For the Scientific American.

Aurora Borealis.

The Aurora Borealis, or Northern Lights, have ever excited the speculation of philosophic minds; yet the wisest philosophers have been unable to explain its wonderful display, and bring it within the range of philosophic law. We find in our atmosphere a strong under-current of cold air moving towards the equator; so strong indeed, as to form a stiff breeze, called trade wind; and necessarily there must be a corresponding upper current moving towards the poles. This upper current, when it leaves the torrid zone, is highly rarefied, and does not meet with any very rapid condensation, until it arrives within the influence of the eternal frosts of the poles, or as high latitudes as 70°. Near this latitude the magnetic poles have been fixed; and around the earth, following this line of latitude, is frequently seen in the heavens a brilliant band of light, from which flashes np beams and floods of light, forming the beautiful and frequently brilliant display termed Northern Lights. This light is electrical light, produced by the evolution of electricity consequent on the sudden condensation of the atmosphere. The beams of light which spring up through the sky, are currents of air highly charged with moisture, which, on coming within striking distance of the electrical band, are suddenly electrified.

It has been discovered by observation that in certain latitudes a storm generally succeeds a brilliant display of Northern Lights. This is owing to the check given to the advancing current by the opposing force of electricity, which condenses it; and consequently it falls to the earth. G. H. W.

Nelson, Madison Co., N. Y.

[For the Scientific American.]

The Steamer Henry Clay.

The sad catastrophe to this steamer, which has been announced, leads us to reflect on the causes which led to the great sacrifice of human lite here. From the accounts received through the papers, the ostensible cause originated in the excess of heat generated, by which the wood-work of the vessel was set on fire, being, no doubt, ~~in an~~ excessively ~~dry state~~ easily inflamed. A steamer constantly in action, must be in a state of extreme danger from this cause, and the surprise may be, that such accidents do not more frequently occur. This calamity is a sad warning to us, to guard against its recurrence. The present system upon which steamers are built, subjects them to accidents of this kind almost constantly, and no effectual plan has been yet devised to remedy the evil. That a remedy exists there can be no doubt, and as it is essential that such remedy should be at hand, I would here present the means by which this remedy may be applied, for the consideration of steamboat engine builders. The base of this means is the application of the motive power itself to remedy the evil. The intervention of steam, between a burning body, or flame, and a body subject to be set on fire from the too near approximation to the burning body, will effectually guard the latter from conflagration, or attaining a degree of heat which would induce it to take fire. This conservative action of steam is well known, and I took occasion some short time since to point out its application in extinguishing fires, by guarding the houses surrounding the fire by throwing on the surface exposed to the fire, only so much water as will be converted into steam by the heat of the adjacent fire. This fact being established, (a very important one), the application of the same means,—namely, steam—thrown and kept between the fire and the wood-work of the vessel, will effect the object of securing the vessel from taking fire, however hot the furnace should be. I shall not enter here into the philosophy of the principle. Facts are of more importance than theory, and we have many of the former to prove the truth of the proposition. It is upon this principle that individuals have exposed their persons to the violent heat of ovens, that would cook an egg with impunity. The excessive perspiration induced from their bodies kept the heat from acting on them. It is thus that the fire-eaters (as they are called), are able to lay a red hot iron on their tongue, without injury to themselves, because a body of steam is generated between the surface of the tongue and the red-hot iron, that prevents the tongue from suffering, or being burnt: the fire-eater would not dare to put the red-hot iron on his tongue when in a dry state. Why do the operators in furnaces, where they are subject to violent heat, wet themselves and moisten their lips, when they are ladling up the red-hot metal? The answer to this is evident from what has been already advanced. These facts will suffice to prove the efficiency of the plan to cut off the heating process between the furnace of the steamer and the wood of the vessel. The whole of the heating apparatus aboard the steamers should be cut off from the hulk by a body of steam filling the cavity made here, which will guard the vessel from the danger of fire. I have voyaged in many steamers, and have found them all more or less greatly heated near the furnaces, and though this may not be dangerous in short trips, as the heat soon ceases, yet where the voyage is long the danger is increased in proportion. It is time for us to look into this matter, and if there be danger, which has been manifested in the fate of the Henry Clay, we should not lose a moment to rectify the evil. The problem of adapting the means suggested, to the particular condition of this department in the steamer, belongs to the Engineer of the Machinery, and with him I leave the subject for consideration and action. The community will not be satisfied without a guard is set securely against a recurrence of the distressing catastrophe of the Henry Clay.

Robt. Mills, Engineer and Architect.
Washington, D C.

Brick Making.

Since my communication of the 6th March (No. 25) I have been engaged in pefectingthe brick machine there mentioned; during the progress of which many unforeseen difficulties were encountered and many disappointments incurred where success seemed certain. Perseverance, however, has overcome them all and I have now the satisfaction of seeing my anticipations realized.

It will be remembered that I set out with the intention of taking the clay direct from the bank, temper and mould it as stiff as potter's clay, so that the bricks might be borne off to the floor and set on edge to dry. The first part of the operation was successful from the start, and for this I am indebted to my former dry clay machine, for the secret lies in first reducing the clay to dust before it is mixed with the water, when the two combine instantaneously. The operation of the knives then mix and temper it so thoroughly that in less than five minutes it is reduced to a consistence which no amount of labor can excel. Not a particle of raw matter can be discovered, even the size of a bean. This must render the machine of peculiar advantage at the South, where they have not the benefit of the great disintegrator—frost. There this part of the process is the most laborious I am told that it requires the work of twelve oxen, travelling half a day in a clay pit, to mix enough for 8000 bricks. By this machine the tempering and moulding is all done at once, and never more than a cart load under operation at the same time.

To fill the moulds with clay as stiff as I proposed, was the first difficulty encountered, and here many thought that I should fail. It is indeed astonishing how much this increases the resistance compared with the soft mud as usually worked, and what power is necessary to overcome it. After numberless experiments, which it would be tedious to recount; the section of a screw applied in a peculiar way accomplished the object, and since it was adopted not a single failure has occurred.

But then the communication between the sixteen moulds first filled, and the body of clay in the box, must be broken as the train passes along the railway; and this presented a far greater resistance than I had anticipated. After repeated trials and many disappointments, a combination of gearing secured this also, and finally, having perfected some minor details, chiefly in the mode of management, the machine has been put in full operation to the satisfaction of all who have witnessed it.

I send you specimens of the burned and unburned, and call your attention particularly to the solidity and closeness of the texture, not unlike stone, as an evidence of the great pressure under which the clay is thrown together.

The steam machine, driven by a six-horse engine, works six moulds in a frame-maker three and a half revolutions per minute, giving 1260 bricks per hour. The work is all done by common laborers, chiefly boys. Supposing the clay dropped at the machine, it requires one man at the pulverizer, three boys to dust the mould and return them to the machine, two boys to off-bear, and three boys to wheel the cars to the yard and set the bricks in the sun. Each car carries forty bricks: cost of the machine, including patent right, $500.

The smaller machine is moved by one horse attached to a twelve-foot lever; it makes three revolutions per minute, throwing out four bricks each time, giving 720 per hour. In this the pulverizer is omitted, as it would render it too complicated. For this purpose the clay must be thrown into a heap and well saturated with water twelve hours previous; the machine does the rest. I can see no difference in the quality of the brick made by either: cost, including right, $250.

To make "gluts" for fronts, a separate train of mould must be prepared, made a fourth of an inch deeper, and a fraction less in width and length. If a suitable shed or other building is prepared for the purpose, all this part of the operaaion may be done in rainy weather, and thus afford constant employment to the hands. Twenty-four hours after being moulded, the "gluts" are ready for the hand press

I have in contemplation another improvement, which, as it is not yet fully proved, I will merely mention. The present speed is all that can be allowed to enable the boys in front to work the pistons and pass off the bricks; when made of stiff clay they are square and true—very nearly if not quite equal to the common latch mould front. But when quantity, instead of quality is desired, I propose to have an extra train of moulds with fixed bottoms: to work the clay soft, as in other brick machines—pass the moulds immediately off to the drying floor, and throw them down flat. They will of course be no better than other moulded bricks except as to the clay being better tempered, but as there are no pistons to work, and no interruption in front, the speed may be double, and consequently the quantity of bricks increased in like proportion. Francis H. Smith.

Baltimore, August 12, 1852.

[We have seen specimens of the bricks referred to above; they are of a very superior quality. In the course of a few weeks, we shall publish an engraving of the machine.

Elementary Mechanics.

Strength and Strain of Materials.—The materials employed in machinery are subjected to four different kinds of stress or strain, by which the force of cohesion may be ultimately overcome, and fracture ensue.—These are, 1. Tenison, or any stretching force, by which they may be torn asunder, as in the case of ropes, tie-beams, king-posts, &c. 2 Transverse Pressure, or any breaking force acting perpendicularly or obliquely to the direction of their length, as in the case of levers, joists, &c. 3. Vertical Pressure, or any crushing force acting in the direction of their length; as in the case of pillars, posts, &c. 4. Torsion, or any twisting force acting at either or both extremities of a beam or rod, such as the axle of a wheel, a screw, &c.

The natural forces, inherent in materials, which oppose the preceding forces, are, Direct Cohesion and Elasticity. Numerous experiments have been made on the direct cohesion of different substances, particularly woods and metals—on their resistance to transverse pressure, and their amount of deflection under a given pressure—on the *modulus* or measure of their elasticity—and lastly, though neither to so great nor so satisfactory an extent, on their resistance to vertical pressure or crushing weight.

The following table contains the mean strength and elasticity of various materials, as deduced from the most accurate experiments; it is the latest that has been published, and it was presented by Mr. Barlow, to "the British Association for the Advancement of Science."

The first column of figures, marked C, contains the mean strength of cohesion on an inch section of the material; the second, marked S, the constant for traverse strains; the third, marked E, the constant for deflections; and the fourth, marked M, the modulus of elasticity.

MATERIALS.		C	S	E	M
Woods		lbs.			
Acacia, - - -			1800	4609000	3739000
Ash, - - -		17000	2026	6580000	4988000
Beech, - - -		11500	1560	5417000	4457000
Birch, common -			1900	6570000	5406000
Birch, American blk.			1500	5700000	3388000
Box, - - -		20000			
Bullet-tree, - -			2650	10512000	5878000
Cabacully, - -			2500	7437000	4759000
Deal, Christiana, -		11000	1550	6350000	5378000
Deal, Memel, -		11000	1730	6420000	6268000
Elm, - - -		5780	1030	2803000	3007000
Fir, New England,		12000	1190	5967000	6249000
Fir, Riga, - -		12600	1130	5314000	4080000
Fir, Mar Forest, -		12000	1100	3400000	2797000
Green heart, - -			2700	10620000	6118000
Larch, Scotch, -		7000	1120	4200000	4480000
Locust tree, - -		20580	3400	767000	4649000
Mahogany, - -		8000			
Norway spars, -		12000	1470	5830000	5789000
Oak, English	from	9000	1200	3490000	2872000
	to	15000	2260	7000000	4702000
Oak, African, -		14400	2000	9500000	55830000
Oak, Adriatic, -		14090	1380	3880000	2257000
Oak, Canadian, -		12000	1760	8950000	5674000
Oak, Dantzic -		14500	1450	4760000	3607000
Pear-tree, - -		9800			
Poon, - - -		14000	2200	6760000	6488000
Pine, Pitch, - -		10500	1630	5000000	4364000
Pine, Red, - -		10000	1340	7360000	6423000
Teak, - - -		15000	2460	9660000	7417000
Tonquin bean, -			2700	10620000	5826000
Iron.					
Iron, cast,	from -	16300	8100	69120000	5530000
	to -	36000			
Iron, malleable, -		60000	9000	91440000	6770000
Iron, Wire, - -		80000			

The use of this table will be exemplified in the following problems, for the demonstration of the principles of which, we must refer the reader to the scientific treasties on Natural Philosophy.

Force of Direct Cohesion, or Tenacity of Materials.—The resistance of a homogeneous body to longitudinal tension or a stretching force is proportional to the area of a transverse section; hence, the centre of tenacity is the same as the centre of gravity of the section. The absolute strength of rods or beams is estimated by the cohesive power of the material of which they are composed. The preceding table exhibits in column C, the force of direct cohesion in pounds avoirdupois for every square inch of area in the transverse section of a beam or rod of the materials enumerated in the first column.

To find the absolute strength or force of direct cohesion of beams or rods of given materials, that is, their absolute resistance to longitudinal tension or strain in pounds—

Rule—Multiply the area of the transverse section of ~~the rod or beam~~ in inches by the tubular number, in the column marked C, opposite the name of the material, and the product will be the strength or resistance required. Note 1.—In practice, the weight or strain should not exceed one-third of the absolute strength according to Barlow, or one-fourth according to Tredgold. Thus, the force which would tear asunder a piece of teak 4½ inches broad and 2 inches thick, is 2×4½×15000=135000 pounds. Hence a longitudinal strain of more than 45000 lbs. would be unsafe in practice. Note 2.—The tenacity of materials of the same kind is proportional to their specific gravity. Hence, a piece of teak, whose specific gravity was 1-20 part less than that of the preceding, would have 1-20 part less of cohesive power.

When the direction of the straining force does not coincide with the perpendicular to the centre of tenacity or centre of gravity of the transverse section, the Rule is modified as follows: Multiply the tabular number in column C, by the breadth and square of the thickness of the beam, both in inches, and divide the product by the sum of the thickness and 6 times the distance of the line of direction from the centre of the section, in inches; the quotient will be the absolute strength required, of which take one-third as before, for the practical load. Note.—In actual constructions, an allowance of one-third of the thickness should be made, for the probable deviation of the direction of the stretching force. The absolute strength will then be one-third of that found by the Rule in the preceding article; and the practical load 1-9 of the same quantity, or 1-12 according to Tredgold.