

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,

S I R,

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. **T**HE 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^o 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^o 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^o 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 furtout 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^o 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^o 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 unpliant and brittle, as to be rendered quite useles.

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 chafms 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^o 4.

Hence I suspected, that *granulæ* might be found among the oats: we probed, but to 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 repositied 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 *Barabarba*, 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 glafs, 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 Princi-
pal Librarian of the British Museum.*

Read Nov. 22, 1759. **T**HE 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 metal it furrounded, 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. Transf. Abr. Vol. V. p. 154.

† Ibid. Vol. VIII. p. 504.

“ up, some of them were melted ; others snapped in
 “ funder ; others had their hafts burnt ; others their
 “ sheaths either finged or burnt ; others not.” From
 all which circumstances, duly considered, I think no-
 thing certain in favour of cold fusion can be fairly
 drawn.

XXXI. *An Account of a Meteor seen at
 Shefford, in Berkshire, on Saturday, Octo-
 ber 20th, 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. Rec-
 tor of Shefford.*

Reverend. Sir, Shefford, Octob. 31, 1759.

Read Nov. 8, 1759. **O**N Saturday the 20th instant, about
 Six in the evening, a ball of fire
 fell nearly east from this place. I did not see it my-
 self. My servant (who is a very sober, honest fel-
 low) says it was nearly of the same size with the
 moon, and full as bright as she ever shines : its mo-
 tion 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 acquaint-
 ing 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