For the Scientific American.

On Tides.

Having never seen any theory on the subject of tides, which come clearly within my comprehension, (as likely to produce the results we witness,) I therefore take the liberty of sending you a rough and undigested theory, which may probably have neither originality or merit.

Suppose you take a sledge and put a hammer on the opposite ends of the handle, and throw it, (giving them a rotatory motion,) they would revolve round the centre of gravity of the two bodies :—such we suppose to be the motion of the earth and the moon in their orbit round the sun ; therefore the centre of gravity betwixt those two bodies would perform the regular circuit of their mutual orbit ; and as these two bodies are thrown asunder exactly with the same force with which they attract each other, the waters which surround our globe would be disposed to separate in obedience to the centripetal and centrifugal force at 90° from the moon's zenith ; and, if uninfluenced by the sun, would produce tides of equal height at all times on opposite sides of our globe. But as the tides are influenced by both sun and moon, the effect will be, at new moon, (she being within, and the earth beyond the circle of their joint orbit, and consequently moving with greater rapidity, thereby increasing the centrifugal force,) to raise a tide equal to that on the side next to the sun and moon ; and at full moon, the earth being within the circle of their mutual orbit, consequently moving with less velocity, yet producing an equal tide from this attraction of sun and moon on opposite sides ; at the quarters, when the earth and moon are both on the circle of their mutual orbit, the attraction and centrifugal force of the sun and moon counteract each other, and the tides we then have are entirely produced by superior lunar influence.

We do not suppose the mutual attraction, which holds the earth and moon together, and the centrifugal which keeps them asunder, can raise the water in opposition to gravity, but that they act laterally, moving the whole body of water, and as it requires an exertion of force for some time to overcome inertia, the swell of tide does not take place when the moon is in the zenith, but about two hours afterward, to illustrate this better, you can draw a boat of 100 tons at right angles to gravity, but cannot lift it in opposition.

Upon this theory the water is attracted and thrown from the poles of the earth without much opposition from gravity ; hence the flattening of the poles and the high tides which we experience so far equatorial as 48 or 50 degrees. The inequality of tides in the same latitudes is owing to local causes—forms of coasts, inlets of water from polar regions, and depth of the ocean at particular places (as the whole body of water must obey the same law.) We find where inlets or bays mouth in a southern direction, that a great inequality of rise and fall is experienced. Suppose such a bay with deep water near its outlet, a small shift of position would empty the bay, which from its form could not be kept up by the moving of water from the North ; in the above instance the inequality of surface would be occasioned by exertion and not by accumulation.

At the equator, the earth is revolving on its axis nearly 1000 miles per hour, therefore a swell of water cannot precede the virtual position of the moon, but must follow it, hence there would be a gradual moving of the ocean from the African to the American coast, and from its angular form the water would be deflected north-westwardly, along the shores of Brazil, Guiana, Venezuela, through the Carribbean Sea, betwixt Cuba, the point of East Florida and the Bahama Islands, forming the Gulf Stream, of which the Banks of Newfoundland are probably the deposite ; thence crosses the Atlantic down the coast of Africa, and again up the Atlantic. The temperature of the Gulf Stream proves it to have arisen from an equatorial climate.

Capt. Wriley attributes the loss of the vessel which he commanded on Cape Bagadore, to the resistance of a strong current down the African coast. WM. WILSON.
Williamsport, Pa.

Coal Saddle Theory.—New Discovery.

We learn by the Mining Journal, (Pottsville, Pa.), that a Mr. McGinnes, of that place, has discovered a way of determining where coal saddles are to be found ; the theory of which is thus explained by our worthy exchange :—

"It has been taken for granted the large seams of white ash coal which are exposed at the Lehigh Summit, forming their great mine, extended under the whole of the Schuylkill coal field, although they appear and are worked only at the Northern edge of it. We conceived that it lay in the shape of a deep and narrow basin, coming up to the surface only at two points represented by the edge of the oblong basin ; and as one of the edges which rises in the Sharp Mountain is shaken and disturbed, it has been considered unworkable.—The only white ash coal therefore, that we have considered available at present is that which comes up to the surface on the Northern (or Mine-hill and Broad-mountain) edge of the basin.

The great supposed depth to which we should have to sink through solid rocks (2500 to 5000 feet) to get at these big veins of coal in the intermediate three miles across the coal basin, would have involved an outlay of money that could not have been made to pay for its cost.

Now the discovery which we record proves, that instead of these big veins making but one curved line, extending at great depths under and across the coal, they form six or seven curved lines ; the upper part of each curve (we call this the saddle) coming up so near the surface as to be easily and cheaply reached by a workable shaft. Thus making these big veins workable through the whole length and breadth of the Schuylkill coal field."

[Speaking of coals, reminds us of saying a few words about their quality. It is a mistaken idea to suppose that all coal from one district or one field, is the same in quality. In the same mine, in different parts of the same vein, the quality of the coal differs, but not in a very great degree, for it may be said, that the quality of coal in one mine, is of the same character. In the coal basins of England and Scotland, the quality of the coal is very various, even in one basin or coal field. The character of the "Hurlet" coal in the Clyde Basin, in Scotland, is totally different from that of the "Firework," a few miles distant ; and the character of the "Farm" mine is different from the "Stonelaw" mine, which are not a mile distant from one another. This is the reason why there is a difference in the quality of the coal received here, from one region. Some people consider themselves imposed on, and receive one kind of coal for another, such as the Lehigh for the Lackawannah, &c. The reason of those differences in coal from the same region, is owing to the variation of the base or material of which the *carboniferous* strata is formed, and also the manner of the formation, for this affects the nature or quality of the products also.

Death of a Sculptor.

Thom, the sculptor, who died in this city on the 18th ult., was celebrated for his pieces of sculpture, "Tam O'Shanter" and "Old Mortality," the last production being the same that meets the eye of the visiters of Laurel Hill Cemetery on the Schuylkill, as they enter the front gate. Thom by birth was a Scotchman, and came to America some twelve or fourteen years ago, in pursuit of a fellow countryman, who brought over the sculptor's celebrated statuary on exhibition, but failed to remit to its proprietor the proceeds of the exhibitions. Mr. Thom, having discovered his false agent, and recovered a portion of the money obtained for the sculpture, concluded to remain in America. He first discovered the beautiful freestone quarry at Little Falls, N.J., of which Trinity Church in New York, is built, and was employed in doing the fine stone cutting for that building. He also produced copies of his celebrated works, from this freestone, and likewise a statue of Burns, and various ornamental pieces. With the profits of his labor he purchased a farm near Romapo, in Rockland County, N. Y., and erected a house after his own fancy, having quite a predilection for architecture. During the latter part of his life he seems to have abandoned a profession in which he might have attained the highest eminence. At one time he possessed considerable money, but it is said that he died poor and left his family in indigent circumstances. He was a man of a powerful frame, and was a most rapid workman, generally executing in a few days works that would take others as many weeks to accomplish.

Thom's "Old Mortality," presides as the frontispiece of Laurel Hill Cemetery, near Philadelphia, and his statues, of "Tam O'Shanter" and "Souter Johnny," adorn the entrance of Mr. Colt's mansion, at Paterson, N. J. When the last two figures were exhibited in this city, John Graham, the blind poet, used to recite with great force that inimitable poem of Burn's, which formed the subject of the sculptor's study. Thom was retiring in his manners, plain and unvarnished, without any literary qualifications, unlike many of his countrymen of the same profession. We have heard that he produced a number of works in his own country, which have only a local not an artistic fame, such as statues of Wallace and Bruce, and one of McGavin, the "Protestant," now in the Glasgow Necropolis.

Antiquities of Ancient Chaldea.

Major Rawlinson has read some papers before the British Society of Antiquaries which have excited a great deal of interest. He appeared with large sculptured fragments, cylinders, statues, and vessels of various kinds, giving explanations of them. On the third occasion he produced, and hung round the walls and covered the tables of the meeting room with, inscriptions taken chiefly from the celebrated rock of Behistan—all in the wedge-form Persian or Babylonian character, including the tri-lingual record which forms the key of the whole. Major Rawlinson entered minutely into the subject, and showed his great acquirements in the unknown and apparently unintelligible chronicles.

Letters, the Times says, have been received from Bagdad, stating that Mr. Loftus, the geologist attached to the Commission which is now employed in the demarcation of the Turco-Persian line or frontier, had succeeded, on his passage from Bagdad to Bussorah, in visiting all the most remarkable ancient sites in Lower Chaldea. From that paper we borrow the following particulars. The ruins now called Werka (the Orchenoi of Strabo,) which represents the Ur of the Chaldees, whence took place the exodus of Abraham, were carefully examined by Mr. Loftus, and were found to be of great extent and of extraordinary interest. A vast number of ancient coffins of baked clay, highly glazed, and covered with figures of men in relief, were discovered in one spot, the coffins being about six feet in length, adapted to the shape of the human body, and with an oval ornamental lid, which closed the upper part ; a moderately sized water-jar was also attached to each coffin. Gold ornaments and other Chaldean relics were said to be frequently found in them ; but those which Mr. Loftus examined had been already rifled, and he had no leisure for excavation. Numerous bricks covered with cuneiform characters were, however, brought away from the ruins by M. Loftus ; together with pieces of terra-cotta, moulded in the shape of a bull's horn, and bearing inscriptions, and several fragments of a hexagonal clay cylinder, inscribed with a long historical record, similar to that deposited in the British Museum, which was found by Mr. Ledyard at Nineveh.

Werka is still traditionally known in the country as the birthplace of Abraham, and its identity with Ur of the Chaldees is established beyond the reach of cavil. Th ruins have been observed at a distance by other travellers, but are unusally inaccessible, owing to the inundation of the surrounding country and the dangerous neighborhood of the Khezail Arabs.

Mr. Loftus is the first European who has ever succeeded in actually visiting this primeval seat of the Jewish race. At the ruins called Hammam, near the Hye Canal, Mr. Loftus obtained a statue of black basalt, bearing two cuneiform inscriptions ; and at Umgheir beyond the Euphrates, he found another statue, representing one of the Chaldean gods —but it was too much mutilated to be worth moving. The commission to which Mr. Loftus belongs, in skirting Susiana, will traverse a country studded with Chaldean ruins ; and discoveries, therefore, may be expected to be made which will be of the utmost importance in aiding the efforts of Major Rawlinson and others to unfold the early history of the East, through the interpretatien of the inscriptions of Nineveh and Babylon.

To Convert Iron into Steel by Cementation.

The iron is formed into bars of a convenient size, and then placed in a cementing furnace, with sufficient quanity of cement which is composed of coals of animal or vegetable substances, mixed with calcined bones, &c.,—The following are very excellent cement :—1st, one part of powdered charcoal, moderately powered, one part of bones, horn, hair, or skins of animals, burnt in close vessels to blackness, and powdered, and half a part of wood-ashes ; mix them well together. The bars of iron to be converted into steel are placed upon a stratum of cement, and covered all over with the same, and the vessel which contains them, closely luted, must be exposed to a red heat for eight or ten hours, when the iron will be converted into steel.

Steel is prepared from bar iron by fusion, which consists of plunging a bar into melted iron, and keeping it there for some time, by which process it is converted into good steel.

All iron which becomes harder by suddenly quenching in cold water is called steel ; and that steel which in quenching acquires the greatest degree of hardness in the lowest degree of heat, and retains the greatest strength in and after induration, ought to be considered as the best.

English Cast Steel.

The finest kind of steel, called English cast steel, is prepared by breaking to pieces bilstered steel, and then melting it in a crucible with a flux composed of carbonaceous and vitrifiable ingredients. The vitrifiable ingredient is used only in it as a fusible body, which flows over the surface of the metal in the crucibles, and prevents the access of the oxygen of the atmosphere. Broken glass is sometimes used for this purpose. When thoroughly fused it is cast into ingots, which by gentle heating and careful hammering are tilted into bars. By this process the steel becomes more highly carbonised in proportion to the quanity of flux, and in consequence is more brittle and fusible than before. Hence it surpasses all other steel in uniformity of texture, hardness, and closeness of grain, and is the material employed in all the finest articles of English cutlery.

Shingling and Manufacturing Iron.

The ore being fused in a reverberating furnace, is conveyed, whilst fluid, into an air-furnace, wher it is exposed to a strong heat, till a blush flame is observed on the furnace ; it is then agitated on the surface till it loses its fusibility, and is collected into lumps called loops. These loops are then put into another air-furnace, brought to a white or welding heat, and then shingled into half-blooms or slabes. They are again exposed to the air furnace, and the half-blooms taken out and forged into anconies, bars, half-flats, and rods for wire, while the slabes are passed, when of a welding heat, through the grooved rollers. In this way of proceeding, it matters not whether the iron is prepared from cold or hot-short metal, nor is there any occasion for the use of finery, charcoal, coke, chafery, or hollow fire ; or any blast by bellows or otherwise ; or in use of fluxes, in any part of the process.

Welding Iron.

This consists in the skillful building of the iron to be welded, in the use of extraordinary large forge hammer, in employing a balling-furnace, instead of a hollow fire or chafery, and in passing the iron, reduced to a melting heat, through grooved mill-rollers of different shapes and sizes, as required.

Common Hardening.

Iron, by being heated red hot, and plunged into cold water, acquires a great degree of hardness. This proceeds from the coldness of the water, which contracts the paticles of the iron into less space.