Sir, are the particulars of that day's misfortunes; but there were ſome more trifling damages, too much for this preſent time to admit me to recount: and this account you may depend on as authentic, as more than an hundred people can teſtify, that flocked in on that, and for ſeveral days after, to view. If this is any-wiſe ſatisfactory to you, it will give great pleaſure to,

SIR,

Your humble ſervant,

Anne Whitfeld.

XXX. *An Account of ſome extraordinary Effects of Lightning, in a Letter to Dr.* Gowin Knight: *By Mr.* William Mountaine, *F. R. S.*

Dear Sir,

Read Nov. 22, 1759. THE following account of the effects of lightning, in my neighbourhood, I have drawn up for your peruſal; and, if it meets with your approbation, be pleaſed to communicate the ſame to the *Royal Society*, or diſpoſe of it in any other manner, as you ſhall think proper.

During the morning of July the 16th laſt, was much thunder and lightning: about eight o'clock was heard an extraordinary loud crack, which ſeemed to me very near, as the large flaſh and ſound were almoſt coincident. In a few minutes, there was an alarm,

alarm, that an houſe was on fire in *Goat-ſtreet*. I readily ſuſpected the cauſe, and ſoon after went to the place, in order to inquire into particulars, and was informed, that three houſes were damaged in that place.

The firſt houſe I entered into was inhabited by Mr. William Loft, a cuſtom-houſe waterman, which was almoſt untiled on the weſt ſide, and being of timber, was very much ſplit and ſhattered: ſome of the weather-boards were thrown outwards to the bottom of the garden, to the diſtance of about thirty feet from the houſe, and the windows were forced inwards; but no damage was done to this houſe by fire.

It may not be amiſs to mention, that ſeveral ſmall pieces of glaſs, in the leaded windows, were impelled with ſuch force, as to ſtick very faſt in a door which was oppoſite, and in the hard plaiſtered partition; ſome of which I drew out of both, which, together with ſome bits of melted window-lead, you will find in the box N° 1.

The ſecond houſe, that I examined, was that of Mr. Arthur Tawke, a ſail-maker, on the oppoſite ſide of the ſtreet, to the eaſtward. This was the houſe ſaid to have been on fire; and here I found the following accidents and effects; viz. the window-ſhutters of the back parlour, on the eaſt ſide, were ſhattered, and moſt of the bell-wire in this room melted; its track on the wainſcot much ſcorched, but more ſo at the cranks: a hole was burnt in a copper-plate print, which hung under the wire; and, along the ſame ſide of the room, ſeveral ruſh-bottomed chairs were burnt in ſpecks and holes of different

ferent forms and ſizes: the floor had the like marks of burning, more eſpecially under the courſe of the wire: on the projections of the wainſcot, I found ſeveral granulations, and longer pieces of the wire, ſome of which were bedded in burnt cavities. A few of theſe, taken out by hand, I examined; but could not find, that they were impregnated with any magnetic quality.

I afterwards employed magnets in ſearch of the iron particles, which were found in the crevices of the wainſcot, ſeams of the floor, and in the bottoms of the chairs, &c. which you will meet with in the box N° 2.

The ſervant maid was ſtanding in the door-way, between this room and the fore-parlour, when the ſtroke happened, and gives this very ſimple deſcription of what ſhe ſaw; viz. "that the appearance "in the room was like a ſhower of fire."—The diſperſion and fall of the red-hot particles of the melted wire would make ſuch a repreſentation very natural.

In the fore-chamber, up one pair of ſtairs, which lies to the weſt, Mrs. Tawke was in bed, having lately laid-in: the flaſh alarmed her much; but, having recovered from the fright, ſhe perceived a ſulphureous ſuffocating ſmell.—By her direction, a dark cloſet near the bed-ſide was examined, and found full of ſmoke and flames, which were ſoon extinguiſhed. Hence aroſe the before-mentioned report of an houſe being on fire.

In this cloſet, I found the bell-wire, coming from the parlour below, to be intirely melted, or diſperſed, but the effect ceaſed at the crank, which tranſmitted it to the chamber adjoining, where it remained intire.

A pair of ſtriped cotton trowſers, at the diſtance of 4 or 5 feet from any part of the wire, were burnt almoſt to tinder, a piece of which is here preſerved in the box N° 5.

An old wig-box was burnt in part: a ſheet was burnt through ſeveral folds, in large holes, and alſo a blanket; but the holes were ſmaller, tho' of different ſizes: the velvet cape of a ſurtout coat, at a greater diſtance from the wire, was treated in like manner; tho' the burnt ſpots were in general ſmaller. Hence it ſeems, as if the particles of the fuſed wire did not *all* drop perpendicular; but that they were actuated by ſome impellent force, and that the ſmaller granulations were diffuſed to a greater diſtance; and hence aroſe that appearance of the ſhower of fire before-mentioned: and in this I am ſomewhat the more confirmed by ſome of the facts hereafter deſcribed. Even ſome of the larger pieces were thrown to a great diſtance; for here I found a wire mark burnt in the floor not leſs than ſix feet from any part of the ſuſpended wire, and, on comparing a piece, which the maid picked up in the ſaid place, with the ſaid mark, it appeared to be the ſame, which produced that effect.—You will find it, being the largeſt in the box N° 3.

A deal box, ſtanding on a cloaths-cheſt under the the wire, was burnt in ſpots even more remarkably than the floor, according to the figures and forms of the ſeveral pieces, particles, or granulations. In this cloſet I alſo employed the magnets, and collected from the crevices, corners, &c. a quantity of iron particles, which are contained in the box N° 3.

The third houſe, inhabited by Mr. Robert Harris ſenior, corn-factor, lies at the north-eaſt corner of the ſame ſtreet, at the diſtance of about 40 yards. Here I found ſome damage done to the glaſſes and China ware in a cloſet contiguous to one of the bell-wires in a ground room: moſt of the wire in this room was melted; and a piece of the deal moulding, nine inches long, covering the wire, and adjoining to the braſs thumb-piece, very near the ſaid cloſet, was ſplintered off, and ſtruck the ſervant maid in the face, as ſhe was entering the room, at about 14 feet diſtance.

In ſome of the rooms in the ſecond ſtory, the wires were in part melted. In one room of the third ſtory the wire was intirely diſſipated; the wall ſcorched; the whole plaiſtering over the door, adjoining to the bell, driven out in a body; the floor burnt; and the ſheets and quilt of a bed, near the bell-wire, ſcorched and fire-pitted in like manner as at Mr. Tawke's; only the effects of the ignited particles were not ſo general through this houſe, nor was any thing here abſolutely ſet on fire.

I was afterwards informed, that tho' all the wires were not deſtroyed, yet they had been obliged to renew the whole; for, when they came to be examined, they were found ſo unpliable and brittle, as to be rendered quite uſeleſs.

On the 28th of July I went again to Mr. Tawke's, who, being then at home, conducted me to a garret, which lies partly over the before-mentioned dark cloſet, from whence a bell-wire was directed to this room, by me unobſerved before; nor did the family very ſoon diſcover, that this wire was intirely melted, and the partition greatly ſcorched.

This

This room contained a large heap of oats, and another of beans, a foot-path, as it were, being reſerved next the partition, where the aſcending wire ran, which was covered with much duſt and ſtraggling grains of the corn.—Here again I employed the magnets, Mr. Tawke aſſiſting, and collected a conſiderable quantity of melted particles, not only from the floor, joints and projections of the ſkirting-board, but from the holes and chaſms in the broken plaiſtering, where-ever we could introduce the magnets, and that at the diſtance of 4 or 5 feet from the wire-place. Theſe you have in the box N° 4.

Hence I ſuſpected, that *granulæ* might be found among the oats: we probed, but to no no purpoſe; the heap was too large, and had been moved, by fetching away what was wanted from time to time. However, we carried our inquiry to the bare floor, quite acroſs the heap, at 10 feet diſtance, and, in the joints or ſeams, found of very fine particles a ſufficient quantity to prove, that they were violently diffuſed to a great diſtance.

From theſe houſes the lightning ſeems to have tended towards the N. E. for in that direction, at the diſtance of about 200 yards, and not ſo far from my own houſe, Captain William Provoſt was ſtruck thereby, ſtanding in his own entry, and rendered almoſt ſenſeleſs and ſpeechleſs for ſome hours, and, for ſeveral days, was much afflicted with a ſtupor, giddineſs, and vomiting, and retained a conſtant and ſtrong taſte of ſulphur in his mouth and throat. His child had hold of his cloaths, and his wife was near him; but the ſtroke appears to have been above the child, as it ſeems to have ſtruck him about the head. No other damage was done here.

Mrs. Provoſt ſays, that the flaſh or fire ſeemed to be as large as a ſmall pewter plate, and paſſed clear through the entry (the doors being open) directed to the northward.

On the oppoſite ſide of the ſtreet, and ſomewhat oblique towards the north-eaſt, at the diſtance of about 20 yards, Mr. Ambroſe Lyon, ſail-maker, had, at the ſame time, about ſix dozen of bottles of Port wine broken to pieces.

The front of Mr. Lyon's houſe has nearly a ſouth-weſt aſpect: among other conveniences under-ground is a ſubſtantial arched brick vault, and capacious for a private houſe; it is quite cloſe, having no light or opening into it, but at the door, which faces the ſouth, and is always kept locked.—On the weſtern ſide of this vault were repoſited ſeveral caſks of wine, moſt of them iron-bound; alſo ſeveral dozens of rum behind them upon the floor. On the northern end was a circular tub or cooler, iron-bound with three hoops, containing Port wine in bottles. About ten feet from hence, on the eaſtern ſide, nearer the door, and directly oppoſite thereto, ſtood by itſelf another large circular cooler, 32 inches diameter, and 12 inches deep, bound alſo with three iron hoops, containing about ſix dozen of Portugal wine, called *Barabarha*, the remainder of a larger quantity, which he had kept in caſk for more than two years before it was bottled, in which laſt ſtate it had been for more than three months, and all proper care taken of it; for he is very curious in theſe things. Theſe bottles were inclined upon their ſides, for their better preſervation, as were all the others containing wine; and this tub was fixed upon ſkids (pieces of timber) about ſix inches thick.

In

In half an hour, or leſs, after the great thunder-clap, having occaſion to go into the vault, upon his entrance, he immediately diſcovered the noiſe of a running drip, and liquor flowing about the floor, which, upon further inſpection, he found proceeded from the laſt-mentioned cooler, the bottles therein contained being broken to pieces, as if done by a mallet, not ſo much as one remaining intire of the whole quantity; and the cooler being not very tight, the wine was running out from thence; but, by a quick application of ſuch veſſels as were at hand, the remainder was preſerved, and, after clearing it from the glaſs, was put into a ſmall caſk to recover, adding thereto about a one-third part of Port wine to fill up the veſſel, ſome of which I have taſted; and a bottle, drawn from the ſaid caſk, I herewith ſend you.

Mr. Lyon did not obſerve, at the ſame time, any kind of alteration in the ſaid wine made by fermentation, or otherwiſe; only that it was vapid or flat: one bottle of the ſaid wine was afterwards found among the bottles of Port in the firſt-mentioned cooler, which was not affected, but was fine, and in perfection; nor was any other damage done in the vault, that he could diſcover upon the ſtricteſt inquiry.

Captain John Dickinſon, a gentleman in the neighbourhood, ſhared half the caſk of the ſaid wine, which had a ſimilar management, was bottled off at the ſame time, and had a leſs cool and friendly vault; yet not one bottle of this has hitherto been in anywiſe damaged.

I have

I have been more particular in the examination of ſome of the foregoing facts, as they ſeem to contradict an opinion generally received, that the ſolution of metals by lightning is effected by a kind of cold fuſion; for it appears very evident, that the melted iron-wire, in the ſeveral preceding caſes, had all the marks of heat and ignition, that uſually attend the fuſion of that metal, when brought about by common fire. I am,

Dear Sir,

Your moſt obedient ſervant,

Gainsford-ſtreet, Southwark,
Septem. 28th, 1759.

Wm. Mountaine.

Some Remarks on the preceding Letter, by Gowin Knight, *M. B. F. R. S. and Principal Librarian of the* Britiſh Muſeum.

Read Nov. 22, 1759.

THE facts, contained in Mr. Mountaine's letter, are an evident proof, that the fuſion of metals by lightning is, ſometimes at leaſt, attended with heat and ignition, as in the caſe of common fuſion. And, ſince the reading of thoſe facts, I have been more and more induced to ſuſpect, that the received opinion of a cold fuſion is a vulgar error, tho' too generally adopted, and of very long ſtanding. From ſome of the circumſtances attending theſe facts, compared with what is to be found in authors relating to the ſame ſubject, I think it poſſible both to ſhew, whence this opinion firſt took its riſe, and how it became ſo general; and at the

the ſame time to prove, that there is no clear evidence for the truth of it from any relations hitherto publiſhed.

The inſtances, that are moſt generally given of cold fuſion, are two; that of a ſword being melted in its ſcabbard, and that of money being melted in a bag, both the ſcabbard and bag remaining unhurt. A great number of authors have mentioned both the facts, without giving their own teſtimony, or that of any one elſe, for the truth of them, or deſcribing any of the other concomitant circumſtances. However, it ſeems poſſible, that lightning might produce effects ſufficiently ſimilar to theſe, to give riſe to ſuch reports, without our being obliged to have recourſe to a cold fuſion to account for them.

If at any time the edge or external ſurface of a ſword had been melted, whilſt the main part of the blade remained intire, it would have afforded ſufficient grounds to aſſert, in general terms, that the ſword was melted, and yet the ſcabbard might have remained unhurt; becauſe either the edge or ſurface of a ſword might be inſtantly melted by lightning, and cooled ſo ſuddenly, as to make no impreſſion of burning on the ſcabbard. Metals, as well as other bodies, will both heat and cool ſooner, in proportion as they are thin and ſlender. Very ſmall wire will inſtantly become red-hot, and even melt, and run into a round globule, in the flame of a common candle; and it is no ſooner removed out of the flame, but it is as inſtantly cool. The edge of a ſword therefore, or even its ſurface, might be inſtantly melted by lightning, and being in contact, or rather ſtill united to the reſt of the blade, which might be ſtill cool,

cool, it would part with its heat too ſuddenly to produce any appearance of burning.

I was confirmed in this reaſoning, by examining the fragments and melted particles of wire ſent me by Mr. Mountaine. Amongſt them there appeared to be globules of various ſizes, which had undergone very different degrees of fuſion: the largeſt of theſe had not been fluid enough to put on a ſpherical figure; but they approached nearer thereto, in proportion as they were ſmaller: ſo that in the ſmalleſt *granulæ* the fuſion was moſt perfect, the globules being very round and ſmooth. Their ſizes continued diminiſhing, till they became inviſible to the naked eye; and ſome of them, when viewed with a microſcope, required a third or fourth magnifier to ſee them diſtinctly.

Some of the bits of wire were rough and ſcaly, like burnt iron, and were ſwelled in thoſe places where they were beginning to melt: others continued ſtrait, and of an equable thickneſs; but their outward ſurface ſeemed to have undergone a perfect fuſion, ſo that there were two or more pieces adhering together, as if joined by a thin ſolder.

In Mr. Pitfold's account of the effects of lightning at Darking in Surry, publiſhed in the Philoſophical Tranſactions *, mention is made of a ſimilar fact. He ſays, "ſome ſmall tacks were ſoldered together, ſix, "ſeven, eight, or ten in a clump, as if they had "had ſcalding metal run over them."

It is eaſy to conceive, how the heat of this ſuperficial fuſion might be ſo ſuddenly diffuſed throughout

* Philoſ. Tranſ. Vol. XLIX. p. 311.

the

the metal it ſurrounded, which the lightning might not have heated, as inſtantly to have reduced the whole to too cool a ſtate, for any other contiguous body to be burnt thereby.

In like manner, a ſtream of lightning paſſing thro' a bag of money, might fuſe the ſurfaces of ſuch pieces as lay in its way, and ſolder a number of them together; and yet the bag remain unhurt.

An accident or two of this kind may have come, by tradition, to the knowlege of ſome of the firſt collectors of marvellous facts, and from them be tranſcribed by others, perhaps with additions and improvements. Thus, according to Pliny *, both gold, ſilver, and braſs, have been melted in bags ſealed up, which were not in the leaſt burnt, nor was the wax of the ſeals melted: whereas Seneca † ſpeaks only of ſilver being melted in the pocket or purſe, which remained whole and unhurt. Later writers ſeem to have copied from one of theſe for the moſt part, without mentioning their authority.

In the Philoſophical Tranſactions are two or three relations, which ſeem, at firſt, to favour a cold fuſion; but, when duly conſidered, prove nothing concluſively. The firſt is in a paper concerning the effects of lightning at Colcheſter, on July 16, 1708; which concludes with obſerving, that, "during the ſame "ſtorm, four perſons were killed in a boat, that was "going from Harwich to Ipſwich; and that, in one "of their pockets, a watch and chain was melted all "on a lump." In another account, given by Or-

* Plin. Nat. Hiſt, lib. ii. c. 51.

† Seneca, Nat. Quæſt. l. ii. c. 32.

lando Bridgman, Eſq; deſcribing the ſame ſtorm, it is ſaid, that "the chain of the watch was melted, "and that no harm or burn could be perceived on "his breeches or cloaths." Now, if both the watch and chain were melted all on a lump, and the pocket unburnt, as might be concluded from both theſe accounts laid together, it would be a ſtrong argument in favour of cold fuſion: but there is great reaſon to ſuſpect the truth of the firſt-mentioned relation; becauſe the author of it writes only from hearſay, being himſelf at Colcheſter, at ſeveral miles diſtance from where the thing happened. Whereas Mr. Bridgman was upon the ſpot, and examined one of the dead bodies himſelf very minutely; and tho' he does not ſay, that he ſaw the body of him, whoſe watch-chain was melted, yet he gives a very circumſtantial account of it; and, if the watch had been melted, as well as the chain, he could not have omitted that particular. It is therefore probable, that the chain only was melted, and that, hanging out of the pocket, it had left no marks of burning on the breeches.

We have, in our Tranſactions, another account of the effects of lightning by Dr. Cookſon, of Wakefield †, who relates, "That the lightning fell on a "box of knives and forks, and melted a great many "of them, the ſheaths being untouched." But the doctor, in another account, which is fuller and more exact, ſays, "the lightning diſperſed a great "many dozen of knives and forks, which were put up "in a box, all over the room. Upon gathering them

* Philoſ. Tranſ. Abr. Vol. V. p. 154.
† Ibid. Vol. VIII. p. 504.

"up,

" up, ſome of them were melted; others ſnapped in " ſunder; others had their hafts burnt; others their " ſheaths either ſinged or burnt; others not." From all which circumſtances, duly conſidered, I think nothing certain in favour of cold fuſion can be fairly drawn.

XXXI. *An Account of a Meteor ſeen at* Shefford, *in* Berkſhire, *on* Saturday, October 20*th*, 1759; *with ſome Obſervations on the Weather of the preceding Winter: In a Letter to* Thomas Birch, *D. D. Sec. R. S. from* Richard Forſter, *M. A. Rector of* Shefford.

Reverend Sir, Shefford, Octob. 31, 1759.

Read Nov. 8, 1759. ON Saturday the 20th inſtant, about Six in the evening, a ball of fire fell nearly eaſt from this place. I did not ſee it myſelf. My ſervant (who is a very ſober, honeſt fellow) ſays it was nearly of the ſame ſize with the moon, and full as bright as ſhe ever ſhines: its motion was very ſwift, and, as far as he could judge (for it was out in a moment) quite downright, i. e. perpendicular to the horizon.

And now my hand is in, I cannot forbear acquainting you with an obſervation I have made, which bids fair to overſet a maxim pretty ſtrongly eſtabliſhed in the world, as not being only believed and depended on by the vulgar and middling people, but mentioned