

Franklin and Electrostatics- Ben Franklin as my Lab Partner

A Workshop on Franklin's Experiments in Electrostatics

Developed at the Wright Center for Innovative Science Teaching
Tufts University
Medford MA 02155

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VII. Franklin on lightning and lightning rods.

A collection of several pieces of Franklin's writing on lightning and lightning rods, including a translation of the experiment carried out in 1752 in Marly-la-Ville in France.

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**Some of Franklin's Comments on Lightning.
His proposal of the "sentry box" experiment.
M. Dalibard's description of that experiment.
Methods of protection against lightning.**

To John Lining at Charleston, South Carolina
March 18, 1755 *Bigelow vol III, pp. 67-71*
extract pp 70-71

PHILADELPHIA, 18 March, 1755

Bigelow II: pp. 70-71

Your question, how I came first to think of proposing the experiment of drawing down the lightning in order to ascertain its sameness with the electric fluid, I cannot answer better than by giving you an extract from the minutes I used to keep of the experiments I made, with memorandums of such as I purposed to make, the reasons for making them, and the observations that arose upon them, from which minutes my letters were afterwards drawn. By this extract you will see that the thought was not so much "an out-of-the-way one," but that it might have occurred to any electrician.

"November 7th, 1749. Electrical fluid agrees with lightning in these particulars: 1. Giving light. 2. Color of the light. 3. Crooked direction. 4. Swift motion. 5. Being conducted by metals. 6. Crack or noise in exploding. 7. Subsisting in water or ice. 8. Rending bodies it passes through. 9. Destroying animals. 10. Melting metals. 11. Firing inflammable substances. 12. Sulphureous smell. The electric fluid is attracted by points. We do not know whether this property is in lightning. But since they agree in all the particulars wherein we can already compare them, is it not probable they agree likewise in this? Let the experiment be made."

In this section, I have collected several excerpts dealing with Franklin's proposal of an experiment to test whether lightning has electrical properties.

Franklin was not the first to propose this, but no one else proposed an experimental test of the idea. Franklin's design of the "sentry box" experiment, which was carried out in 1752 by M. Dalibard in France, made him immediately famous.



Benjamin Franklin
engraving by H. A. Ritchie after
painting by Charles N. Cochin,
the younger, 1777
Bigelow 1904 Vol. IV
(public domain)

The paragraphs at the left are an excerpt from a longer letter to John Lining, a physician and experimenter in Charleston, who tried Franklin's kite experiment for himself after Franklin had described it. The letter is important because Franklin quotes from the journal of his experimental work, which does not seem to have survived in Franklin's papers.

The following paragraph is excerpted from
**Additional Papers to Peter Collinson
enclosing Opinions & Conjectures**
(July 29, 1750) *Bigelow vol II. p 286-31*

(The complete letter is in section VI of this workshop)

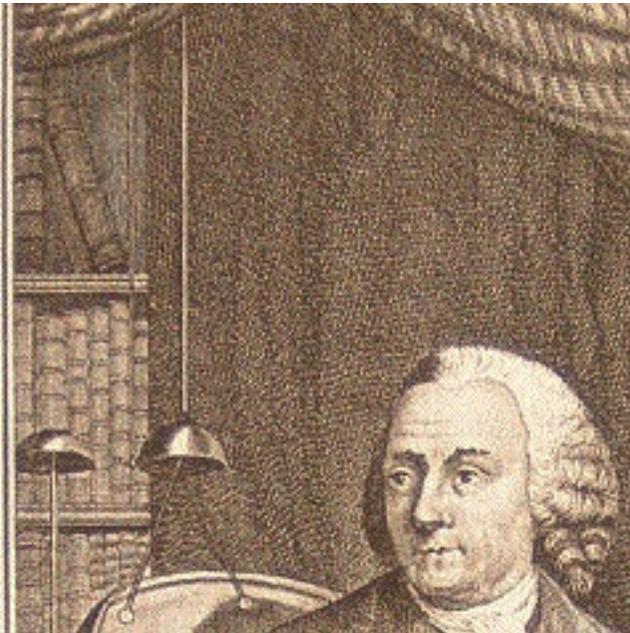
21. To determine the question whether the clouds that contain lightning are electrified or not, I would propose an experiment to be tried where it may be done conveniently. On the top of some high tower or steeple, place a kind of sentry-box (as in Plate I., Fig. 9), big enough to contain a man and an electrical stand. From the middle of the stand let an iron rod rise and pass bending out of the door, and then upright twenty or thirty feet, pointed very sharp at the end. If the electrical stand be kept clean and dry, a man standing on it when such clouds are passing low might be electrified and afford sparks, the rod drawing fire to him from a cloud. If any danger to the man should be apprehended (though I think there would be none), let him stand on the floor of his box, and now and then bring near to the rod the loop of a wire that has one end fastened to the leads, he holding it by a wax handle; so the sparks, if the rod is electrified, will strike from the rod to the wire and not affect him.

The figure at the right is Franklin's illustration of his proposed experiment. The lightning rod is attached to an insulated stand, and the man doing the experiment stands on the insulator. He could then give sparks to someone else. Franklin then suggests that a safer version would be to have the person stand on the floor, and holding a grounded wire with an insulating handle, bring it near the rod to draws sparks.

This later version of a rod with a spark gap to a grounded rod is the design he used in his "lightning bells" depicted in the painting by Mason Chamberlin. (See figure on next page)

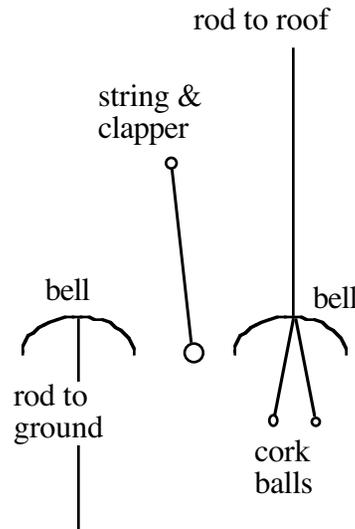


Figure 9 from J. Bigelow 1904
Works of Benjamin Franklin
Vol. II p. 200 (public domain)



Detail-engraving by Fisher after Mason Chamberlin Park Benjamin, *A History of Electricity*, NY 1898 p 537 (public domain)

Excerpt from Franklin's letter describing his lightning bells.



Extract from Bigelow Vol II: page 416

To Peter Collinson

Philadelphia, — September, 1753.

...

In September, 1752, I erected an iron rod to draw the lightning down into my house, in order to make some experiments on it, with two bells to give notice when the rod should be electrified; a contrivance obvious to every electrician.

I found the bells rang sometimes when there was no lightning or thunder, but only a dark cloud over the rod; that sometimes, after a flash of lightning they would suddenly stop; and, at other times, when they had not rung before, they would, after a flash, suddenly begin to ring; that the electricity was sometimes very faint, so that, when a small spark was obtained, another could not be got for some time after; at other times the sparks would follow extremely quick, and once I had a continual stream from bell to bell, the size of a crow-quill; even during the same gust there were considerable variations.

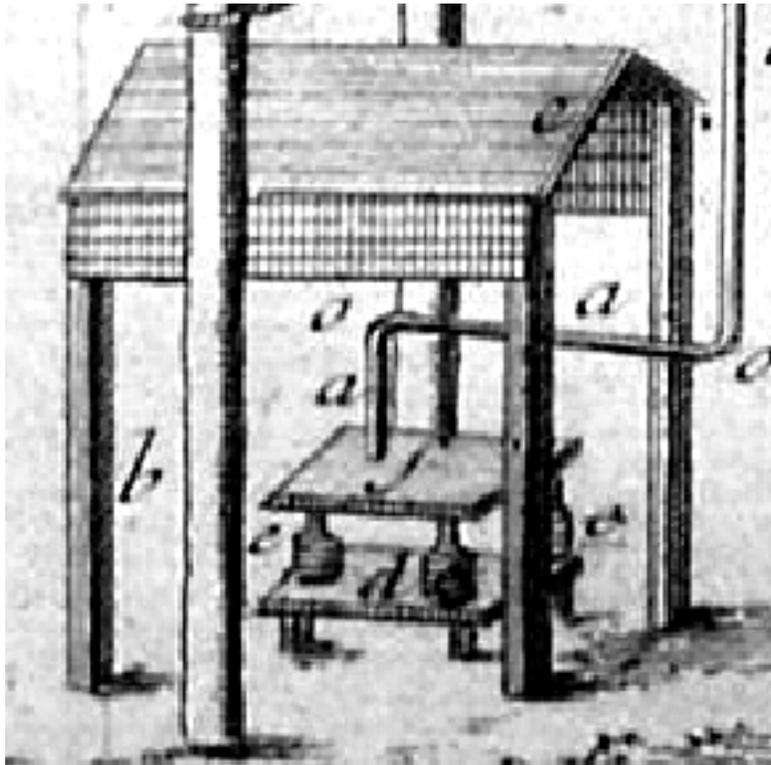
Franklin describes an experiment with the lightning bells to find the sign of the charge of the clouds.

In the winter following I conceived an experiment, to try whether the clouds were electrified *positively* or *negatively*; but my pointed rod, with its apparatus, becoming out of order, I did not refit it till towards spring, when I expected the warm weather would bring on more frequent thunder-clouds.

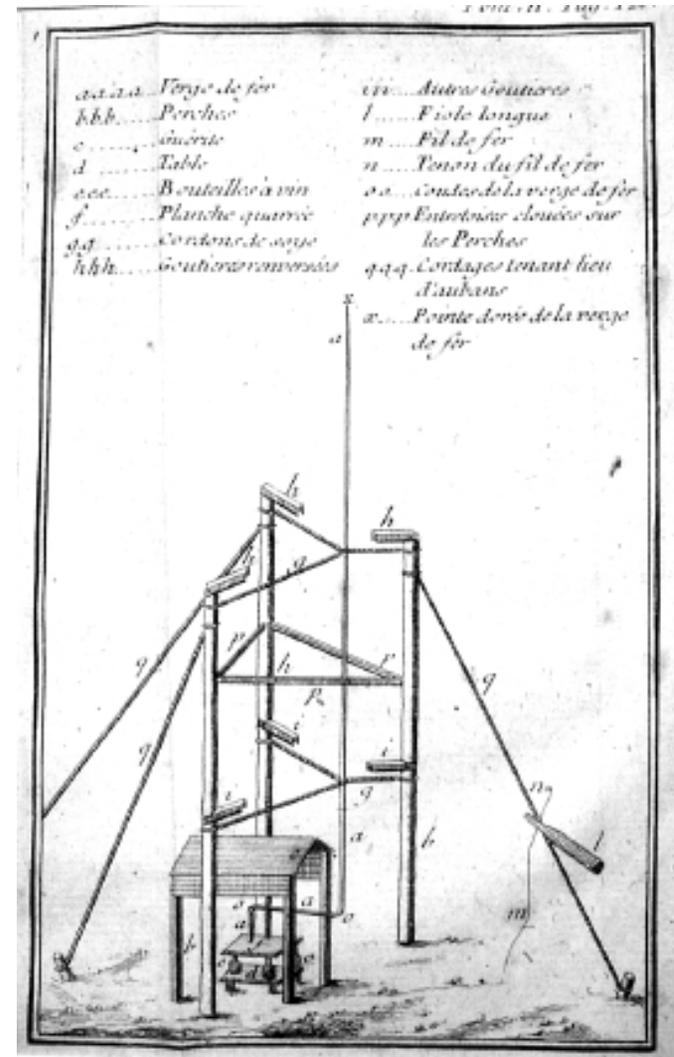
The experiment was this; to take two phials; charge one of them with lightning from the iron rod, and give the other an equal charge by the electric glass globe, through the prime conductor; when charged, to place them on a table within three or four inches of each other, a small cork ball being suspended by a fine silk thread from the ceiling so as it might play between the wires. If both bottles then were electrified *positively*, the ball, being attracted and repelled by one, must be also repelled by the other. If the one *positively*, and the other *negatively*, then the ball would be attracted and repelled alternately by each, and continue to play between them as long as any considerable charge remained.

The French Experiment

The diagram at right shows M. Dalibard's experiment to test Franklin's idea. The equipment was constructed at Marly-la-Ville in a large open area. The ropes and poles are arranged as described in the following letter to support a long, insulated metal rod which connected to the experimental stand inside the shelter



The detail at left shows the rod, and the insulated stand, supported on glass bottles.



reproduced from D'Alibard, trans. *Experiences et Observations sur L'Electricité*. 2nd Ed. Paris 1756
The Burndy Library, Dibner Institute for the History of Science & Technology
Cambridge, Massachusetts

Sparks 1837 vol V: page 293-294

THE ABBE MAZEAS TO STEPHEN HALES¹

Giving a further Account of the Electrical Experiment at Marly. READ AT THE ROYAL SOCIETY, MAY 28TH, 1752

SIR,

The Philadelphian experiments, that Mr. Collinson, a member of the Royal Society, was so kind as to communicate to the public, having been universally admired in France, the King desired to see them performed. Wherefore the Duke d' Ayen offered his Majesty his country-house at St. Germain, where M. de Lor, master of experimental philosophy, should put those, of Philadelphia in execution. His Majesty saw them with great satisfaction, and greatly applauded Messieurs Franklin and Collinson. These applauses of his Majesty having excited in Messieurs de Buffon, Dalibard, and de Lor a desire of verifying the conjectures of Mr. Franklin, upon the analogy of thunder and electricity, they prepared themselves for making the experiment.

M. Dalibard chose for this purpose a garden, situated at Marly, where he placed upon an electrical body a pointed bar of iron, of forty feet high. On the 10th of May, twenty minutes past two in the afternoon, a stormy cloud having passed over the place where the bar stood, those that were appointed to observe it, drew near and attracted from it sparks of fire, perceiving the same kind of commotions as in the common electrical experiments.

M. de Lor, sensible of the good success of this experiment, resolved to repeat it at his house in the Estrapade, at Paris. He raised a bar of iron ninety-nine feet high, placed upon a cake of resin, two feet square, and three inches thick. On the 18th of May, between four and five in the afternoon, a stormy cloud having passed over the bar, where it remained half an hour, he drew sparks from the bar, like those from the gun-barrel, when in the electrical experiments, the globe is only rubbed by the cushion, and they produced the same noise, the same fire, and the same crackling. They drew the strongest sparks at the distance of nine lines, while the rain, mingled with a little hail, fell from the cloud, without either thunder or lightning; this cloud being, according to all appearance, only the consequence of a storm, which happened elsewhere.

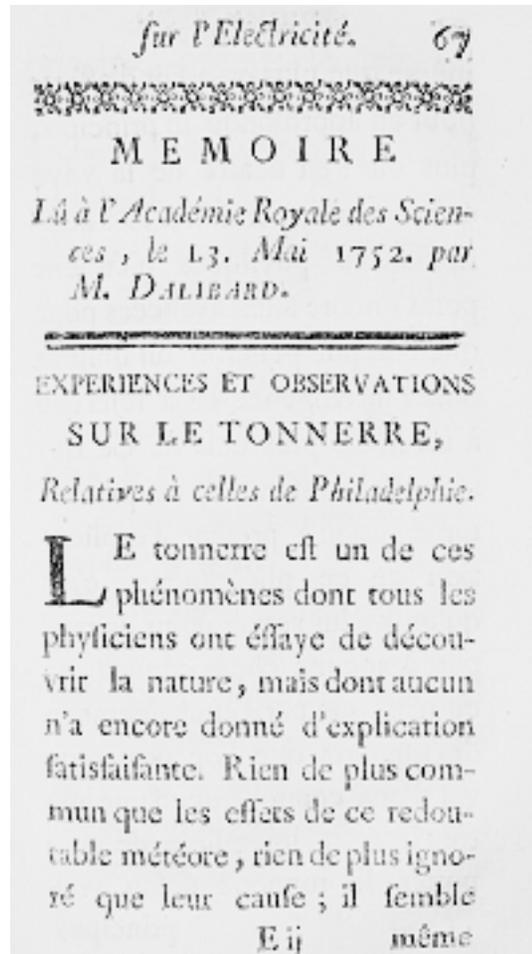
I am, with a profound respect,

Your most humble and obedient servant,

G. Mazéas.

¹ The early letters of Dr. Franklin on electricity having been translated into French, and printed at Paris, the Abbé Mazéas, in a letter to Dr. Stephen Hales, dated St. Germain, May 20th, 1752, gives the above account (printed in the "Philosophical Transactions") of the experiment made at Marly, in pursuance of that proposed by Mr. Franklin.

Page 67 from volume II of Dalibard's translation of Franklin's works, in which he prints his letter describing the experiment translated above.



The letter by M. Dalibard, who translated Franklin's works into French, is given on the next several pages in a new translation by Mary-Margaret Morse, formerly French teacher at the Sheridan School in Washington, DC.

Extract of a memoir of Mr. Dalibard.
Sparks, 1837 Vol. V: page 288-293
Translation by M-M Morse, 2004

Read at the Royal Academy of Science 13 May 1752

While following the route that Mr. Franklin has traced for us, I obtained complete satisfaction. Here are the preparations, the procedure and the success.

1° I had built at Marly-la-ville, situated at six leagues from Paris in the middle of a beautiful field where the ground is raised, a round iron rod, about one inch in diameter, forty feet long, and very pointed at the upper end: to ensure a very fine point, I had it coated in steel and then polished, due to a lack of gilding, to prevent rust; otherwise this iron rod is bent towards the bottom end into two somewhat round angles; the first elbow is two feet away from the end and the second one in opposite direction three feet away from the first.

2° I had placed in a garden three large poles of 28 to 29 feet, placed in a triangle, and distant one from the other about eight

M. D'Alibard, trans. *Experiences et Observations sur L'Electricité par M. Benjamin Franklin*, 2nd ed., Paris, 1756.

The Burndy Library,
Dibner Institute for the History of Science & Technology
Cambridge, Massachusetts

feet, two of these poles were against a wall, and the third was in the yard. To connect them firmly together, we nailed to each one cross beams at 20 feet in height; and in that the strong wind continued to agitate this type of edifice, we attached on the top of each pole some long ropes which acted as stays, well anchored at the bottom to strong stakes well driven into the ground at more than 20 feet from the poles.

3° I had constructed in between the two poles closest to the wall, and resting against the wall, a small wooden workman's hut [sentry box] able to contain one man and one table.

4° I had placed in the middle of the hut a small table about one half foot high; on this table I placed and attached an electric stool. This stool is nothing other than a small square board, placed on three wine bottles. It is made in this matter to substitute for a cake of resin which I lacked.

5° Everything thus being ready, I had elevated perpendicularly the iron rod in the middle of the three poles, and I made it firm by attaching it to each of the poles with strong silk rope in two places only. The first attachment points are on top of the poles, about three inches below their top; the second attachments about half way up their height. The bottom part of the iron rod is solidly connected to the middle of the electrical stool, in which I had drilled a hole to receive it.

6° As it was important to insure no rain could fall on the stool and silk ropes, because they would allow electrical matter to pass if they were wet, I took necessary precautions to prevent this. It is with this in mind that I placed the stool

in the hut, and bent my iron rod at sharp angles; so that water could not run the length of the rod and arrive at the stool. It is also for these reasons, that I had nailed on the top and in the middle of the poles, at three inches above the silk ropes, a type of box formed from three small boards of about 15 inches in length which covered the silk ropes on both the top and on the sides for the same length without touching them.

It is essential to make, at the time of a storm, two observations of the iron rod as situated; one to note at its point a luminous "feather" similar to that which one sees at the point of a needle, when one puts it close to an electrical body; the other experiment was to collect sparks from the iron rod, such as one finds from the barrel of a gun in electrical experiments; and therefore to guarantee pricks from these sparks, I attached the end of the brass wire to the wire of a large phial which served as a sleeve.....

Wednesday 10 May 1752, between 2 and 3 PM, the appointed Coiffier, a retired soldier, whom I put in charge of the observations in my absence, having heard a strong clap of thunder, runs immediately to the machine, takes the flask with the brass wire, holds the end of the wire to the rod, and sees a small bright spark and hears it crackling; he draws out another spark stronger than the first one and louder! He calls his neighbors, and sends for the Prior. The latter arrives running with all his strength; the parishioners seeing their parish priest hurry, imagine that the poor Coiffier was killed by the thunder; the alarm spreads throughout the village; even the arriving hail does not prevent the villagers from following their priest.

The honest man of the church approaches the machine, and seeing that there is no danger places his hand on the machine and draws forth strong sparks. The storm cloud and hail lasted no more than a quarter of an hour passing directly above our machine, and one heard only one clap of thunder. As soon as the cloud had passed, and no more sparks were drawn from the iron rod, the prior of Marly had Mr. Coiffier himself depart to bring me the following letter, which he wrote in haste.

“I announce to you, Sir, that which you were waiting for; the experiment has been made. Today at 2:20 PM thunder clapped directly over Marly; the clap was quite strong. My wish to serve you and my curiosity took me away from my arm chair, where I had been reading. I ran to the dwelling of Coiffier who had already sent a child to fetch me and whom I met on the road; I doubled my pace in the torrent of hail. Having arrived at the location of the bent rod, I presented the brass wire while advancing sufficiently towards the rod, at one inch and a half, or so; coming from the rod was a small column of blue fire which smelled of sulfur, which hit the end of the brass wire with extreme vivacity and created a noise similar to the noise one makes when hitting a rod with a key. I repeated the test at least six times in a period of four minutes, in the presence of several people, and each test that I did lasted the time of a *pater* and an *ave*. I tried to continue; but the action of the fire diminished little by little. I approached closer, but drew out only a few sparks, and then nothing.

The thunder gust which created this event was not followed by another; all ended with an abundance of hail. I was so involved at the time of the test with what I was looking at, that having been hit on the arm a little above the elbow, I cannot say whether it was in touching the brass wire or the rod; I did not complain of the pain from the blow at the time that I received it; but in that the pain continued,

once back home, I uncovered my arm in the presence of Coiffier and we saw an encircling bruise around the arm, similar to one given by a blow of brass wire as if I had been hit on the bare arm. In returning from Mr. Coiffier, I met the Vicar, Mr. de Milly, and the school master, to whom I related what had just happened; all three complained that they smelled an odor of sulfur which hit them harder as they approached me; I carried home the same odor and my servants noticed it without me saying a thing.

Here it is, Sir, a tale related in haste, although naive and true that I vouch for and you can be sure I am ready to testify of this event on any occasion. Coiffier was the first to do the test and repeated it several times; it is only because of what he saw that he sent for me. If other witnesses are needed besides him and me, you will find them. Coiffier is anxious to leave.

I am, with respectful consideration, Sir, yours, etc.

(signed)Raulet, Prior of Marly.

10 May 1752

One sees, by the detail given in this letter, that the result is well noted and leaves no doubt on this subject. The carrier of this note assured me aloud that he had drawn over a time of close to a quarter of an hour in the presence of 5 or 6 people, stronger and louder sparks. then those referred to in this letter. The first witnesses, arriving successively, did not dare approach within more than 10-12 steps of the machine and at that distance, even under a full sun, they saw sparks and heard the noise.....

The result of all the tests and observations that I relate in this memoir and especially of the last test done at Marly-la-ville, is that the matter of thunder is incontestably the same as that of electricity. Mr. Franklin's theory ceases to be a conjecture; it has become a reality, and I dare to believe that the more we go into all that he has published on electricity, the more we will recognize how much physics owes him for this part.

Franklin's own experiment using a kite, was apparently carried out in June of 1752, before he had heard of the success of the French experiment, and Franklin published an account of it in the fall of that year. See the section VIII on the kite experiment for a description of it.

Bigelow vol. IV: page 319 CCCI

OF LIGHTNING AND THE METHODS (NOW USED IN AMERICA) OF SECURING BUILDINGS AND PERSONS FROM ITS MISCHIEVOUS EFFECTS.

PARIS, September, 1767

Experiments made in electricity first gave philosophers a suspicion, that the matter of lightning was the same with the electric matter. Experiments afterwards made on lightning obtained from the clouds by pointed rods, received into bottles, and subjected to every trial, have since proved this suspicion to be perfectly well founded; and that whatever properties we find in electricity, are also the properties of lightning.

This matter of lightning, or of electricity, is an extreme subtile fluid, penetrating other bodies, and subsisting in them, equally diffused.

When, by any operation of art or nature, there happens to be a greater proportion of this fluid in one body than in another, the body which has most will communicate to that which has least, till the proportion becomes equal; provided the distance between them be not too great; or, if it is too great, till there be proper conductors to convey it from one to the other.

If the communication be through the air without any conductor, a bright light is seen between the bodies, and a sound is heard. In our small experiments, we call this light and sound the electric spark and snap; but, in the great operations of nature, the light is what we call *lightning*, and the sound (produced at the same time, though generally arriving later at our ears than the light does to our eyes) is, with its echoes, called *thunder*.

Franklin had written several descriptions of how to use a lightning rod to protect houses and public buildings. In this article he describes his theory of the operation and construction of lightning rods.

If the communication of this fluid is by a conductor, it may be without either light or sound, the subtile fluid passing in the substance of the conductor.

If the conductor be good and of sufficient bigness, the fluid passes through it without hurting it. If otherwise, it is damaged or destroyed.

All metals and water are good conductors. Other bodies may become conductors by having some quantity of water in them, as wood, and other materials used in building; but, not having much water in them, they are not good conductors, and therefore are often damaged in the operation.

Glass, wax, silk, wool, hair, feathers, and even wood, perfectly dry, are non-conductors; that is, they resist instead of facilitating the passage of this subtile fluid.

When this fluid has an opportunity of passing through two conductors, one good and sufficient, as of metal, the other not so good, it passes in the best, and will follow it in any direction.

The distance at which a body charged with this fluid will discharge itself suddenly, striking through the air into another body that is not charged, or not so highly charged, is different according to the quantity of the fluid, the dimensions and form of the bodies themselves, and the state of the air between them. This distance, whatever happens to be between any two bodies, is called their *striking distance*, as, till they come within that distance of each other, no stroke will be made.

The clouds have often more of this fluid in proportion than the earth; in which case, as soon as they come near enough (that is, within the striking distance) or meet with a conductor, the fluid quits them and strikes into the earth. A cloud fully charged with this fluid, if so high as to be beyond the striking distance from the earth, passes quietly without making noise or giving light, unless it meets with other clouds that have less.

Tall trees, and lofty buildings, as the towers and spires of churches, become sometimes conductors between the clouds and the earth; but, not being good ones, that is, not conveying the fluid freely, they are often damaged.

Buildings that have their roofs covered with lead, or other metal, and spouts of metal continued from the roof into the ground to carry off the water, are never hurt by lightning, as, whenever it falls on such a building, it passes in the metals and not in the walls.

When other buildings happen to be within the striking distance from such clouds, the fluid passes in the walls, whether of wood, brick, or stone, quitting the walls only when it can find better conductors near them, as metal rods, bolts, and hinges of windows or doors, gilding on wainscot, or frames of pictures, the silvering on the backs of looking-glasses, the wires for bells, and the bodies of animals, as containing watery fluids. And in passing through the house it follows the direction of these conductors, taking as many in its way as can assist it in its passage, whether in a straight or crooked line, leaping from one to the other, if not far distant from each other, only rending the wall in the spaces where these partial good conductors are too distant from each other.

An iron rod being placed on the outside of a building, from the highest part continued down into the moist earth, in any direction, straight or crooked, following the form of the roof or other parts of the building, will receive the lightning at its upper end, attracting it so as to prevent its striking any other part; and, affording it a good conveyance into the earth, will prevent its damaging any part of the building.

A small quantity of metal is found able to conduct a great quantity of this fluid. A wire no bigger than a goose-quill has been known to conduct (with safety to the building as far as the wire was continued) a quantity of lightning that did prodigious damage both above and below it; and probably larger rods are not necessary, though it is common in America to make them of half an inch, some of three quarters, or an inch diameter.

The rod may be fastened to the wall, chimney, &c., with staples of iron. The lightning will not leave the rod (a good conductor) to pass into the wall (a bad conductor) through those staples. It would rather, if any were in the wall, pass out of it into the rod to get more readily by that conductor into the earth.

If the building be very large and extensive, two or more rods may be placed at different parts for greater security.

Small ragged parts of clouds, suspended in the air between the great body of clouds and the earth (like eaf gold in electrical experiments) often serve as partial conductors for the lightning, which proceeds from one of them to another, and by their help comes within the striking distance to the earth or a building. It therefore strikes through those conductors a building that would otherwise be out of the striking distance.



Warner House on Daniel Street in Portsmouth, NH. A lightning rod running down the chimney and the side of the house was reputedly installed under the supervision of Benjamin Franklin. R. Morse photograph 2004

Long, sharp points communicating with the earth, and presented to such parts of clouds, drawing silently from them the fluid they are charged with, they are then attracted to the cloud, and may leave the distance so great as to be beyond the reach of striking.

It is therefore that we elevate the upper end of the rod six or eight feet above the highest part of the building, tapering it gradually to a fine sharp point, which is gilt to prevent its rusting.

Thus the pointed rod either prevents a stroke from the cloud, or, if a stroke is made, conducts it to the earth with safety to the building.

The lower end of the rod should enter the earth so deep as to come at the moist part, perhaps two or three feet, and if bent when under the surface so as to go in a horizontal line six or eight feet from the wall, and then bent again downwards three or four feet, it will prevent damage to any of the stones of the foundation.

A person apprehensive of danger from lightning, happening during the time of thunder to be in a house not so secured, will do well to avoid sitting near the chimney, near a looking-glass, or any gilt pictures, or wainscot. The safest place is in the middle of the room (so it be not under a metal lustre suspended by a chain), sitting on one chair and laying the feet up in another. It is still safer to bring two or three mattresses or beds into the middle of the room, and folding them up double, place the chair upon them; for they not being so good conductors as the walls, the lightning will not choose an interrupted course through the air of the room and the bedding, when it can go through a continued better conductor, the walls. But where it can be had, a hammock or swinging bed, suspended by silk cords equally distant from the walls on every side, and from the ceiling and floor above and below, affords the safest situation a person can have in any room whatever, and what indeed may be deemed quite free from danger of any stroke by lightning.

B. FRANKLIN.



Detail of the top of the lightning rod on the Warner House, Portsmouth, NH R.A. Morse Photograph 2004

This letter, to David Hume, gives a very specific set of directions for installing a lightning rod on a house, The apparatus at right simulates a house struck by lightning and has a receptacle for gunpowder to be set off by a spark when the rods were topped by balls but not ignited when the balls were removed and the points exposed.

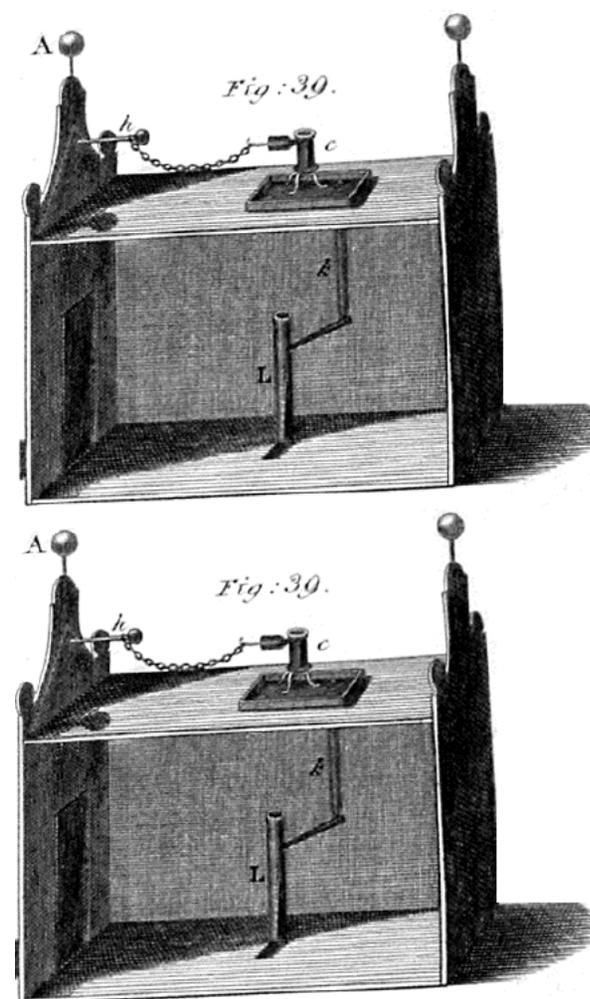
Bigelow Vol. III: page 368-369

CCIV TO David Hume

LONDON, 24 January, 1762

DEAR SIR:—In compliance with my Lord Marischal's request, communicated to me by you, when I last had the pleasure of seeing you, I now send you what at present appears to me to be the shortest and simplest method of securing buildings, &c., from the mischiefs of lightning. Prepare a steel rod five or six feet long, half an inch thick at its biggest end, and tapering to a sharp point; which point should be gilt to prevent its rusting. Let the big end of the rod have a strong eye or ring of half an inch diameter: Fix this rod upright to the chimney or highest part of the house, by means of staples, so as it may be kept steady. Let the pointed end be upwards, and rise three or four feet above the chimney or building that the rod is fixed to. Drive into the ground an iron rod of about an inch diameter, and ten or twelve feet long, that has also an eye or ring in its upper end. It is best that the rod should be at some distance from the foundation of the building, not nearer than ten feet, if your ground will allow so much. Then take as much length of iron rod of about half an inch diameter, as will reach from the eye in the rod above, to that in the rod below; and fasten it securely to those rods, by passing its ends through the rings, and bending those ends till they likewise form rings.

This length of rod may either be in one or several pieces. If in several, let the ends of the pieces be also well hooked to each other. Then close and cover every joint with lead, which is easily done, by making a small bag of strong paper round the joint, tying it close below, and then pouring in the melted lead; it being of use in these junctures, that there should be considerable quantity of metalline contact between piece and piece. For, if they were only hooked together and so touched each other but in points, the lightning, in passing through them, might melt and break them where they join. The lead will also prevent the weakening of the joints by rust. To prevent the shaking of the rod by the wind, you may secure it by a few staples to the building, till it comes down within ten feet of the ground, and then carry it off to your ground rod; near to which should be planted a post, to support the iron conductor above the heads of the people walking under it.

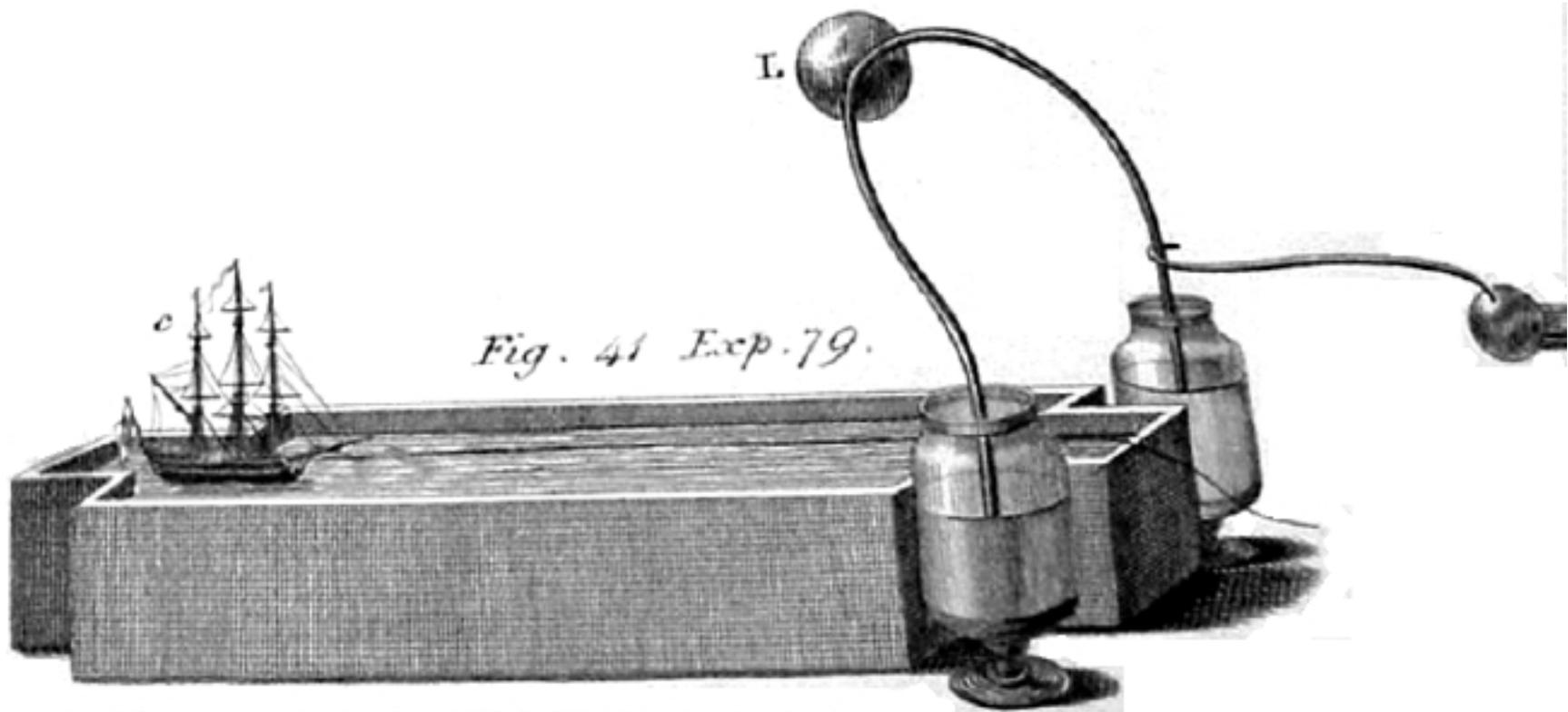


Lightning House demonstration from Plate V,
J. Cuthbertson, *Practical Electricity & Galvinism*,
London, 1821
The Burndy Library, Dibner Institute for the History of
Science & Technology, Cambridge, Massachusetts

Franklin discussed the protection of ships from lightning in several letters. In the same letter in which he proposes the sentry box experiment, Franklin suggests: (*Bigelow Vol II, p. 298 in Morse p. 45*)

“...may not the knowledge of this power of points be of use to mankind in preserving houses, churches, ships, &c., from the stroke of lightning, by directing us to fix on the highest parts of those edifices upright rods of iron made sharp as a needle, and gilt to prevent rusting, and from the foot of those rods, a wire down the outside of the building into the ground, or down round one of the shrouds of a ship, and down her side till it reaches the water? Would not these pointed rods probably draw the electrical fire silently out of a cloud before it came nigh enough to strike, and thereby secure us from that most sudden and terrible mischief?”

The apparatus below demonstrates a lightning stroke to a ship as it passes under the ball at L representing a thunder cloud.



Lightning and Sailing Ship demonstration from Plate V,

J. Cuthbertson, *Practical Electricity & Galvinism*, London, 1821

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