(For the Scientific American.)

Explosion on the Steamboat Metropolis.

In a late number of the SCIENTIFIC AMERICAN, on page 245, we noticed some remarks in reference to the explosion of the *Metropolis*, which occurred on the 27th March last, at at West Columbia, on the Ohio River,—which are incorrect, but for which we do not suppose you are to blame, as misrepresentations have been made to you.

You say, "This accident has been attributable to a defect in the metal of the boiler, which is stated to have been tested by the hydrostatic pump, and to have withstood 216 lbs. pressure before she started on her last trip from Pittsburg to New Orleans. It is also stated that the steam in the gauge, when the explosion took place, exhibited only 110 lbs. pressure, and two sheets only in the center of the boiler was all that was torn away. There was no deficiency of water in the boiler, and no evidence of any sudden great increase of steam at the time of the accident."

The *Metropolis* was a new boat, on her first trip, she had been inspected at Pittsburg, and her boilers were tested up to 210 lbs. pressure, and the limit of her working pressure was 133 lbs., as the boilers are 38 inches in diameter, and 14-48ths of an inch in thickness. The next day after the explosion the boat was towed to this place, when we immediately repaired on board, and made a thorough examination and investigation as to the causes of the explosion. She had three boilers, and it was the starboard one that exploded. The place that first gave way was on the 4th rim from the forward end, about 12 inches from the bottom of the boiler, and on the starboard side. The 4th, 3rd, and part of the 2nd rims from the forward end were entirely torn loose from the other part of the boiler, and spread out nearly to a plane surface. There was not a particle of defect about the iron, and no doubt it was of the best quality when manufactured. At the point that gave way, the iron, under the influence of heat and pressure, was bagged down and pressed out to an eighth of an inch in thickness, which was less than one half of its original thickness. From the marks left inside of the boilers, it was quite evident that there was not more than five inches in depth of water in the boiler at the time of the explosion, which was therefore produced in consequence of the scarcity of water, and which would not have occurred with proper management. We therefore revoked the licence of the engineer who was on watch at the time.

It is true that the explosion occurred with about 110 lbs. by the steam gauge, notwithstanding the boilers a few days previous had been subjected to a pressure of 210 lbs. at Pittsburg; but this can be very easily accounted for in the following manner: At the time of the explosion, the tenacity of the iron was so much destroyed, by over-heating, that 110 lbs. pressure was sufficient to separate the particles of iron. No doubt the same boiler, with a proper supply of water would have sustained a pressure of more than 300 lbs. to the square inch, Yours truly,

T. J. HALDIMAN,
W. W. GUTHRIE,
Local Inspectors.

Cincinnati, April 18, 1856.

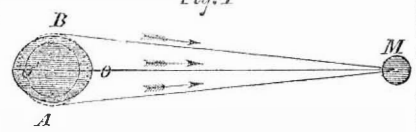
[For the Scientific American.]

The Tides.

The tides are the alternate rising and falling of the waters of the ocean at regular intervals. The rising of the water is called "flood tide," and when the water has attained its greatest elevation it is called "high tide," or "high water." The falling of the water is called "ebb tide," and when at the lowest point, it is then said to be "low tide," or "low water." The interval of time between any two successive high or low tides, at any place, is about 12h. 25m. The water rises for six hours, and then begins to fall, and falls for six hours more; it then begins to rise again, and so on continually. The tides pass round the earth from east to west, with the apparent daily revolution of the moon. Hence it is seen, that when there is high tide at any place, there must be a high tide on the opposite side of the earth; and the same is true in respect to a low tide.

The cause of the tides is the unequal attraction exerted by the sun and moon upon different parts of the globe. We will begin explaining this phenomenon, commencing with the moon.

Fig. 1



Let M, in the figure, represent the moon; E the solid portion of the earth, and A O B and A O′ B the ocean. Under the influence of the attraction of gravitation, alone, the waters on the different parts of the globe would be of the same specific gravity, and would remain of the same hight, as shown by the dotted lines in the figure. But on the side of the earth, towards the moon, the attraction of the earth is in part counterbalanced by the attraction of the moon, and the water is thereby made *lighter* at O; while at A and B, the moon's attraction acting nearly at right angles to the earth's attraction, the weight of the water at these two points is not diminished, but rather increased; the equilibrium of the waters is thus destroyed, and those at A and B *displace* those at O, causing them to become *higher*, while those at A and B *sink lower*, until the equilibrium is restored. We have explained the cause of the high tide on the side of the earth towards the moon, and will now proceed to explain the causes of the high tide on the side of the earth opposite the moon. This is also owing to the lunar attraction. Every particle of matter belonging to the earth is attracted by the moon with a force which varies inversely with the square of the distance of the particle from the center of the moon. Consequently the waters at O′ are less attracted by the moon than any other part of the globe. As the moon's attraction at O′ is directed towards the earth's center, a deficiency of lunar attraction at O′, necessarily diminishes the gravity of the water at O′. To make this plainer, suppose a cubic foot of water at O′ to weigh 62 pounds, i. e., to be attracted by the earth with a force of 62 pounds. The cubic foot of water also attracts the earth with a force of 62 pounds. Now the water at O′ is attracted by the moon 1-31 less than the mass of the earth. The tendency, then, of the moon's attraction, is to separate the earth from the water at O; in other words, to make the water at O′ lighter. According to the above, the weight of the cubic foot of water would be diminished 1-31 of the moon's attraction upon the earth. The waters at O′ having had their specific gravity diminished, they are pressed upwards by the water at A and B, until equilibrium is restored. This produces high tides at O and O′, and low tides at A and B, all at the same time.

The sun also, as has been said, exerts an influence in producing tides. This influence, which acts in the same manner as that of the moon, is about two-fifths less than the lunar influence. We see, then, that the sun and moon produce tides in the ocean, independently of each other. These bodies, however, are continually changing their relative positions in the heavens, and on this account their separate actions are at alternate periods of time united and opposed to each other. The sun and moon act together when the moon is at the syzygies, or at new and full moon, and their separate influences are then united, producing a tide wave equal to the sum of their separate actions. These are called "spring tides." Twice every month, when the moon is at her first and third quarters, the sun and moon oppose each other in their action, and the effect is to raise a tide equal to the difference of their separate influences. These are called "neap tides." Spring tides are the highest flood and ebb tides, and neap tides, the lowest flood and ebb tides. The hight of the lunar tide wave being about five feet and the solar two, the average hights of the spring and neap tides will be in the ratio of 7 to 3.

As we have said, there exists a marked correspondence between the motions of the tides, and those of the moon. And, if the waters moved with perfect freedom, the lunar tide wave would be the highest at any place when the moon was on the meridian of the place But the waters, on account of their inertia, do not immediately obey the impulse given them, under the solar and lunar influences. It thus happens that it is not high water at any place till several hours after the moon has passed the meridian. Not only does the tide lag behind the moon, but inasmuch as the moon rises 50 minutes later every night, as she advances eastward in her orbit, high or low water is about 50 minutes later, in reaching any particular meridian, than on the day precedin

The tides are not always of the same uniform hight at any place, but, in consequence of the moon and sun continually changing their relative positions, greatly vary. One of these causes has been explained in treating of the spring and neap tides. Another cause is found in the declination of the moon and sun. Were the sun and moon always to remain in the plane of the equator, the tides would be continually highest at the equator and lowest towards the polar regions, inasmuch as the highest point of the tide wave tends to place itself directly beneath the body which raises it. But these two bodies are not thus situated, since, owing to the obliquity of the ecliptic, they have an apparent motion north and south of the equator; the sun departing from the equator each way 23 1-2 degrees; while the moon reaches on one side a declination of about 29 degs., and on the other side of about 17 degs. These changes accordingly affect the hight of the tide at any particular place. When the moon has attained her greatest northern declination, the daily high tides will be highest at all those places in the northern hemisphere, where the moon is above the horizon and lowest where she is below the horizon. When the moon has reached her greatest southern declination, the reverse is the case. The tides also vary in hight, according to the distances of the earth and moon at the time when they occur. Take, for example, the spring tides at New Moon. If the earth is at her aphelion distance from the sun, and the moon in apogee, the attraction of both the sun and moon will be less than their average amount, so that there will be but a moderate spring tide; but if the moon is in perigee, and the earth at her perihelion distance, both the sun and moon being at their nearest points to the earth, and in conjunction, will exert their full attractive influence upon the earth; and the spring tide will be unusually high.

The theoretical hight of the tide waves, under the lunar action, is 58 inches, and under the solar action 23 inches. The actual hight of the tide wave is, however, exceedingly various in different parts of the world, owing in some instances, to its being crowded into narrow channels, the union of two tide waves, and to various other local causes. The hight of tides on different portions of the Western hemisphere has been given as follows:—

Bay of Fundy,	60 to 70 feet.
Passamaquoddy River	25 feet.
Boston,	11 feet.
New York,	5 feet.
Cape May,	6 feet.
Cape Henry,	4 1-2 feet.

In the Pacific Ocean it is about two feet; and in some places in the West Indies, it is scarcely fifteen inches. In inland seas and lakes, there are no tides, because the moon's attraction is equal over their whole extent of surface. ALBERT WALDRON.

Breakabeen. N. Y.

To Make Pure Wine of Apples.

Being aware that much wine sold for genuine champaigne was manufactured from cider, we informed a correspondent a short time since of this fact in answer to his inquiry. The following letter was elicited by the reading of the answer referred to:—

MESSRS EDITORS—I am well aware that imitation wines are now extensively made in the State of New Jersey from the juice of the apple, and more from the Harrison apple than from any other variety, and the most of it is made at Newark. Those *knowing* ones are correct with regard to its being a mixture of poisonous drugs not fit for the human stomach.

Having been in the horticultural business for over forty years I have had an eye single to those spurious wines from the juice of the apple.

It is gratifying to me to think that when you come to taste and test my wine—which I send you accompanying this letter—you will find a wine, a pure article, free from all drugs, and not an imitation. The sample I send you is eighteen months old, and made after the following process:

Take pure cider made from sound ripe apples as it runs from the press. Put 60 pounds of common brown sugar into 15 gallons of the cider and let it dissolve, then put the mixture into a clean barrel, and fill the barrel up to within two gallons of being full with clean cider; put the cask in a cool place, leaving the bung out for 48 hours; then put in the bung, with a small vent, until fermentation wholly ceases, and bung up tight, and in one year the wine will be fit for use. This wine requires no racking, the longer it stands upon the lees the better. STERNE BRONSON.

Elkhart, Ind., April, 1856.

[It will be observed that our correspondent has, for the benefit of all concerned, described the method of making pure cider wine, and it is for us to say something regarding the sample he sent us. It is a good cider wine, the best we ever tasted. If it had any fault, it consisted in being a very little too sweet. This can be remedied by using less sugar than the above named amount. A barrel of cider contains 31 gallons. Wine from currants can be made in the same manner exactly.

Great Iron Works—The Largest Water Wheel in the World.

The *Northern Budget* (Troy, N. Y.,) states that the largest water wheel in the world is that of H. Burden, at the Albany Nail Works, on Wyanskill Creek, near Troy. The fall is 75 feet, and the power of the wheel equal to 1000 horses. It drives machinery which works up annually 10,000 tuns of iron into horse-shoes, spikes, nails, rivets, &c., in the different buildings into which the power is distributed, viz., iron foundry, horseshoe factory, rolling mill and puddling forge, cut-nail factory, machine shop, cooper shop, &c., leaving a power equal to that of 400 horses to be applied for additional purposes. 15,000 tuns of coal are used annually, and 3,000,000 tuns of ore. The business amounts to from $950,000 to $1,000,000 a year. The wheel is an overshot, built on what is called the "suspension principle." It is a noble piece of millwrighting, and does credit to those who put it up.

On the same stream are the Iron Works of Corning, Winslow & Co., which has a fall of 75 feet distributed between three dams. A portion of the works—viz., a rolling mill and puddling forge—are worked by steam, while another rolling mill, a wagon, carriage, and car-axle factory, and spike and nail factory are run by water. This establishment employs on an average 500 hands, works up annually about 11,000 tuns of iron, and uses from 16,000 to 17,000 tuns of coal; also 1500 tuns of ore brought down from Port Henry on Lake Champlain. It does a business of a million a year, and pays out probably $180,000 a year for labor performed on the premises—or nearly $3500 a week.

Ships of the Desert.

A number of camels are daily expected from Arabia, and the effort of naturalizing them will be first attempted in Texas. We hope the experiment will be a successful one. We require such "ships of the desert" for traveling over the plains on the east side of the Rocky Mountains.

The great suspension bridge across the Mississippi at Rock Island, it is said, occasions a detention of steamboats, and has become an object of dislike to the steamboat companies.

Young cotton has been injured in some parts of Georgia, by late frosts.

A new line of French steamers have commenced running between this port and Havre. The first steamer of the line, named the *Alma*, arrived here last week.

The sum of $175,000 has been subscribed at Covington, Ky., to build a bridge over the Ohio river.