

### On the Position of Fire Places.

As the cold season is approaching and fuel being unusually high in our city and other places, it is wise to make the inquiry, "can we not do with less than we have been in the habit of consuming?" We believe this will be quickly answered in the affirmative, after reading the following article by Dr. Neil Arnott, F. R. S., it being the subject of a paper read by him before the London Society of Arts, and recently published in the Society's Journal:

"This is the fit place for remarking on the fashion, lately introduced in this country, of placing the fire-grates much lower down than formerly—in some cases, on the very hearth: the reasons usually assigned being that a low fire burns better, or gives out more heat from the same quantity of fuel, than a higher; and, because lower and nearer the floor, that it must warm the carpet better, and so lessen the evil of cold feet. Now, both these suppositions are curious errors or delusions, having their origin in popular misconceptions respecting the heat, and particularly respecting the radiation of heat.

Radius is the Latin word for the spoke of a wheel, and anything which diverges or spreads around from a center, in some degree like spokes, is said to radiate. Light and heat are of this nature; the portion of either which passes in a straight line from the center is called a ray.

The simplest observation teaches all that a lamp placed in the middle of a room radiates its light and heat nearly equally in all directions; and most persons are aware that if an opaque mirror be placed close to a lamp on one side, it not only intercepts all the rays that fall upon it—and that means nearly half of the light given out—but it returns or reflects these rays back in contrary corresponding directions, and nearly doubles the illumination in those directions.

Most persons, also, have observed that if a fire, or a red-hot mass of metal, be placed in free space, it radiates its heat as well as its light nearly equally in all directions; but many do not learn, by their unaided observation, that if a surface of any substance, like fire-brick, which strongly resists the passage of heat through it, be placed near a fire, it not only intercepts the heat-rays falling on it, but after absorbing them, and so becoming heated, often to redness, it then reflects and radiates back the greater part of the heat, almost as if it were additional hot fuel in the fire, and thereby nearly doubles the warmth felt in directions away from the surface.

Neither does common observation make persons aware of the truth, that of the heat produced by combustion in a common fire, one part—being somewhat more than half—is diffused, like the light, by radiation, into the open space around, and the remainder is given, by contact and conduction, to the air which supports the combustion, and to the solid material of the fire-place. Thus, with a common open fire-place, it is the radiant heat almost alone which warms the room, the remainder either at once combining with the burned air or smoke, and passing up the chimney, or being given by the heated grate to pure air, which touches that, then passing into the chimney with the smoke.

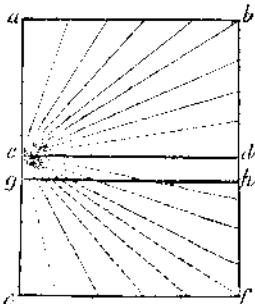
And, lastly, many persons do not at first learn the truth, that the rays of heat passing through pure or transparent air do not at all warm that air, but warm only the solid or opaque bodies by which the rays are intercepted, and that thus the air of a room is warmed only at second-hand, by contact with the solid walls and furniture, which, having intercepted the heat-rays, have themselves first become heated. Yet most educated persons know similar facts, such as that the sunbeams, bringing both light and heat to the earth, as they descend to warm the hottest valleys or plains of the earth, pass through the upper strata of the atmosphere, which are always of a temperature much below freezing. This is proved by the fact that all lofty mountains, even under the equator, are capped with never-melting snows, and that the higher the peaks are—and, therefore, the nearer to the sun—the colder they are. Thus also, all persons who have attended to the subject know that aeronauts, in their balloon-car, if they mount very high, would be frozen to death but that they are protected by very warm clothing. Another fact of the same kind is, that a glass globe,

filled with cold water, or even ice, may in the sun rays be used as a burning-lens.

These explanations being premised, the two popular delusions respecting the low fires become at once apparent.

1st. The supposition that fuel burnt in a low fire gives out more heat, has arisen from the experimenter not reflecting that his hand held over the low fire feels not only the heat radiated from the fire itself, but also that reflected from the hearth close beneath it, which second portion, if the grate were high, would have room to spread or radiate downwards and outwards to the more distant floor or carpet, and so warm them.

2nd. The notion that the fire, because near the floor, must warm the carpet more, springs from what may be called an error in the logic of the reasoner, who is assuming that the hearth, floor, and carpet, being parts of the same level, are in the same predicament—the truth being, however, that in such a case the hearth within the fender gets nearly all the downward rays, and the carpet almost none—as a candle held before a looking-glass at a moderate distance diffuses its heat pretty uniformly over the whole, but if moved close to one part of the glass, it overheats, and probably cracks that part, leaving the rest unaffected. A low fire on a heated hearth is to the general floor or carpet of a room nearly what the sun, at the moment of rising or setting, is to the surface of a field. The rays are nearly all shooting upwards from the surface, and the few which approach it slant obliquely along, or nearly parallel to the surface, without touching, and therefore without warming it.



The annexed diagram serves to elucidate these facts.

*c* represents the fire-place or center of radiation, with rays diverging from it into all free space around.

*a c* is the wall in which the grate is set, and which can receive none of the direct rays—as is nearly true of the floor also, if the fire be on the hearth.

*a b* is the ceiling.

*b d* is the wall opposite to the fire.

*c d* is the floor, with the fire on or close to the hearth. If there were no floor at all, these rays would shoot as abundantly down to the bottom and walls of the room below, as to the ceiling and walls of the room above; but the hearthstone of the floor, *c d*, first intercepts all the inferior rays, and then radiates them up to the ceiling, leaving the floor unsupplied, unless by secondary radiation from the ceiling and walls.

*g h* represents a floor at a moderate distance below the fire. It is seen, by where the ray-lines intersect this floor, that much of the heat of the fire must spread over it, and chiefly between the middle of the room and the grate where the rug is, and where the feet of the persons forming the fireside circle are placed.

Striking proof of the facts here set forth is obtained by laying thermometers on the floors of a room with a low fire, and of a room with the fire, as usual of old, at a height of about 15 or 16 inches above the hearth. An experiment tried in two such rooms, in both of which thermometers on the pianofortes, four feet above the floor, stood at 62°, showed the carpet, not far from the hearth, to be at 56° with the low, and at 73° with the high fire.

As would be anticipated by a person understanding the subject aright, low fires make cold feet very common, unless to those who sit near the fire with their feet on the fender; but deceived by their fallacious reasoning, the advocates are disposed to blame the state of their health or the weather as the cause, and they rejoice at having the low fire, which can quickly warm their feet when placed near it. A com-

pany of such persons seen sitting close around their fire, with thankfulness for its warmth near their feet, might suggest the case of a party of good-natured people duped out of their property by a swindler, and afterwards gratefully accepting as charity from him a part of their own property."

### Discovery of the Origin of Spirit Rappings.

Dr. Schiff, of Frankfort, Germany, read a paper lately to the French Academy of Sciences, in which he professes to have discovered the mystery of spirit-rapping. His attention was called to the case of a young girl, near whose person noises attributed to spirit-rappers were produced. Dr. Schiff's observations led him to conclude that the knocking had taken place within the body of this young girl, not outside; and he has shown experimentally that such noise can be produced by the reiterated displacement of the tendons of the long muscles of the shin bone, from the sheath in which it glides in passing behind the external ankle bone.

The Doctor must be awarded the palm along with Faraday, who discovered the cause of table turning. The Spiritual Rappers, however, claim that they can turn tables without touching them, and certainly all their rappings cannot be produced by shaking the muscles of the shin bone.

### Interesting Experiment.

At the London Polytechnic Institution, a new experiment of a beautiful kind, the invention of a French philosopher, is now being exhibited. It consists in the illumination of the interior of a jet of water, emitted horizontally, and falling into a curve. The light, which is of great brilliancy, and produced by galvanic agency, is applied at the back of the jet. It seems to be wholly absorbed, and bent out of its lateral rectilinear direction by the falling stream of water, every part of which is rendered perfectly luminous. Even the glass vessel into which the stream falls is occasionally illuminated. By placing various colored glasses between the light and the water, the jet is made to assume the most beautiful hues.

### Georgia State Fair.

The Ninth Annual Fair of the Southern Central Agricultural Society will be held in Augusta, Ga., commencing on the 23rd of next month, October. The Managers of the Society, and the citizens of Augusta have adopted very praise-worthy arrangements for the treatment of strangers who may visit the Fair. The *Southern Cultivator* gives the charges of all the hotels in Augusta, the proprietors of which have pledged themselves not to charge more than the usual rates to strangers. This is very different from the proprietors of hotels in some of the cities in this State, where Fairs have been held. A committee of citizens has also been appointed to aid visitors in obtaining lodgings. We like these arrangements exceedingly. The Fair will be held for six days; we hope all Georgia, young and old, will go up to Augusta in the last week of next month.

### The Caloric Engine.

The Caloric Engine invented by Capt. Ericson has been finally abandoned, and is to be taken out of the ship bearing his name, steam boilers being substituted. From the beginning this result has been foreseen by practical and scientific men, notwithstanding the alleged complete success of the experiment. —[United States Gazette, Phila.

[There is no doubt of the fact, that some practical and scientific men foresaw the result above named from the beginning, but so far as we are acquainted with the facts few had the courage to give a public expression to their views. The columns of the SCIENTIFIC AMERICAN contains nearly all the objections against the "hot air project," which have been published, and of their soundness the public can now judge.

### Death of a Man of Science.

Dr. Robert M. Patterson, late director of the U. S. Mint, died at Philadelphia on the 5th inst. He was President of the American Philosophical Society, and had held professorships in the Universities of Virginia and Pennsylvania.

### Explosions of Steam Boilers.

It affords matter for deep sorrow to hear of so many boiler explosions still taking place from time to time in various parts of our country. On the 29th ult., the steamboat *Timour* exploded her boilers on the Mississippi, whereby twenty persons were instantaneously deprived of life. This boat was lying at the dock when the explosion took place, and the St. Louis papers say that "there was little steam, no water, but any quantity of gas in the boilers, as the appearance of the wreck, and the burned and crisped bodies of the victims too plainly showed. The shock was awful; all three boilers going off at the same instant, and not a fragment of either ten feet in length could be found."

On the same day the boiler of the locomotive *Mississippi* exploded on the Mobile and Mississippi Railroad, whereby one person was killed and several severely wounded. The *Mobile Tribune* says "the cause of the catastrophe is not yet explained, and probably never will be, as the person in charge of the engine was the first to lose his life."

### New Water Meter.

Marvin Smith, of New Haven, Conn., has invented an improvement in water meters, of that class which registers the number of strokes made by a piston, which is moved to measure the water in a cylinder of known capacity. The object of the improvement is to effect the reversal of the movement of the piston in a simple manner, without the employment of valves. The piston is so constructed that a slight movement on its axis is all that is necessary to reverse the action of the water upon it. A movement is given to the piston at the end of every stroke, to move it on its axis. The registering of the number of times the cylinder is filled and discharged is accomplished by clock work, constructed for the purpose, in connection with the movements of the piston. Measures have been taken to secure the invention by patent.

### Bates' Instrument for Curing Stammering.

The patentee of the instrument for curing stammering, whose engravings were published in No. 47, last Volume of the SCIENTIFIC AMERICAN, desires us to state, in reply to numerous letters he has had concerning agencies, that he employs no agents to sell his instruments, and that those desiring to purchase or to have them applied, should address him at his residence, 131 South Ninth street, Philadelphia.

### Guanos made from Fish.

A manufactory exists in the Department of the Finistere, France, where a fertilizing powder is made from fish. The fish undergoes a kind of cooking by steam, after which it is dried and pulverized. It requires 455 pounds of fish to produce 100 pounds of the powder, which forms an admirable manure.

### The First Man Struck by Lightning in California.

"During the thunder-shower last Friday," says the *Shasta Courier*, "Mr. Hugh Mackay, while standing before his residence, on Dry Creek, was struck by lightning and thrown upon his face with great violence, a distance of some ten or twelve yards from where he was standing. He remained insensible fully an hour after receiving the stroke. He has since almost entirely recovered. This is the first instance of the kind we have ever heard of in California."

An experiment has just been successfully made in France of employing swallows to carry letters, as pigeons were used some years back.—[Exchange.

[Foolish operation, in these days of the lightning telegraph.

### Our New Dress.

The SCIENTIFIC AMERICAN commences this volume in an entire new dress of beautiful type.

The editor of the *Providence Post*, L. I., recommends beets, baked in the peel, as people bake potatoes, as a substitute for that scanty and often rotten vegetable.