000 persons, together with their cattle of all sorts, as camels, horses, horned cattle, &c. and soon after the earth was closed again, in the same manner as it was before.

Fez and Mequinez.

On the 18th of November there happened another earthquake, which was more violent than the first, and lasted till break of day the 19th ; during which time great numbers of houses fell down at Fez ; many people of both sexes were buried under their ruins ; and as to Mequinez, there are but few houses left standing. The people killed by the falling of the houses, besides the wounded, are numberless ; and in the part of the town called the Jews habitation, only eight persons were saved.

Sarjon Hills.

One of the said hills was rent in two ; one side of which fell upon a large town, where there was the famous sanctuary of their prophet, known by the name of Mulay Teris ; and the other side of the said hill fell down upon another large town, and both towns and the inhabitants were all buried under the said hill.

Tasso.

Taffo.

This famous city was wholly swallowed up; no remains left.

This last earthquake was likewise felt at Tetuan and Tangier, but without any other damage than that the fountains of Tangier were dried up for the space of twenty-four hours.

These are the truest and freshest advices, that have been received at Gibraltar, to the 1st of January 1756.

L E T T E R X V I I .

An Account of the Earthquake in the Island of Madeira, Nov. 1, 1755, in a Letter from Dr. Tho. Heberden, to his Brother Dr. William Heberden, F. R. S.

Read Jan. 8, 1756. **N**OVEMBER the 1st, 1755, in the city of Funchal, on the island of Madeira, at half an hour past nine o'clock in the morning, was perceived a shock of an earthquake. The first notice thereof was a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement: immediately the floor moved with a tremulous motion, vibrating very quickly; the windows rattled, and the whole house seemed to shake. The shock lasted a full minute; during which the vibrations, tho' continual, abated and increased twice very sensibly, in point of force (not unlike what I have observed in an echo from the discharge of a fowling-piece, opposite to a range of mountains, whence

whence the sound has reverberated with reciprocal intensions and remissions). The increase, after the first remission of the shock, was the most intense; the door of the room I was in vibrating to and fro very remarkably then, which it had not done before; neither did it afterwards in the second increase.

The noise in the air, which had preceded the shock, continued to accompany it; and lasted some seconds after the motion of the earth had intirely ceased; dying away like a peal of distant thunder rolling through the air. The direction of the shock seemed to be from east to west.

About an hour and half after the shock had ceased, the sea, which was quite calm (it being a fine day, and no wind stirring) was observed to retire suddenly some paces, and, arising with a great swell, without the least noise, as suddenly advancing, overflowed the shore, and entered into the city. It arose full fifteen feet perpendicular above high water mark, although the tide, which ebbs and flows here seven feet, was then at half ebb. The water immediately receded again, and, after having fluctuated four or five times between high water and low water mark, the undulations continually decreasing (not unlike the vibrations of a pendulum) it subsided, and the sea remained calm as before this phænomenon had appeared.

The season of the year has been more than ordinarily dry; the rains, which generally begin to fall the beginning of October, not having set in as yet (Nov. 10). The weather for some weeks preceding the earthquake has been very fine and clear, but the day previous thereto (October 31), was very remark-

ably fair and serene, as was the former part of the day on which it happened: but the afternoon was very dull and dark, the sky being intirely overcast with heavy black clouds: the subsequnt day was very fair.

The greatest height of the thermometer the three last days in October, and on the first of November, (the day of the earthquake) was — 69°
 November the second it rose to — 71
 The barometer had been stationary several } 29 28
 days, at — — — }
 November the second it rose to — 30 1

In the northern part of this island the inundation has been more violent, the sea there retiring at first above a hundred paces, and suddenly returning, overflowed the shore, destroying or damaging several houses and cottages, forcing open doors, and breaking down the walls of several stores or magazines, and carrying away in its recess a considerable quantity of grain, &c. Above two hundred pipes of wine are computed to be lost on this occasion; great quantities of fish were left on the shore, and in the streets of the village of Machico. All this has been the effect of one sole undulation of the sea, it never flowing afterward so high as high water mark; although it continued fluctuating much longer there, before it subsided, than here at Funchal, as the fluctuation and swell was much greater here than it had been farther to the westward, where in some places it has been hardly, if at all, perceptible.

L E T T E R XVIII.

Another Account of the same Earthquake at Madeira, in a Letter from Mr. Charles Chambers to his Father, in London, dated at Madeira, Novem. 1, 1755. Communicated by Lewis Crusius, D. D. F. R. S.

Nov. 1, 1755. 38 minutes past 9 in the morning.
 Read Jan. 8, 1756. **T**HIS moment happened an earthquake, which lasted more than a minute (I believe near two): though of so long a duration, I do not think it so terrible as that in 1748, possibly owing to the present being in the day-time; but, I assure you, it shook every thing about me very effectually.

P. S. Three quarters past eleven; there is a circumstance attends, or rather follows, the earthquake, which is very surprising, and, I confess, shocks me more than the thing itself, which is, the sea all on a sudden rises as though it were the main body of it, and in many parts runs quite to the wall, and at the prattick house, in at the gate. I say, as though it were the main body, as there is no more swell at other times, than in the midst of summer, with a light easterly breeze, and such as has blown all day. I was just called on to observe this, and thought proper to mention it. God, of his infinite mercy, preserve us from all disasters.

November 3. Thank God we have had no return of the earthquake, nor was the rising of the sea at-

K k k 2

tended

tended with any bad consequences in our part of the island ; though we hear, that at Mechico and Porto da Cruz it did considerable damage : from the latter of which places it carried off near 200 pipes of wine, and several caldeoras [stills for distilling brandy], and when the sea recoiled, it was so far from its usual limits, as to discover the foundation of rocks, that never before had been seen, and which lay as far distant from the shore as our Ilheo *.

N. B. The port, where all the business is done, is called Funchal, and lies in the south part of the island. Mechico is a bay, with a village four leagues to the eastward. Porto da Cruz is the north-eastermost part of the island, about six leagues distant from Funchal. The distance referred to from the shore to the Ilheo, something more than 200 yards.

L E T T E R X I X.

An Account of the late Earthquakes of Novem. 1, and 9, 1755, as felt at Neufchâtel in Swisserland, in a Letter from Mons. De Vautravers, F. R. S. to Thomas Birch, D. D. Secr. R. S.

Neufchâtel, Decem. 13, 1755.

Read Jan. 22, 1756. **T**HE dreadful earthquake of the 1st of November last has been perceived even in this country, though very faintly. It turned some of our rivers on a sudden muddy, with-

* A rock whereon a castle is built.

out any rain, and swelled our lake of Neufchâtel to the height of near two feet above its natural level, for the space of a few hours. Some time before nine, three weeks after the earthquake, we had continual rains and storms, generally from north-west, the air very mild, which is not usual at this season amongst us.

The 9th of this month we felt a much more severe shock of an earthquake. It happened a little before three o'clock in the afternoon, with a vibratory motion from west to east; another from east to west, and a third from west to east again. The stove in our servants room was thereby split in several places. Some chimnies fell in at Cudrefin; the bell in the tower at Morat rung two strokes; but no other misfortune has happened, which I have hitherto heard of. The shock was severer in lofty places than it was in low grounds. The lake of Morat, immediately after the earthquake, sunk three inches, and remains still in the same depression. The same earthquake was felt the same day, at the same hour, at Basil, Berne, Fribourg, Geneva, and all over Switzerland; as likewise at Besançon in France. Whether it extended itself any farther is not yet known.

This kind of phenomenon being unusual in this country, and its dangerous effects having been newly heard of from Portugal and Spain, all our inhabitants were much alarmed, and apprehensive of some other great misfortune in other countries.

Immediately after the earthquake, from frosty weather, we had ever since a damp and mild air, great fogs, and to-day plenty of snow. It has been observed, that these three years successively the inhabitants

bitants of Swisserland have suffered great droughts in the summer-seasons, so as to dry up several springs and rivulets, which were never known in any man's memory to have been dried up.

Extract of LETTER XX.

An Account of the Earthquake felt at Geneva, Novem. 9, 1755, in a Letter from Mons. Trembley, Professor of Mathematics there, to his Brother Mr. Abraham Trembley, F. R. S. Translated from the French.

Geneva, Decem. 16, 1755.

Read Jan. 8,
1756.

I Cannot tell whether the earthquake of November 1, was felt here. It was felt at Lyons. It is said, that the waters retired for some moments at the end of the lake of Geneva; and that a motion was observed in those of the lake of Zurich.

On the 9th of this month, a little before half an hour after two in the afternoon, in very fine and very calm weather, there was felt here in all the houses in general a very great shock of an earthquake; but it did no damage. The motion was particularly remarked in looking-glasses and windows. Those, who were sitting, perceived, that their chairs shook; and many thought, that they were going to fall. The sick felt the motion in their beds. The bells in the rooms of several houses rang. The bell of the clock in the tower of the isle of Rhone rung several times. The motion was felt even on the ground floor of houses. I was then walking upon the
Treille,

Treille *, and felt nothing. People are not absolutely agreed concerning the direction of the motion. The greatest part of them represent it to have been from north to south, as it was in the preceding earthquake felt here in March 1753, about two in the afternoon, in very fine weather likewise; but it was not near so generally felt as this last. This of the 9th of December was felt at Nion, Morges, Lausanne, Berne, Zurich, and perhaps more strongly than here.

An acquaintance of mine, who was then in the country, at half a league distance from this city, saw his garden-wall make three vibrations, and he was seized himself with a swimming in the head.

Three shocks were in fact felt within the space of about a minute. During the first a noise was heard like that of a cart passing over a pavement.

L E T T E R XXI.

An Account of the Earthquake felt at Boston in New-England, Novem. 18, 1755. Communicated by John Hyde, Esq; F. R. S.

Boston, Novem. 24, 1755.

Read March 11, 1756. **N**OVEMBER 18, 1755, being Tuesday, about half an hour past four in the morning, I was awaked by the shaking of my bed, and of the house; the cause whereof I immediately concluded could be nothing but an earthquake, having experienced one before. The trem-

* A pretty high terrace.

bling (for as yet it was scarce more) increafing, I soon got out of bed, and went towards the window on the other fide of the chamber, to obferve, if there was any thing unufual in the appearance of the fky, or heavens. By the time I had got about half way acrofs the room, which might be fix or feven feconds from my firft awaking, the fhaking was a little abated; fo that I imagined the height of the fhock was paff. But this thought no fooner came into my mind, than I found how much I was miftaken; for inftantaneously the fhock came on with redoubled violence, and loud noife: the windows, doors, chairs, &c. being prodigioufly agitated; and indeed the whole houfe rocking and cracking to fuch a degree, that I concluded it muft foon fall, or be racked to pieces, unlefs perhaps it fhould be fwallowed up intire. Having firft juft looked out at the window, I haftened down ftairs, unbolted and opened the door, with an intention to go into the ftreet, thinking, though without reafon, almoft every place freer from danger than that where I was: but, upon opening the door, I found the fhock was fomething abated, and having looked out at the door a moment or two, returned to my chamber, and opened a window, at which I flood for the fpace of five or fix feconds; the fhaking and the noife were by this time much leffened, and ftill kept decreafing, as though all would very foon become ftill and quiet. However, there was after this a little repetition both of the trembling and the noife, though no ways to be compared to what had been before. I then went to the other fide of the chamber for my watch, returning with it to the window, in order to obferve the time, which I did feven or eight
feconds

seconds before the shock was intirely over, it being then thirty-one minutes after four. People, I perceive, differ very widely respecting the whole duration of the earthquake, from the first apparent symptoms of it, till it was intirely over, some supposing it to have been six or seven minutes, some four or five, and others scarce more than one. According to the best computation I am able to make, which is from what I did during the continuance of it, removing from one place to another, as related above, I think it could be but little more, and certainly not much less, than two minutes. There was another shock about an hour and ten minutes afterwards, which, though small in comparison to the former, was yet universally perceived by those who were awake. The visible effects of the earthquake are very considerable in the town; to be sure much more considerable than those of any other earthquake, which has been known in it. Many chimnies, I conjecture (from observation) not much less than an hundred, are levelled with the roofs of the houses: many more, I imagine not fewer than 12 or 1500 are shattered, and thrown down in part; so that in some places, especially on the low loose ground, made by encroachments on the harbour, the streets are almost covered with the bricks that have fallen. Some chimnies, though not thrown down, are dislocated, or broken several feet from the top, and partly turn'd round, as upon a swivel; some are shoved on one side horizontally, jutting over, and just nodding to their fall: the gable ends of several brick buildings, perhaps of twelve or fifteen, are thrown down, and the roofs of some houses are

quite broken in by the fall of the chimnies : some pumps suddenly dried up ; the convulsions of the earth having choaked the springs that supplied them, or altered their course. Many clocks were also stopped by being so violently agitated.

These are the most considerable effects of the earthquake, which have fallen under my observation ; for the shaking of pewter, &c. from the shelves seems hardly worth mentioning after them.

It is said earthquakes are usually preceded and followed by a great noise, which several say they heard with this ; but myself did not perceive any noise in this instance, which I could take to be distinct from the concussion and rattling of the things upon the surface of the earth, added to the roaring of the sea, which roaring had been something greater than is usual for several days before.

Some persons likewise speak of observing a glimmering light at the beginning of the shock, which lasted for some time. But I have no remembrance of this, though I observed with care, and now endeavour to recollect whatever was remarkable respecting a phenomenon so unusual in this part of the world, and so justly terrible in all.

L E T T E R XXI.

An Account of the Earthquake felt in New York, Novem. 18, 1755, in a Letter from Cadwallader Colden, Esq; to Mr. Peter Collinson, F. R. S.

Decem. 9, 1755.

Read Mar. 18, 1756. **O**N the 18th of last November, a few minutes past four in the morning, I was awaked with the shock of an earthquake, I felt the bed under me, and the house, shaking, in such a manner as to alarm me greatly. I plainly heard the noise like that of carts on pavements, going to the eastward, with now and then a noise like the explosion of a great gun at a distance. It was felt about four a clock at Philadelphia, and half after four at Boston, and was more violent to the eastward than the westward; and there was an eruption at a place called Scituate, about twenty or thirty miles to the southward of Boston.

We have had the driest summer and autumn that ever was known: for some days before the earthquake, though the sky was perfectly calm and serene, the air was so light, that the smoke of the town by falling down was offensive to our eyes, as we walked the streets; and my watch, for some time before it, went unusually slow.

In the last remarkable earthquake, which happened about seventeen years ago, and nearly at the same time of year, the weather preceding it was much the same as now, attended with the falling of the smoke in the town,

L E T T E R XXII

An Account of the Earthquake felt in Pennsylvania, Novem. 18, 1755, in a Letter to Mr. Peter Collinson, F. R. S. dated at Philadelphia, Decem. 1. 1755.

Read Mar. 18.
1756. **A**BOUT four of the clock the 18th of November last, this province was pretty generally alarmed with the shock of an earthquake, which occasioned great consternation, but I do not hear of any damage that ensued, unless the breaking some China-ware and glasses. I heard no noise like that of a rushing wind, which was heard in many places; but felt a gentle shaking of my bed, in such a manner as convinced me what it was, which continued to increase, and the windows by the increasing trepidation of the earth began to rattle; some China on a chest of drawers were moved pretty much. As I conjectured, it gradually increased for one minute, to such a degree as to open my chamber door, by drawing the bolt of the lock out of the staple.

Some people think they felt its continuance five or six minutes, but I think it did not exceed two, nor was it less. I felt the shock of the two earthquakes in England; but they were little in comparison to this.

E N D of P A R T I.