XXXII. *An Account of the Effects of Lightning on a Houſe, which was furniſhed with a pointed Conductor, at* Tenterden, *in* Kent. *In Two Letters from* Richard Haffenden, *Eſquire, the Proprietor of the Houſe, to Mr.* Henley. *To which are added ſome Remarks by Mr.* Henley.

Redde, May 4, 1775. HAVING been informed by my friend Mr. CURTEIS, that the houſe of RICHARD HAFFENDEN, eſquire, at Tenterden, in Kent, had been damaged by a ſtroke of lightning, notwithſtanding it had been furniſhed with a metallic conductor to prevent thoſe accidents: I wrote to Mr. HAFFENDEN, requeſting the favour of the particulars, and eſpecially an anſwer to the following queſtions.

1. The length and breadth of the houſe? 2. The height of the chimney, to which the conductor was affixed from the ground, and how far it might riſe above the ridge or roof of the houſe? 3. To what height the conductor was carried up above the top of the chimney? 4. Whether it was terminated by a ſharp point, a blunt end, or a ball? 5. Whether it was in regular contact from the top to the bottom? 6. What was its diameter or breadth? 7. Was it carried down into the moiſt earth, or water? 8. What is the nature of the ſoil it enered? 9. Did any other chimney, or ſtack of chimnies,

chimnies, ſuſtain a ſtroke, beſides that which carried the conductor; and what was the diſtance of each of the ſtricken chimnies from the conductor? and was there any communication of lead on the ridge or roof of the houſe, that might connect ſuch chimney, or part of the houſe in which a ſtroke was received, with the conductor? 10. What was the damage the houſe ſuſtained; and how was the electricity conveyed to the earth? 11. Doth your houſe ſtand ſingle? 12. Is it ſituated on a plain, or on an eminence? 13. Had it rained before the ſtroke; and was that part of the houſe on which the lightning fell, conſiderably wetted at the time? 14. Did the wind blow toward that part of the houſe? 15. When did the accident happen?

LETTER I.

SIR,

I RECEIVED yours of the 31ſt *ult.*; in anſwer to which, pleaſe to obſerve the following ſketch of the top of the houſe (*vide* TAB. VII. fig. B.). *a*, *b*, *c*, *d*, are four chimnies, about thirty-eight feet high, and two feet above the ridge of the houſe. *f* is the conductor, elevated about five feet above the top of the chimney: it is made of iron, about half an inch diameter, tapering to a point, gilt. After being fixed to the chimney, eight or ten feet, it turns under the roof to the leaden pipe (*g*), which carries the water from the gutters E, E, E, and goes down on the outſide of the houſe, till it reaches within four feet of the

earth. In the lower end of this pipe is put one end of a ſquare rod of iron, about three quarters of an inch in breadth; the other end of the iron-rod reſts on the ground, at the diſtance of ſix feet from the foundation. The ſoil is light mould. The houſe ſtands ſingle, on the Weſt ſide of a hill; the front toward the hill. On the top of the hill, at about forty rods diſtance, is a wind-mill, whoſe bottom is nearly as high as the top of the houſe. About two of the clock in the morning of June 17, 1774, after thundering for ſix or ſeven hours at a diſtance, and coming ſlowly on, there being little or no wind, there came three amazing ſtrokes. It rained extremely at the time; but ceaſed immediately at the laſt ſtroke, which ſtruck the top of the chimney (*b*) the furtheſt from the conductor, and broke it down to the lead (*b*), where it divided; ſome up and down the rafters (*i*, *i*,) breaking and ſplitting both tiles and rafters into thouſands of pieces, and throwing ſome of them to a great diſtance, till it reached the gutter (E), which was full of water. Another part, or diviſion of the explo-ſion, broke the mortar down to the lead on the cornice (*k*, *k*, *k*,); which lead goes round the front of the houſe. Through this lead the lightning paſſed quietly, till it reached the chimney (*c*), and broke the mortar on that chimney, till it reached the lead adjoining to it; through which lead it paſſed quietly, and then broke the tiles to the lead on the chimney (*d*); and from thence it paſſed to the gutter or leaden pipe; and there, uniting with the other diviſion of the exploſion, it paſſed down the leaden

pipe

pipe to the iron bar at the bottom; where, by an explosion, it burſt a hole in the pipe, in paſſing from one metal to the other; and then went down the iron rod to the ground, flowing with water. It ſeems to me, according to the ſituation and direction of the cloud, being nearer to the gutters than the conductor, that *they acted as conductors*; and that the conductor itſelf was not in the leaſt affected by the ſtroke; and that had there been conductors on the chimnies (*a* and *b*) they would have conveyed the electric fluid to the ground, without any damage to the houſe: or had there not been a continuation of metal from the gutters, &c. to the earth, it would have damaged the houſe all the way down. There was another diviſion of the exploſion, which, I imagine, came down the chimney, and ſtruck to a bell-wire in the paſſage, and deſtroyed the wire to its end, which happened to be juſt within-ſide the wall, where the water-pipe was without; and there it made a ſmall hole, in the joint of the bricks of an eighteen-inch wall, to the pipe; and then paſſed to the earth with the reſt. I think this accident is no proof whatever of the preference of balls or points as terminations of conductors. Thus, SIR, I have endeavoured to anſwer every one of your queries; which, if ſatisfactory, will give pleaſure to, &c.

N. B. The pricked line in the figure ſhews where the lightning paſſed quietly, having a ſufficient ſubſtance of metal to paſs through. The *curved line* ſhews where it broke every thing. The diagonal lines are all lead.

LETTER

LETTER II.

SIR,

I HAVE received your two laſt; and can aſſure you, it is with great pleaſure I anſwer any queſtion you ſhall be pleaſed to aſk. In anſwer to your firſt and ſecond queries; *videlicet*, What is the breadth of the houſe? and what is the diſtance between the extreme part of the chimney (*b*) and the conductor? The drawing I ſent you is a ſcale of one-tenth of an inch to a foot, or nearly ſo(*a*). 3d. The iron rod in the pipe is only a large *ruſty ſpit* put in, a few inches, *pro tempore*. The place where the leaden pipe is burſten, is even with the point of the ſpit; very little melted, but broke open with the exploſion. The pipe is bent outward, about a foot at the lower end, to carry the water from the houſe; the hole in which, and the point of the ſpit, are near the middle of that projecting part of the pipe. No viſible alteration appeared on the ruſty ſpit by the lightning having paſſed through it. The lower end of it lays *on*, not *in* the earth. I am, &c.

(*a*) Then, the breadth of the houſe is about twenty-nine feet, and the diſtance between the fartheſt corner of the chimney (*b*) and the conductor, about forty-nine or fifty feet. W. HENLEY.

THESE

THESE letters containing a ſatisfactory anſwer to the queſtions which precede them, the following remarks naturally preſent themſelves. 1ſt, A ſharp pointed conductor did not, in this inſtance, invite or draw down upon itſelf a ſtroke of lightning. 2dly, Such a conductor, elevated five feet above the top of one of the chimnies, to an houſe of this dimenſion, may not perhaps be ſufficient, by its ſilent attractive force, to protect the whole of ſuch a building from a ſtroke; eſpecially when a chimney, *a blunt body*, wetted with the rain, ſtanding at fifty feet diſtance from the conductor, and being within five feet of its height, is in actual contact with ſo large, though irregular, a communication of metal, leading from the chimney directly to the conductor; though, in this inſtance, it ſhould be remarked, that the conductor itſelf *was not in contact* throughout; and it is, for that reaſon, a very exceptionable caſe. 3dly, Two ſuch conductors; one, for inſtance, on the chimney (*d*), where this was placed; and the other, on the chimney (*b*), which was ſtricken, with a communication of lead between them, would probably have protected the houſe: but a conductor on each chimney would certainly have ſecured the whole building effectually (*b*). 4thly, As the three branches or diviſions of the lightning all concentrated upon an iron bar, *three quarters of an inch ſquare*, and produced no ſign of heat in it, an iron bar of that ſize ſeems to be fully ſuffiicient for the purpoſe. There ap-

(*b*) This method, I am informed, Mr. HAFFENDEN hath lately adopted.

pears, however, to have been two defects in Mr. HAFFENDEN's conductor: 1. The leaden pipe and the iron bar at the bottom were not in contact. 2. The iron bar, or a thick plate of lead, ſhould have been continued down into the moiſt earth or water; and had not the earth, as Mr. HAFFENDEN obſerves, flowed with water, at the time of the accident, the want of this precaution might, perhaps, have been attended with ſome damage to the foundation. I have been thus particular in my inquiries into, and remarks upon, this fact, as I think it of great importance to thoſe who erect conductors, to be informed of every defect in the conſtruction, and of the dangerous conſequences thence ariſing.

P. S. In Mr. HAFFENDEN's ſecond letter, he obſerves, that the bell-wire, mentioned in his firſt letter, was braſs; and that ſo much of it as went through the paſſage was painted: and the painted part, he ſays, was not deſtroyed; but the paint was looſened on the wire, without being broken off, like the looſe rind of a tree; which reſembles the effect of the artificial electricity, in an experiment of Mr. KINNERSLEY's, where a wire was, by a great exploſion, both leſſened in diameter, and extended in length. The other part of the wire, which was not painted, except a ſhort piece at the end, ſomewhat larger and of iron, was entirely melted. Query, If the wire before ſpoken of had paſſed through a ſtone, particularly a wet one, incloſing it firmly, would not that ſtone have been ſhivered to pieces?

XXXIII. *Of*