THUNDER AND LIGHTNING.

MESSRS. EDITORS:—An article on "Atmospheric Electricity," published on page 73, of the present volume of the SCIENTIFIC AMERICAN, fully corroborates my own observations and experiments with electricity and lightning-rods. The theory of the lightning-rod is, that it disarms the surcharged cloud which may hover over the building protected by the rod. Franklin and his cotemporary electricians never claimed for the rod that it should receive thunderbolts. They claimed that the rod should carry lightning from the impending cloud to the earth *silently*. The rod is (theoretically) intended to *draw* the charge from the atmospheric magazine; not to receive the red-hot shot as fired from Jupiter's cannon. You are correct in saying that rods "do not cause a disruptive discharge when one would *not* have been made if the rod had not been erected." There should be no disruptive discharges npon a lightning-rod that fulfills the office of its inventors, or else the experiment of the "thunder-house," as used to illustrate the nature and effects of atmospheric electricity in its silent as well as in its disruptive habitudes, means nothing. That the rod is a protection to an area of surface equal in diameter to four times the length of the rod's projection above the building is the practical truth of its efficacy, but not always, if at all, to thunderbolts; it is only so when the surcharged thunder cloud comes within that distance of the point of the rod, that the electricity is silently conducted from the cloud to the earth. This does occasionally really happen. Mr. Daniel George, of Philadelphia (a practical manufacturer of electrical apparatus), called my attention to the fact, one night, when a terrific thunder storm was raging over the city of Philadelphia. We went to the top of his building through a trap-door, the clouds were heavy, flying very low and surging violently around; it was one of those thundergusts that inspire terror in those who are ignorant of electricity, and sublimity in the mind that contemplates it in an intelligent manner. The rod on this house had its point illuminated on that occasion. He informed me then that he only saw this illustration of the rod's efficacy when this kind of storms prevailed, and for that reason he invited me to the top of the building, knowing that I was also engaged in the construction of electrical apparatus at the time.

I have examined many lightning-struck buildings that had lightning-rods on them, erected as the theory of the rod directs. Now permit me to state, in all candor, the results of these observations. Some buildings were struck on the end of the roof or apex farthest from the end surmounted by the rod. The damage in these cases rather overbalanced the damage sustained in the cases where the rod received the bolt. In cases where the rod was struck, there was always a dispersion of the bolt; some run down the rod into the earth, rooting it up, and some of the bolts (electric fluid) would knock off shingles, shiver the end rafters of the building in others, knock off bricks from the top of the chimney, and sometimes knock to pieces the brick gable ends as though they had been struck by a cannon ball. Where it struck barns filled with grain and hay, the destruction by fire has been as fatal to the barns which receive the bolts on their rods, as the barns that received the bolts without rods. In the latter case I have ever been confronted by the lightning-rod men with the allegation that the rod was not properly erected. In most cases I knew that the rods were erected in accordance with the rule laid down, namely, the rod projecting above the building, contiguous in its length by screw joints, running into the earth six feet, with the lower points for distribution; yet with all this the barn was burned down. A very small portion of disrupted lightning will set fire to a barn in the heat of summer, when a very heavy bolt will do no more to a dwelling-house than to knock off the shingles where it strikes, capsize the top of a brick chimney, knock in the gable apex of the wall, and perform pranks through the interior of the house that puzzle all electrical and dynamical philosophy. Barns suffer the most, hereabouts, by thunderbolts. The reason is this. In warm weather, a barn stowed with hay or grain presents two favorable conditions for ignition and conflagration that do not exist in dwelling-houses and other buildings. The warm gases evolved from vegetable matter, like stacked and stored hay and grain, being both conductive and supportive to ignition and combustion, cause the greater fatality to barns. The hay or grain presents to the spark (sometimes intense scintillations of sparks from the exploded bolt) the same conditions presented in the knob of the "discharging rod" when covered with cotton sprinkled with powdered resin, when we show the power of the electrical spark as drawn from the prime conductor of the electrical machine, in contradistinction to drawing the charge from it with a "pointed rod."

In the last case of my observations, only a few weeks ago, in this city, I made a close inspection of the dynamic character of the thunderbolt. In this case it struck a chimney (unsurmounted by a rod). It was seen coming in an oblique direction. Its force upon the bricks, some two dozen of them, was similar to that in the case of any solid projectile coming in the same direction with an equal force. This indicated that a *material* body had struck the bricks, and struck them under the ordinary law of dynamical force.

My observations teach me that metallic-roofed-houses are protected from injurious effects of lightning. In these, for greater security, I would advise a connection with the water conductor below, and the latter put into connection with a hydrant pipe or street gas pipe. Since our farmers are adopting the slate roof for barns, they also diminish the loss of barns by thunderbolt conflagrations. Upon slate roofs it glances off; but upon shingled roofs there is a fuzz that is easy of ignition. Upon straw-covered(thatched) roofs there is, as it were, an invitation to Jupiter for a display of his pyrotechnics. And these conditions hold good, rod or no rod.

My observations on electricity, while sailing in and above the thunder cloud, corroborate the electrical theory of Professor Joseph Henry. When the rain drops come from a cloud, surcharged, as I know they are, with positive electricity, they are neutralized of their *active* electricity in two ways before they reach the earth, though they do *sometimes* reach the earth in their active state and do emit sparks in striking it. Firstly, when the rain falls from the upper to the lower cloud, the surcharged rain-drops give up their active electricity to the lower cloud. When the lower cloud is not capaciously negative to receive it all, an explosion follows, like the spontaneous explosion of the Leyden jar when you attempt to force more upon it than its capacity will bear. Secondly, the condition of the air below the cloud may be such that, as the cool drop of water is descending, it is combining with more water by the contact of its cold surface to constant new accessions of warmer air; thus the drop becoming larger, and in that proportion diminishing its positive or active condition.

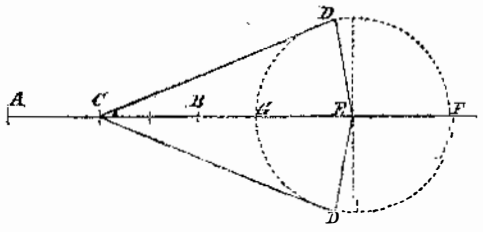
JOHN WISE.

Lancaster, Pa., August 4, 1860.

[It is true, as our correspondent states, that barns, when filled with grain and hay, are frequently struck by lightning,but not from the causes stated. The warm gases evolved from vegetable matter are generally carbonic acid and some nitrogenous mixtures, which will not ignite because they are not sustainers of combustion. Warm gases, also, if not the very worst, are very poor electric conductors, so that they do not invite electricity nor conduce in the least to the destruction of barns by lightning. Mr. Wise has given us in his communication considerable information respecting what are commonly called "thunderbolts," and his views on this subject are quite interesting and novel.—EDS.

A PROPERTY OF THE CRANK MOTION.

MESSRS. EDITORS:—The T-head, C, when in the center of the slide, does not bring the crank at right angles with a line drawn through the center of the cylinder, but brings it nearer to the cylinder. Now, what I wish to know is this: Let A B be the slides, C the cross-head in the center of the slides, D E the crank. When the



crosshead is in the center of the slides, the crank assumes the position, D E; the crosshead has traveled half-way, but the crank has not. How is it that the crank has to travel through the arc, D F D, on one part of its revolution to bring the T-head to the center of the slides, and on the other side it only travels through the arc, D G D, to bring said head to the center of the slides. Please explain it to me, and also tell me what the irregular motion of the crank consists in?

A MECHANIC.

Cincinnati, Aug. 6, 1860.

[It appears to us that our correspondent's diagram explains the matter, and that any words added would merely have the effect to confuse it.—EDS.

A NEW WAY TO LAY THE ATLANTIC CABLE.

MESSRS. EDITORS:—On page 41 of the present volume of the SCIENTIFIC AMERICAN, I noticed a "leader" concerning some new efforts about to be made for laying a new Atlantic telegraph cable; I therefore take the liberty of presenting the following hints for your consideration and that of the practical portion of the public, all of whom are more or less interested in this international undertaking.

I believe I made the first wire rope that was ever made west of the Allegheny mountains. In the year 1830-'31, I constructed wire ropes for the several ferries across the Ohio river at Wheeling, some of which were more than a mile in length. I have, therefore, practical experience, which is often better than theory. Circumstances which are apparently trivial in themselves are usually of vast importance to the successful issue of a new and untried enterprise. I read carefully and with great interest all the details of the first experiment made in laying the Atlantic cable; and with much regret did I learn of its failure, one reason of which, I believe, was the method of stowing the cable in the vessels. It is a fact well-known to most persons, and especially to sailors, that when a rope or cable, coiled in one continuous direction—either *with* the "lay" of the rope or *against* it—is "payed-out," it has a tendency, in one case, to twist tighter, and in the other to untwist itself. The more rigid and unyielding the fabric in its texture, the more the evil will be increased, especially if it be important that the integrity of every inch be scrupulously preserved, as is the case in ocean telegraphic cables.

Now the remedy for the above evil is so simple that I feel astonished that no person has previously suggested it. Instead of laying down the coil in *one* direction, let it be laid in the direction of the figure 8, that is to say, a double coil, crossing in the center. Thus, each alternate coil *neutralizes* the other in "paying-out"—or, to speak more familiarly, whatever twist one coil may put into the cable, the other will take out of it; and if the cable be composed of straight wires, parallel to the length, their position will be preserved undisturbed, and the insulating covering (whatever it may be) will remain intact, other things being properly managed. It would be almost impossible to "foul" such a cable in coiling, as each layer must necessarily retain its relative position; and hence a facility and safety in "paying-out" would be obtained to a much greater degree than in the old way.

E. MATHERS.

Fairmount, Va., August 1, 1860.

COFFEE.—The consumption of coffee is estimated in the following manner:—The whole of North America consumes 337,500,000 lbs., being in the largest proportion. France, Switzerland, Spain, Italy, Portugal and adjoining islands, consume amongst them only 202,500,000 lbs.; Germany, including Austria, 292,500,000 lbs.; Holland and Belgium, 142,500,000 lbs.; Denmark, Sweden, Russia, Finland and Poland, only 75,000,000 lbs. among them, owing, probably, to the fondness of those nations for something stronger. Great Britain and Ireland consume about 60,000,000 lbs.

CURE FOR COLIC IN HORSES.—E. H. Ezell, of Houston county, Ga., advises (in the *Southern Field*) simply to pour cold water on the back of the animal for fifteen or twenty minutes. Pour the water on from the withers to the loins, so as to run profusely over the sides and stomach. He has seen it tried in fifty instances. It will give almost entire relief in one hour.

AMERICAN INSTITUTE FAIR.—The thirty-second annual fair of the American Institute, will be held at the Palace Gardens, in Fourteenth-street, this city, commencing on Tuesday, September, 25th.