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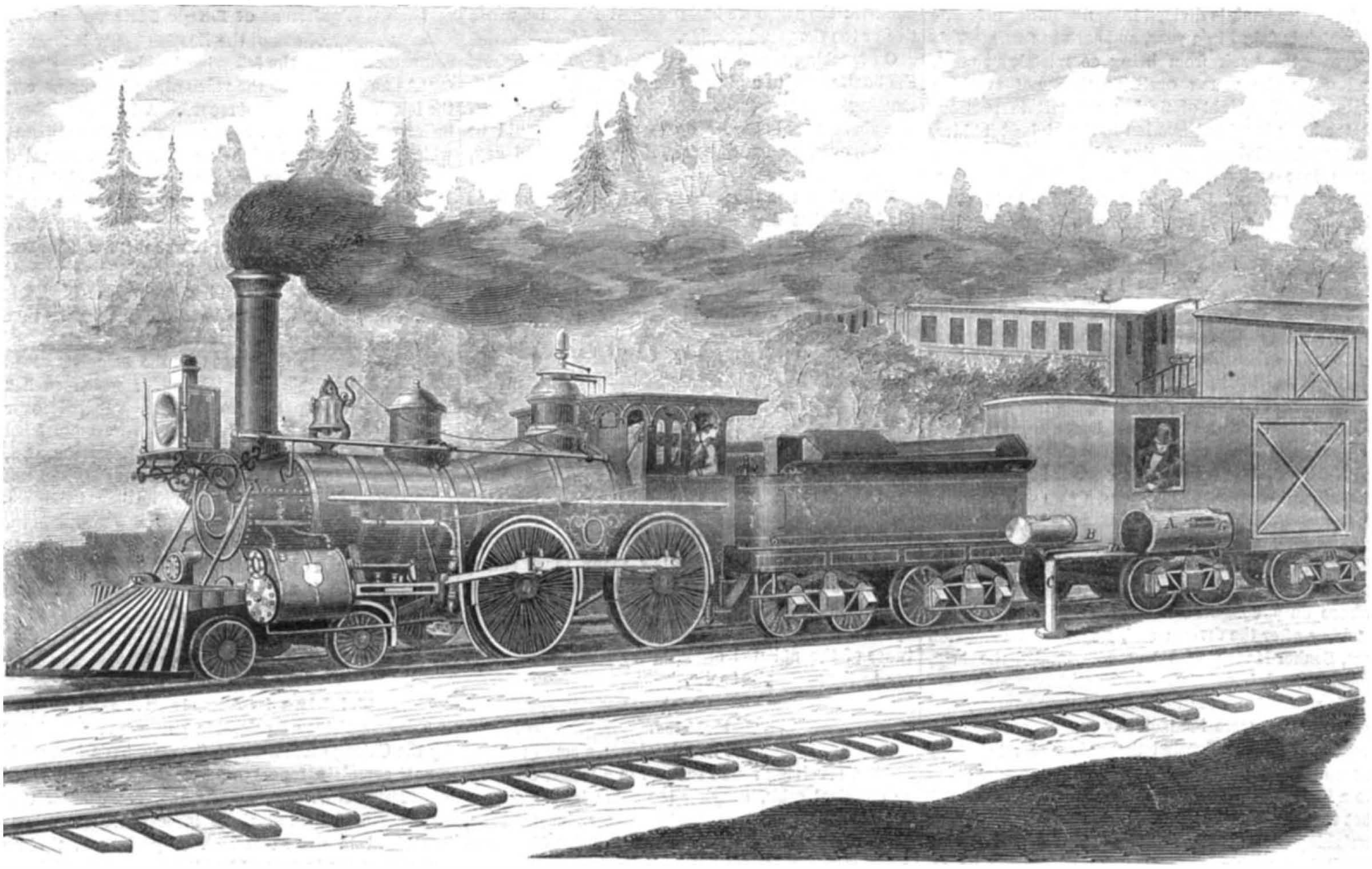


CHAVANNES'S APPARATUS FOR DELIVERING AND RECEIVING MAIL BAGS ON MOVING TRAINS.

Apparatus for Receiving and Delivering Mail Bags with the Train in Motion.

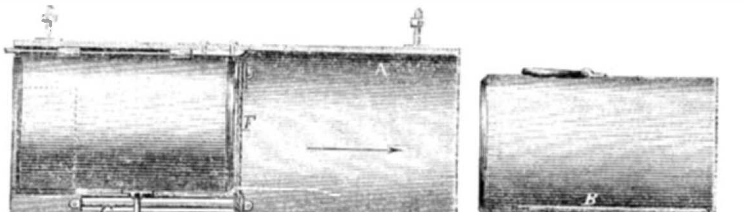
In many parts of the country the post offices are some distance from the railroad, and the stoppage of trains merely to deliver the mails is a costly piece of business. Not only are three or four hundred persons detained on their journey, but the pecuniary loss involved arising from the waste of power in checking the momentum and then overcoming the inertia of a heavy train on starting, soon reaches a considerable figure.

In order to avoid this continual expense it has been suggested that the mail bags might be caught, or snatched in a twinkling, as the train thundered on without pausing in its passage. In some parts of England, we are given to understand, this scheme has been carried out in the following manner—our informant did not observe the arrangement very closely and does not vouch for its accuracy:

By the side of the track a substantial post is erected with a projecting arm; from this the mail bag is suspended at the proper hight. On the train is another arm which can be lowered down. At all other times it is safely housed. When the mail is to be caught, this arm on the train has a stout net on it which is so adjusted with reference to the bag that when the two come in contact the bag will be caught and detached from its position; remaining in the net both by its own weight and the pressure exerted on it by the air.

A plan similar to this is here given, but it is much more certain in its operation. The details are shown in the small figure, while the position of it when in operation is shown in the perspective.

A cylinder, open at both ends, is connected horizontally to the side of the mail or post-office carriage of the train. The mail to be delivered from the train is placed in a cylindrical case, A, or mail bag; this mail bag is placed in the rear end of the cylinder, and is supported therein by loops on its exterior, being slid on to a rod fixed to the top of the cylinder, A. The forward end only of the rod is fixed to the cylinder, so that the loops by which the mail bag is suspended may slip freely off its rear end, and permit the mail bag to pass out the rear of the cylinder.



The mail bag to be picked up by the train is placed in a similar bag or case to that which contains the mail to be delivered, and the bag rests, or is supported on parallel rods, B, carried by the arm, C, which stands at the side of the line of rails The arm is placed in such a position that the mail bag supported by it will be raised into the cylinder carried by the mail carriage as the train passes. The cylinder for this purpose is made of sufficient internal diameter to allow of the mail bag or case entering the cylinder in spite of any rocking motion there may be in the carriage. A slot is also formed through the bottom of the cylinder from one end to the other, so that the bottom of the cylinder may not come in contact with the arm which supports the mail bag to be picked up. When the latter enters the cylinder, the mail bag to be delivered (which has previously been placed in the cylinder) strikes against the mail bag to be picked up, and imparts its momentum to it, so that the bag to be delivered passes out of the rear end of the cylinder, while the other remains in the cylinder and is carried on within it. The mail bag which passes out of the cylinder is received on a rod, D, which passes through a ring, E (see Fig 2), on the under side of the bag. This rod is supported by the arm which carries the bag to be picked up.

To insure that the mail bag to be picked up by the cylinder shall not pass out at the rear end, a net work or partition of tarred ropes, F, is placed across the center of the cylinder. This net work is connected to the cylinder by rings or eyes which run on rods, G, within it, so that the net work may be capable of sliding backward a distance toward the rear end of the cylinder.

Each of the mail bags is furnished with a buffer or pad at its end so as to lessen the blow of the two bags when striking against each other, and in order, that the contents of them may be preserved from the violent action which would otherwise occur.

These are the main points, and the operation of them is readily understood.

It was patented through the Scientific American Patent Agency, by Andre Chavanne of Paris, France, on July 25, 1865. For further information address Seyton & Wainwright, 30 Wall street, New York.

WHAT I SAW OF THE PEARL FISHERY.

The *Liesure Hour* publishes a long communication with the above title, giving the writer's experience in the island of Ceylon, but the following extract is all that relates strictly to the subject of pearl fishing:

We found Condatchy Bay the scene of much animation; for more than one hundred and fifty boats, principally from the Coromandel and Malabar coasts, had reached the bay, and their crews were making preparations for engaging in pearl fishing, which was not to commence until the 16th of the month, three days after our arrival.

An oyster bank is divided into five parts, only one of which is fished in a year, and each in turns. This prevents the bank from being completely stripped, and gives the young oysters a chance of reaching maturity. The right of fishing on certain portions of the bank is sold at auction to the highest bidder, and purchased by speculative merchants, who generally lose money in the business. This, however, does not prevent them from engaging in it, since there is a chance of a large fortune being made at it in one season.

Each fishing boat is manned by twenty men, beside a *tindal*, or man acting as pilot, who has authority over all the others. Ten of the twenty men are divers; the others attend on them, pull the boat, and perform all other duties.

The oyster banks off Condatchy are about twenty miles from the shore; and early on the evening of the 15th more than a hundred boats were manned by men anxiously waiting for the signal for them to start for their respective fishing grounds.

At ten o'clock in the evening a gun was fired at Arippo. It was a signal that the boats might start; and setting a sail to catch the land breeze, then fairly on its way for the sea, we started. I had consented to form one of the ten of a boat's crew, whose duty consisted in managing the boat and looking after the divers; and, on our first excursion out, Senhor Manos, who had commanded the brig, was our *tindal*, or pilot.

We reached our station a little before sunrise, and preparations were immediately commenced for business. The divers divested themselves of all clothing except a small piece of calico about the loins; and to a belt around the waist each fastened a small net to hold the oysters. Each had a piece of iron weighing about ten pounds, to which was tied a small line with a loop in which a foot could be inserted. These weights were to enable them to descend with greater rapidity to the bottom; for, as they could only remain under water from one minute and a half to two minutes, it was necessary that no time should be lost on the way down.

One end of the small line attached to the weight was retained in the boat, to enable us to recover the weight after the diver had reached the bottom and withdrawn his foot from the loop. Although there were ten divers in each boat, only five went over at a time. This enabled each to have a rest, and still kept the work constantly going on.

Each man before going over had placed around his body, under the arms, a line by which he could be pulled to the surface, the end of the line being held by one of the crew in the boat; and as an additional precaution against danger, a line was hanging from the stem of the boat, and sunk with a weight to the bottom.

With a knife in one hand, and firmly grasping the nose with the other, five of our divers went over the side, and rapidly disappeared below, while those in the boats saw that the lines attached to their bodies ran out clear, and stood ready to pull them up, should the signal be given for us to do so.

This was the first work of the kind I had ever seen performed, and the minute and a half or more in which we waited for the shaking of the lines, which was the signal for us to haul up, seemed to me a period of nearly ten minutes.

All came up within a few seconds of each other, and each had not less than one hundred oysters in the net. The diver attached to the line I was holding was the first to make an appearance, and required much more force in pulling him up than what I thought was necessary; but as he reached the surface, the reason of this was immediately seen. He was bearing in his hands a mass of oysters adhering together, which he had succeeded in detaching from a rock with his knife. The mass could not have weighed less than forty pounds.

The other five divers immediately went down; and in this way the work was carried on until noon, the divers having gone down about forty times each since the time they commenced in the morning. The sea breeze had then commenced blowing, and we started for the shore.

Thus far we had been fortunate; and yet there was a possibility that in the many bushels of oysters we had secured there might not be a pearl of the value of one shilling. But with this possibility there was another: the cargo we had procured might be worth five or ten thousand pounds.

On reaching the shore the oysters were taken from the boat, put into a pit, and then covered over with matting and some earth, there to die and decompose. The shells would then be open, when they would be picked over, and the pearls, if they contained any, would be extracted.

More than two thousand men had been at work on the banks that day, and many tuns of oysters had been taken from their homes to die.

"What," thought I, "can be the real cause of this labor, this waste of time for a substance that is of no practical use to mankind?"

To many of those I had seen employed that day an answer to this question would have been very simple. They would have told me that they were working for money; but I looked beyond this for the real cause of their toil.

The conclusion at which I arrived may be wrong, perhaps worse—ungallant; for all this wicked waste of time I ascribed to the fact that ladies have vanity. From the result of this infirmity thousands of others have to suffer. It seems that the law of nature, that from the misfortunes of a few many must suffer, applies to pearl oysters as well as human beings; for since being in the fishery I have learned that only oysters in ill health produce pearls; yet the misfortunes of the afflicted bring all from their beds in the sea to the earth pits to die.

Bolides.

A bolide is a planet in miniature: a small mass of matter, revolving round the sun in a longer or shorter elliptical orbit, obeying the same laws and governed by the same forces as the greater planets. Now, suppose the orbit described by a bolide to cross the orbit of the earth, exactly as one road crosses another; and, moreover, that the two travelers reach the point of junction or crossing at the very same time. A collision is the inevitable consequence. The bolide, which, in respect to size, is no more than a pebble thrown against a railway train, will strike the earth without her inhabitants experiencing, generally, the slightest shock. If individuals happen to be hit, the case will be different. If the earth arrive there a little before or after the bolide, but at a relatively trifling distance, she will attract it, cause it to quit its own orbit, dragging it after her, an obedient slave, to revolve around her until it falls to her surface. Or it may happen that the bolide may pass too far away for the earth to drag it into her clutches, and yet near enough to make it swerve from its course. It may even enter our atmosphere, and yet make its escape. But, in the case of its entering the atmosphere, its friction against the air will cause it to become luminous and hot, perhaps determining an explosion. Such are the meteors whose appearance an enormous hights our newspapers record from time to time.

Be it remarked that bolides are true planets, and not projectiles shot out from mountains in the moon, as has been conjectured. A projectile coming from the moon would reach the earth with a velocity of about seven miles per second. But the most sluggish bolide travels at the rate of nearly nineteen miles per second, fast goers doing their six-and-thirty miles in the same short space of time. None of the inferior planets travel so rapidly as that. Mercury, the swiftest of them all, gets over only thirty miles per second. Mr. Tyndall states that this enormous speed is certainly competent to produce the effects ascribed to it.

When a bolide, then, glances sufficiently close to our earth to pass through our atmosphere, the resulting friction makes its surface red hot, and so renders it visible to us. The sudden rise of temperature modifies its structure. The unequal expansion causes it to explode with a report which is audible. If the entire mass does not burst, it at least throws off splinters and fragments. The effect is the same as that produced by pouring boiling water upon glass. The fragments, falling to the ground, are aerolites. It is needless here to cite instances of their falling. They are of universal notoriety. Aerolites have no new substance to offer us. If the earth, therefore, be made up of atoms, we may conclude that the universe is made up of atoms.—*All the Year Round.*

Weakness of Large Flues.

An engineer of one of the English boiler insurance companies relates the following incident :—

"As an instance of the value of the hydraulic test, the following is worthy of record. A large, one-flued boiler was proposed for insurance with this company, which was in course of being generally overhauled and repaired and also enlarged by the addition of several feet to its length. The old flue tube was 3 feet diameter throughout, ⅜ plates, the new part of tube was gradually enlarged to about 3 feet 4 inches, the total length being about 38 feet. The proposed load on safety valve was 60 lbs. per square inch. It was suggested to the owners to strengthen the tube by angle iron hoops or cross tubes, and their attention was directed to the fact that the calculated load (per Mr. Fairbairn's formula), under which such a flue might be expected to collapse, was little over 80 lbs. per square inch. It was also recommended to apply the hydraulic test after the alterations, etc., were completed. Unfortunately the tube was not strengthened as advised, and on the test being applied, the flue collapsed almost the entire length, when the pressure had reached about 83 lbs. per square inch, thus illustrating most forcibly the correctness of the formula referred to, and the value of the hydraulic test; as, had the boiler been set to work, the flue would in all probability have failed with fearful result."

Trichina in American Pork.

The committee of scientific gentlemen appointed by the Chicago Academy of Science, have just made a very complete report on the origin, growth and disposition of trichina. Their researches show that as many as 10,000 of these insects are sometimes contained in one cubic inch of pork, and that an average of one in every 50 of the hogs in the Chicago market is more or less affected, and the comparative immunity from the disease which our own people have enjoyed, undoubtedly results from the habit of cooking meat before eating it, while in Germany it is eaten raw by the poorer classes on account of the high price of fuel. For its distruction the committee say :—"It is simply necessary to cook it thoroughly so that every portion of the meat shall have experienced a temperature of at least 160 degrees Fahrenheit. We cannot insist too strongly on this point."

Prof. Newman says, contrary to the generally received opinion, birds prefer to fly against the wind. The quails of Europe almost invariably start on their passage of the Mediterranean with a head wind, and if it chops round and blows fresh from the southwest, they are drowned by thousands, and their dead bodies are washed ashore for weeks afterwards. When the wind is abaft, it gets under the bird's feathers in the most aggravating manner, and upsets his equilibrium and equanimity at the same time.

A Cork Ship.—The Mobile papers report the arrival of a great curiosity at that city, a vessel made entirely of cork, which is lying at one of the wharves. That she will never sink may be true enough, but the other claim of the Mobilians, that "she will last forever," requires some proof.

PAPER MADE FROM WOOD.

In our last number we briefly noticed the wood paper works just started at Manayunk in Philadelphia. We regret very much that we were unable to accept the invitation of Messrs. Jessup & Moore to visit the works in company with the large number of gentlemen present on the 12th inst. The N. Y. *Times* supplies the following account of the process, which will read with interest:

The Manayunk Pulp Works, we were informed, were begun in August, 1864, and completed during the present month. The buildings are built of stone and brick, and occupy a space of about 1,000 feet in length by 350 in width, and cost over $500,000. The canal and river are close to them, and the Flat Rock Paper Mills make part of the establishment, which covers in the aggregate ten acres of ground. These are without doubt, the most extensive works of the kind in the world, and are capable of producing from twelve to fifteen tuns of paper pulp per diem, while the straw pulp produced by the Flat Rock Mills averages daily from 7,000 to 8,000 pounds. The works were projected by a company of gentlemen from different parts of the Union, and the subscribed capital is estimated at from ten to fifteen millions of dollars, and the investments, or active capital employed in the Wood Pulp Works and the Flat Rock Paper Mills, is between one and two million dollars. These works will increase the daily production of printing paper about 13,000 pounds, lessening to that extent the consumption of rags, thus diminishing the price of both..

The present process for pulping wood was begun about the year 1850, by Mr. Hugh Burgess. Various improvements have at different times been made in the apparatus, until perfection may almost be said to be attained. The chief part of the process is a secret, but some idea of its wonderful nature can be given by a brief description. The wood which is to be made into pulp is taken into the chopping house, containing two choppers, capable of cutting each over 35 to 40 cords of wood every twenty-four hours. The wood is reduced in these choppers to little chips, which are received in cars and conveyed by an elevator to the boilers, ten in number, situate in a building 75 by 132 feet. These boilers can turn out 300,000 pounds in pulp (dried) in twenty-four hours. Here the chips are boiled in alkali for five or six hours, until the fibers are separated, when the mass, mixed with chemicals, is blown into vats below. The chemicals held in solution are then drawn from the pulp by water, and then the pulp is afterward taken out and bleached in the usual manner. When bleached it is put into a vat in the drying house, when, being diluted with water, it assumes the consistence of weak milk. From this vat it is conveyed through a pipe to a sort of tank, from which it is made to run over a revolving cylinder, and the water being drawn off, the pulp adheres to one side of the cylinder, from which it runs on a blanket to other cylinders, until it becomes dry enough to maintain consistency. It passes over thirteen cylinders before it is sufficiently dry to be cut into sheets. The sheets intended for bookmaking are sent to the mills at Wilmington, while those for newspapers are taken to the Flat Rock Mill adjoining, where they are mixed with straw material, in the proportion of eighty per cent of wood to twenty of straw, to give the requisite degree of softness and tenacity. It will be noticed that in the production of pulp no mechanical action is used, chemical means only being employed.

In all these vast buildings nothing but the smoke that goes out from the chimneys is wasted. The liquid which runs off from the pulp is "recovered" in the round house, a building two hundred feet in diameter. Here are twelve furnaces, from which a blast is carried over the surface of the liquor, flowing in boilers below, which deprives it of its ligneous and other adulterations. The residue, with a due mixture of white ash, is again brought into requisition in the tanks. Whatever there is of residuum after these processes, is employed for manure. Adjoining the round house is an alkali storehouse and a mixing house, and kilns for the manufacture of marble lime required in the alkali department. At the north end is a settling pond to furnish clear water for the works. It is 300 feet square, 10 feet deep, and has a capacity of 5,500,000 gallons. All the mills are worked by water power. The consumption of wood for this establishment may be inferred from the fact that its stock of that necessity on hand at this time is about 15,000 cords. It employs comparatively few hands, most of the labor being done by machinery.

THE SOLAR SYSTEM.

The following catalogue has been compiled expressly for the SCIENTIFIC AMERICAN, and embraces all the members of the solar system known up to January 1, 1866, except those comets whose elliptical orbits have not been well ascertained. Although America was late in the field of astronomical research, she has shared with the old world the glory of some of the grandest discoveries in astronomy. We can claim a new ring and satellite to the planet Saturn, eleven planets, and upwards of twenty comets:

Name.	By whom and when discovered.	Period of revolution.
Mercury	The ancients.	88 days
Venus.	"	225 "
Earth	"	
Mars	"	1 yr 11 m
Ceres	Piazza, at Palermo, Jan. 1801.	4 yrs 7 m
Pallas	Olbers, Bremen, March 28, 1802.	4 yrs 7 m
Juno	Harding, Gottingen, Sept. 1, 1804.	4 yrs 4 m
Vesta	Olbers, Bremen, Dec. 29, 1807	3 yrs 7 m
Astrea	Hencke, Driessen, March 8, 1845.	4 yrs 1 m
Hebe	" " July 1, 1847.	3 yrs 9 m
Iris	Hind, London, Aug. 13, 1847.	3 yrs 8 m
Flora	" " Oct. 18, 1847.	3 yrs 3 m
Metis	Graham, Ireland, April 25, 1848.	3 yrs 8 m
Hygeia	DeGasparis, Naples, April 12, 1849.	5 yrs 7 m
Parthenope	" " May 11, 1850.	3 ys 10 m
Victoria	Hind, London, Sept. 13, 1850.	3 yrs 7 m
Egeria	DeGasparis, Naples, Nov. 2, 1850.	4 yrs 2 m
Irene	Hind, London, May 19, 1851.	4 yrs 2 m
Eunomia	DeGasparis, Naples, July 29, 1851.	4 y s 4 m
Psyche	" " Mar. 17, 1852.	5 yrs
Thetis	R. Luther, Bilk, Ger., Ap. 17, 1852.	3 ys 11 m
Melpomene	Hind, London, June 24, 1852.	3 yrs 6 m
Fortuna	" " Aug. 22, 1852.	3 yrs 9 m
Massilia	DeGasparis, Naples, Sept. 19, 1852.	3 yrs 8 m
Lutetia	Goldschmidt, Paris, Nov. 15, 1852.	3 ys 10 m
Calliope	Hind, London, Nov. 16, 1852.	5 yrs
Thalia	" " Dec. 15, 1852.	4 yrs 2 m
Themis	DeGasparis, Naples, April 5, 1853.	5 yrs 7 m
Phocea	Chacornac, Marseilles, Ap. 6, 1853.	3 yrs 8 m
Proserpine	R. Luther, Bilk, March 5, 1853.	4 yrs 4 m
Euterpe	Hind, London, March 8, 1853.	3 yrs 7 m
Bellona	R. Luther, Bilk, May 1, 1854.	4 yrs 7 m
Amphritite	Pogson, Oxford, Nov. 1, 1854.	4 yrs 1 m
Urnia	Hind, London, July 22, 1854.	3 yrs 7 m
Euphrosyne	Ferguson, Washington, Sept. 1, '54.	5 yrs 7 m
Pomona	Goldschmidt, Paris, Oct. 26, 1854.	4 yrs 2 m
Polhymnia	Chacornac, Paris, Oct. 28, 1854.	4 ys 10 m
Circe	" " April 6, 1855.	4 yrs 5 m
Lucothea	R. Luther, Bilk, April 19, 1855.	5 yrs 2 m
Atulanta	Goldschmidt, Paris, Oct. 5, 1855.	4 yrs 7 m
Fides	R. Luther, Bilk, Oct. 5, 1855.	4 yrs 4 m
Leda	Chacornac, Paris, Jan. 12, 1856.	4 yrs 6 m
Laetitia	" " Feb. 8, 1056.	4 yrs 7 m
Harmonia	Goldschmidt, Paris, March 1, 1856.	4 yrs 5 m
Daphne	" " May 22, 1856.	3 yrs 8 m
Isis	Pogson, Oxford, May 23, 1856.	3 yr 10 m
Ariadne	" " April 15, 1857.	3 yrs 2 m
Nysa	Goldschmidt, Paris, May 27, 1857.	3 ys 10 m
Eugenia	" " June 28, 1857.	4 yrs 6 m
Thestia	Pogson, Oxford, Aug. 16, 1857.	4 yrs
Aglia	R. Luther, Bilk, Sept. 15, 1857.	4 ys 11 m
Melett	Goldschmidt, Paris, Sept. 9, 1857.	
Doris	" " Sept. 19, 1857.	5 yrs 6 m
Pales	" " Sept. 19, 1857.	5 yrs 5 m
Virginia	Ferguson, Washington, Oct. 4, 1857.	4 yrs 4 m
Nemansa	Laurent, Nismes, Fr., Jan. 2, 1858.	3 yrs 8 m
Europa	Goldschmidt, Paris, Feb. 4, 1858.	5 yrs 6 m
Calypso	R. Luther, Bilk, April 4, 1858.	4 yrs 3 m
Alexandra	Goldschmidt, Paris, Sept. 11, 1858.	4 yrs 6 m
Pandora	Searle, Albany, Sept. 10, 1858.	4 yrs 7 m
Mnemosyne	R. Luther, Bilk, Sept. 22, 1859.	5 yrs 7 m
Concordia	" " March 24, 1860.	4 yrs 5 m
Elpis	Chacornac, Paris, Sept. 12, 1860.	4 yrs 6 m
Danae	Goldschmidt, Paris, Sept. 9, 1860.	5 yrs 2 m
Echo	Ferguson, Washington, Sep. 14, 1860.	3 yrs 8 m
Erato	Lesser, Berlin, Sept. 14, 1860.	5 yrs 6 m
Ausonia	DeGasparis, Naples, Feb. 10, 1861.	3 yrs 8 m
Angelina	Tempel, Marseilles, March 4, 1861.	4 yrs 5 m
Cybele	" " March 8, 1861.	6 yrs 5 m
Maid	H. P. Tuttle, Cambridge, Apr. 10, 1861.	4 yrs 4 m
Asia	Pogson, Madras, Ind., Apr. 17, 1861.	3 yrs 8 m
Leto	R. Luther, Bilk, April 29, 1861.	4 yrs 7 m
Hesperia	Schiaparelli, Milan, April 29, 1861.	5 yrs 7 m
Pomopea	Goldschmidt, Paris, May 8, 1861.	4 yrs 5 m
Niobe	R. Luther, Bilk, Aug. 18, 1861.	4 yrs 7 m
Feronia	Peters, Clinton, N.Y., Jan. 29, 1862.	4 yrs 5 m
Clytia	Tuttle, Cambridge, April. 7, 1862.	4 yrs 4 m
Galatea	Tempel, Marseilles, Aug. 30, 1862.	4 yrs 7 m
Euridice	Peters, Clinton, Sept. 22, 1862.	4 yrs 4 m
Freya	D'Arrest, Copenhagen, Oct. 23, 1862.	6 yrs 5 m
Frigga	Peters, Clinton, Nov. 12, 1862.	4 yrs 5 m
Diana	R. Luther, Bilk, March 15, 1863.	4 yrs 3 m
Eurynome	Watson, Ann Arbor, Sept. 14, 1863.	3 ys 10 m
Sappho	Pogson, Madras, May 3, 1864.	3 yrs 6 m
Terpsichore	Tempel, Marseilles, Sept. 30, 1864.	4 ys 10 m
Alcmene	R. Luther, Bilk, Nov. 27, 1864.	4 yrs 7 m
Beatrice	DeGasparis, Naples, Apr. 26, 1865.	3 yrs 9 m
Clio	R. Luther, Bilk, Aug. 25, 1865.	3 yrs 7 m
Io	Peters, Clinton, Sept. 19, 1865.	4 yrs 4 m
Jupiter	The ancients.	11 ys 9 m
Saturn	"	29 ys 5 m
Uranus	W. Herschel, Slough, Mar. 13, 1781.	84 y 10 m
*Neptune	Galle, Berlin, Sept. 23, 1846.	164 y 8 m

*Theoretically discovered by Le Verrier and Adams prior to this date.

PERIODICAL COMETS.

Name	By whom and when discovered.	Period of revolution.
Encke	Pons, Marseilles, Nov. 26, 1818.	3 yrs 4 m
DeVico	DeVico, Rome, Aug. 22, 1844.	5 yrs 3 m
Winneck	Winnecke, Bonne, March 8, 1858.	5 yrs 6 m
Brorsen	Brorsen, Kiel, Feb. 26, 1846	5 yrs 6 m
Biela	Biela, Josephstadt, Feb. 26, 1826.	6 yrs 6 m
D'Arrest	D'Arrest, Leipsic, June 27, 1851.	5 yrs 3 m
Faye	Faye, Paris, Nov. 22, 1843.	7 yrs 4 m
Tuttle	Tuttle, Cambridge, Ms., Jan. 4, 1858.	13 ys 7 m
Peters	Peters, Constantinople, June 26, '46.	12 ys 9 m
Halley		76 ys 3 m
Pons	Pons, Marseilles, July 20, 1812.	70 ys 8 m
Olbers	Olbers, Bremen. March 26, 1815.	73 y 11 m
Tuttle	Tuttle, Cambridge, July 18, 1862.	123 y 11m
Peters	Peters, Albany, N. Y. July 25, 1857.	258 yrs
Tebbutt	Tebbutt, Australia, May 13, 1861.	415 yrs
Bremiker	Bremiker, Berlin, Oct. 22, 1840.	344 yrs
Donati	Donati, Florence, June 2, 1858.	1875 yrs

SATELLITES.

	Earth.	
Moon	The ancients.	
	Jupiter.	
1	Io	Galileo, Padua, Jan. 7, 1610.
2	Europa	" " " "
3	Ganymede	" " " "
4	Calisto	" " " 13, "
	Saturn.	
1	Mimas	W. Herschel, Slough, Sept. 17, 1789.
2	Enceladus	" " Aug. 28, 1789.
3	Tethys	Cassini, Paris, March, 1684.
4	Dione	" " " "
5	Rhea	" " Dec. 23, 1672.
6	Titan	Huygens, Hague, March 25, 1655.
7	Hyperion	G. P. Bond, Cambridge, Sept. 16, 1848.
8	Japetus	Cassini, Paris, Oct. 25, 1671.
	Uranus.	
1	Ariel	Lassell, Liverpool, Sept. 14, 1847.
2	Umbriel	W. Herschel, Slough, Jan. 18, 1790.
3	Titania	" " " 1787.
4	Oberon	" " " "
	Neptune.	
Not named		Lassell, Liverpool, Oct. 10, 1846.
	Rings of Saturn.	
1	Bright ring	Galileo, Pisa, Nov. 12, 1610.
*2	Dusky "	G. P. Bond, Cambridge, Nov. 11, 1850.

* C. W. Tuttle, assistant at the Cambridge Observatory, first suggested, in 850, an interior dusky ring as a true explanation of the phenomenon discovered by Bond.

Schonbein on Ozone.

The rumor which you helped to spread abroad that Schonbein has succeeded in isolating ozone and antozone, attracted, it seems, the notice of the Scientific Association of France, and that learned body invited Schonbein to come to Paris and exhibit his experiments to the wondering gaze of Parisian savans. Schonbein's reply gives us the exact state of his knowledge or belief on the subject, and is worth communicating to English chemists. He says that he has been engaged almost exclusively, and without interruption, in the study of oxygen for thirty years, and during this time he has discovered a number of facts which allow of his drawing the following conclusions:—1. That oxygen may exist in three different allotropic states; 2. Two of these states are active, and opposed one to the other—he designates one of them ozone, and the other antozone; 3. Equal quantities of ozone and antozone neutralize each other to form ordinary neutral or inactive oxygen; and, 4. Ordinary neutral oxygen may be split up or transformed, half into ozone and half into antozone. The experimental demonstration of the truth of these conclusions, however, he admits, is not so simple—as for example, the composition and decomposition of water; and he adds that the experiments necessary for their logical deduction would occupy more time than could be devoted to a single lecture. "Some scientific journals," says Schonbein, "have been badly informed when they asserted that I had succeeded in isolating ozone and antozone in a state of purity. The assertion is without foundation. It is true that for a long time I have made a great number of attempts to arrive at this desirable end, but always without complete success. Ozone and antozone are always mixed with neutral oxygen from causes closely associated with the generation of the two active modifications." The Professor concludes his letter by offering to come to Paris, should it still be desired, and if his health permit, and give a short course illustrative of the whole subject. It is to be hoped he will be invited, and while here, perhaps he might be induced to go on to London, which I do not think he has visited since the year he announced his discovery of ozone.—*Paris Correspondent of Chemical News.*

DR. EBRARD observes that an adult leech, gorged with blood, requires nearly eighteen months in a state of captivity for the process of digestion. Young and free specimens require six weeks or two months.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening, April, 12, 1866, the President, Prof. S. D. Tillman, in the chair.

THE WAY TO MAKE A FILTER.

Mr. Thompson, of Cayuga, N. Y., described his method of making a filter. He divides a deep wooden tub by a tight vertical partition through the middle, perforating the partition at the bottom with numerous small holes. The tub is nearly filled on both sides of the partition with granulated charcoal made from sugar maple, and screened through a mesh of one-sixteenth of an inch, the fine dust being separated by bolting. The foul water enters the tub on one side at the top, passes downward and through the small holes in the partition, and rises upward on the other side, leaving its impurities, both solid and gaseous, in the charcoal.

Mr. Thompson stated that one practical difficulty that he had encountered in filters was the adhesion of the water from cohesive attraction to the walls of the filter, down which it flows in narrow channels without passing through the purifying material. To remedy this he now surrounds the filter on the inside with a series of narrow ledges, sloping downward and inward, which conduct all the water into the body of the charcoal.

The best wood for making charcoal for filters is boxwood, but it is impossible to obtain enough boxwood for the purpose. The wood that comes next to this in excellence is sugar maple, and this, consequently, is employed. It must be burned twice, once under turf, and afterward in a tight retort or cylinder, the combustion being continued till all the gaseous products are expelled.

Charcoal is far better to catch the solid impurities in water than sand, or even than broken quartz. If carefully burned and granulated, so as to preserve the fibrous structure, each one of the little pores may be seen under a microscope surrounded by a serrated edge, presenting the best surface possible for arresting any matter floating in the water. As in addition to this power of mechanically separating the solid impurities, charcoal possesses in the highest degree, the power of absorbing the gases held in solution by water, it is, unquestionably, the best of all materials for filters.

Mr. Thompson said that his filters would occasionally become fouled, and the water for a few days would be unfit to use; the filter would become clear again and the water would be as sweet as ever. He asked for an explanation of this action.

[The explanation is doubtless this: The solid organic matter collects in the filter until it has accumulated in sufficient quantities to induce decomposition, when it gives off carburreted and sulphurreted hydrogen, and the other offensive gases which are the usual products of animal and vegetable decay.—EDS. SCI. AM.]

Professor Everett remarked in relation to the method of preparing the charcoal, that if Mr. Thompson would examine the mode followed by powder makers, he would find it more simple than the one that he had described.

Dr. Parmelee observed that the best filtering is soft brick.

PEAT.

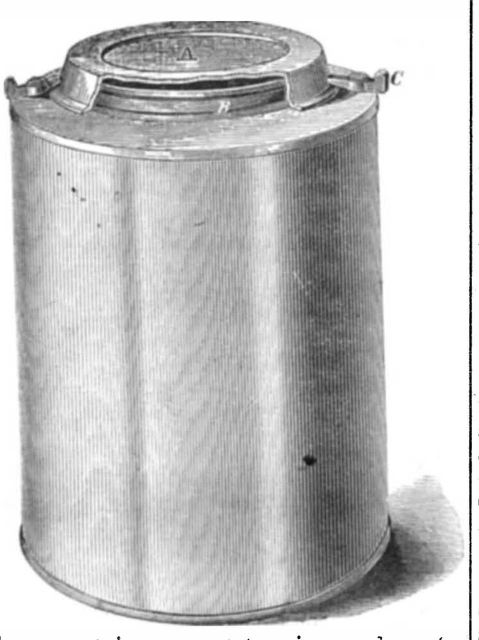
The President announced the regular subject of the evening, which was peat. A long discussion followed, but we report for our columns only the statement of—

Mr. Hirsh. At a previous meeting the assertion had been made that in refining sugar, peat charcoal would decolorize the sirup as well as bone charcoal, and Mr. Hirsh, being engaged as a chemist in a sugar refinery, decided to try the experiment. Into each of seven glass beakers, he put 15 grammes of peat charcoal, and into another beaker of the same form and size 15 grammes of bone charcoal. A glass tube was inserted into each beaker, with its lower end to the bottom of the beaker, and through these the coal was saturated with dark-colored sirup. After standing three hours—the usual time in large operations—the sirup was forced out at the top of the beakers by fresh charges poured through the tubes. That which had passed through the bone charcoal was perfectly white, while that which had passed through the peat was only partially discolored.

Mr. Hyde remarked that the peat used in this experiment had been burned four years, whereas it should be freshly burned.

ILLIG AND NEUBERGER'S FRUIT CAN.

The old way of preserving fruit for winter use was, as all persons know, to use an inordinate quantity of sugar and boil the fruit in the same till it lost all flavor. The result was an unwholesome preparation, totally devoid of the natural flavor of the fruit. A vast improvement on this is the method now in vogue of scalding the fruit and sealing it up hot in its own juice, in cans or jars made for the purpose.



These engravings represent an improved can for the purpose, which is admirably adapted for its object. The can has a tin cover, A, fitting over a projecting rim on the body of it; said rim having a rubber joint or gasket, B, let into a recess so that it cannot slip off. When the fruit is in and properly scalded, the cap is pushed down and immediately seals it up from contact with the air.

It sometimes happens that the steam from the scalding fruit lifts the cover again, so that air is admitted and the contents spoiled unless some one places a weight on top to keep it down; where there are many hundred cans in preparation at once this is a troublesome piece of work, and therefore the inventors provide two small buttons, C, which hold the cover firmly in place and prevent the evil referred to. This can has been in use one season, and is highly approved. The inventors wish to sell State, county, or shop rights to manufacture. For further information address Illig & Neuberger, 137 Clinton street, Buffalo, N. Y., by whom it was patented on April 11, 1865.

PROF. DOREMUS'S LECTURES.

At eight o'clock in the evening of Tuesday, April 17th, the Academy of Music, in Brooklyn, was filled from floor to dome with the best citizens of the place to listen to the first lecture of Professor Doremus's course, which he entitles "Views of Life through the Medium of Natural Science."

These lectures are an enterprise of the Mercantile Library Association, of Brooklyn, which has appropriated $3,500 for the experiments; $2 is charged for admission to each lecture, or $5 for the course of three. The stage was covered with tables loaded with elegant apparatus, all of the largest dimensions, and the scene painter had been employed to produce geological illustrations on a gigantic scale. As the lecturer spoke constantly from eight till half-past ten, it is impossible for us to give a verbatim report of his remarks; we select a few of the more interesting portions:—

THE THREE STATES OF MATTER.

After a brief and eloquent introduction, the speaker said that he should consider matter first in its three forms—solid, liquid, and gaseous, and the relations of these three forms to heat. He would exhibit experiments to show that when matter changes from the gaseous to the liquid state, or from the liquid to the solid, heat is generated; also other experiments to show that when matter changes in the reverse way, from the solid to the liquid, or from the liquid to the gaseous, heat is absorbed, or cold is produced.

THE COLOR OF GASES.

First, he would call the attention of the audience to the properties of gases. They are all transparent, and most of them are white and invisible, though a few are delicately colored. "This vase is filled with bromine gas, which is red, as you see. This contains chlorine, which derives its name from its green color. If I turn this vase over, which contains hydrochloric acid, those near the stage will perceive that some gases are possessed of odor as well as color."

THE WEIGHT OF GASES.

On the stage was a pillar some ten feet in hight, supporting at its top a balance beam about eight feet in length, from the ends of which were suspended scales of the same proportions. On one scale was an empty barrel, exactly poised by weight in the opposite scale. Two assistants took up a barrel of carbonic acid gas, and poured it into the barrel upon the scale. Of course the operation presented exactly the appearance of pouring nothing from an empty barrel; but the carbonic acid, being about once and a half heavier than atmospheric air, was poured as water would have been, and its weight was shown by the immediate tipping of the beam.

The weight of carbonic acid gas was exhibited in another manner not less impressive. A large tank full of the gas had been fixed among the scenes, at an elevation of some fifteen feet, and from the bottom of the tank at the front side a trough, ten or twelve feet in length, inclined downward at an angle of 45°. Two rows of short candles were burning in the bottom of the trough, and just beneath its lower end was hung a light overshot wheel, four feet in diameter, made of paper and laths. At a signal, an assistant, by pulling a string, opened a door in the side of the tank at the upper end of the trough, when the invisible gas flowed downward through the trough, extinguishing the candles in succession, and when it poured from the lower end upon one side of the overshot wheel, the wheel began slowly to revolve.

CARBONIC ACID.

"This vase is filled with carbonic acid. You see that it is as transparent and invisible as the atmosphere. I will dwell for a moment on its properties in consideration of the great part which it performs in the life of our globe. It is composed of carbon and oxygen. When it enters the leaves of vegetables it is decomposed by the force of the sunbeam; the oxygen returns to the atmosphere and the carbon enters into the composition of the grains and the roots that we eat. This gas is the supporter, therefore, of vegetable life—the original source from which we derive the food that sustains our own existence. The oxygen exhaled by the vegetable enters our bodies through the skin, as well as through the lungs, and coming again in contact with the carbon of our food enters into combination with it, and this gas is again produced. By this combination the heat of our bodies is maintained. Like Shadrach, Meshach, and Abed-nego, we are constantly burned without perceptible change. From this gas, then, we are originally formed, and to it principally we return. It is the alpha and omega—the beginning and the end of life."

THE PECULIAR COLDNESS OF SHERRY COBLERS.

Among the experiments intended to illustrate the absorption of heat when bodies are changed from the solid to the liquid state, was one which was thus described, as it proceeded:—

"If I put some water into this tumbler, add a little ice which is at the temperature of 32°, a little sherry wine, and a little sugar, and agitate the mixture till the sugar is dissolved; on introducing the thermometer into the liquid, I find the temperature is several degrees below that of the ice at the beginning. Those who have observed the peculiar coldness of a sherry cobler, will understand that it is due to the absorption of heat by the sugar in passing from the solid to the fluid state."

BURNING OF EXPLOSIVES IN VACUO.

After several other experiments similar to those o which we gave an account last year, the lecturer said that he would exhibit one which, though not very impressive, was of very peculiar interest—this was the burning of explosives when removed from the pressure of the atmosphere. Though gunpowder contained sufficient oxygen to effect its combustion, yet when heated in a vacuum, it boiled away without any explosion; fulminating mercury and other fulminates behave in the same manner. Gun-cotton, if heated to incandescence in a vacuum, is slowly dissipated without combustion. A strip of gun-cotton was then attached to a loop of platinum wire, and placed in a bell glass. The wire was connected with the poles of a small galvanic battery, which soon brought it to a red heat. The lower end of the gun-cotton was charred, and when the current was broken it ceased to glow. The bell glass was then filled with air, and the cotton was taken out; on again closing the circuit the platinum wire was quickly reheated, when the gun-cotton vanished with a flash.

SCALE OF EXPERIMENTS.

Besides the novel experiments exhibited in these lectures, the ordinary class experiments are conducted on a scale which produces the effect of novelty. For instance, in burning potassium on water, a tank was used which extended entirely across the theatre in front of the stage, covering the whole area of the space usually occupied by the orchestra, and the middle of this tank contained several hundred pounds of ice in massive blocks; upon this water and ice half a pound or more of potassium pellets were scattered, producing most brilliant corruscations of violet and yellow sparks and flames, and filling the whole theater with a cloud of potash. Several gallons of liquid carbonic acid was condensed, and the bar of mercury frozen by it was a yard in length and two inches in width. To exhibit the combustion of steel in the blow pipe flame, a whole saw and half of a long sword were burned, the sparks pouring forth in a shower fifteen feet in length.

Professor Doremus has a remarkably clear, loud voice, and every word of his long lecture was heard in all parts of the house. The experiments succeeded each other so rapidly, that the audience was entertained and delighted to the close.

MATCH MAKING.

The query, what becomes of all the pins? might be met with another—what becomes of all the matches? We have often thought that as conveniences multiply and become common, people lose a sense of their value, so that, only those respectable persons, "the oldest inhabitants," appreciate them. In the "flint and steel" days, happily gone by, it was only by dint of much tinder, wind, and patience, that a light could be obtained, and unhappy sufferers in the pangs of colic or others yet more sorely oppressed, waited anxiously for the lucky spark that should fall on the tinder; brightening at last into a ruddy glow to chase away the darkness and the pain together.

Who attaches any consequence to a match? Certainly not he who seizes one at random from the safe on the wall, and curses it if it fails. Not he who finds a bundle of them ready at hand in all places, high and low. But despite the low estimation in which they are held, the manufacture of them is one of the most important of the minor branches of industry, in all countries.

Willis says in one of his poems-

"I am not old, my locks are not yet gray,"

but we can call to mind not long ago when matches were a curiosity and were carefully used, not squandered, as they now are. They were sold at a shilling per box, and in still earlier days at much higher prices. As to the quantity now made, it is something enormous. Even in one factory in this State they use in one year no less than 720,000 feet of pine of the best quality for matches, and 400,000 feet of bass wood for cases. Of sulphur—ill smelling compound 400 barrels are required, and of phosphorus 9,000 pounds. To make the boxes 500 pounds of paper are used daily, and for the larger boxes 8,000 pounds of pasteboard weekly. They also use 66 pounds of flour for paste every day, and the proprietors pay $1,440 for penny stamps daily.

A large factory in England has some peculiar features which are interesting. The wood to be made into matches is cut up into lengths which are afterward divided into the size of matches. These splints, as they call them, are then heated, or slightly charred on the ends, which is said to make them dip better; the paraffine and brimstone, both of which are used in the manufacture, being absorbed better by the hot wood than if cold.

The splints are next carried to one of the framing rooms. There are two of these, each seventy feet long by thirty-five feet wide, proportionate hight, and well ventilated. In these rooms the utmost activity prevails, upwards of three hundred children being employed in placing the prepared matches in frames previous to the combustible mixture being attached to the ends. In each room there are twenty-four tables, each having a stand for twelve persons.

The table is similar to a large school desk, but more upright. An iron frame is placed in a standing position, and from a quantity of matches lying on the flat part of it the framer takes and places a run at the bottom upon a small piece of board with notches in it to receive fifty, at equal distances apart, then piles one board upon another, each run having the fifty notches placed in the grooves, and in a few minutes the task is completed. The whole is then screwed tightly together, forming a compact mass. Each child takes her full frame, and according to her number—each person being known in the building by one—a mark is made on a slate by a person at the end of the room, when at the end of the day the number of frames each has filled is counted and paid for her portion at the end of the week. It is curious to the visitor to hear the constant reports of lucifers being trodden upon, but the floor being either of stone or iron, all danger of fire is done away with.

The room in which the composition is mixed and prepared is called the kitchen, and a very important place it is. Great care is required and the process is performed by two steady and skillful men. The ingredients are given to one of the men, who first mixes it in a pan, dry, similar to a cook making paste and when worked with the hands, sufficiently, is laid upon a stone or iron slab. Water is then added to it and a stiff paste made. It is then placed in pans and a certain quantity of glue added, to make it adhesive to the matches. Steam is used for all the heating processes.

The next process is the dipping, or covering the ends of the splints with the explosive material. A panful of the mixture is taken from the kitchen, and put into a receptacle of hot water, which is kept at a certain heat during the time required. The dipper takes the frames which are brought by the girls from the framing room, and (after the mixture is placed upon the iron slab, and regulated by a gage to about the thickness of one eighth of an inch) dips them into the thin paste, the whole of which is charged with the explosive ingredients.

After the matches have been dipped they are taken by the boys to the drying-rooms. These are three in number, one to each dipper, and they are built with every care for the prevention of accident. The floor is thickly spread with sawdust, which causes the loose matches to sink under the feet and thereby escape friction. The rooms are of arched brick, having double iron doors, and should a fire occur, these doors could be closed, and the ventilators or air-traps at top let down by the dipper, and the rooms hermetically sealed; the fire is then smothered. For every frame taken into the dipping room, one of a two days' drying is taken out to the packers; and from there being 50 splints in a row, boxes containing 100 or 200 are easily filled, very little calculation being required. Nevertheless, it is surprising to see how dextrously the filling is done, as is also the framing; many of the children not being more than nine or ten years of age, and their little fingers acting like clock-work.

The box making is the last round in the ladder, and forms a very good concluding part of the process of making a simple box of lucifers. The wood of the boxes is made of the best spruce-fir, pieces of a sufficient length having been placed upon a movable plane, which travels backwards and forwards upon a railroad. When the plane is cutting the wood it is pulled by steam power along the under surface of the block, it being securely held in its place at either end by screws and blocks. The slices are cut with amazing rapidity, and it requires two of these powerful machines to keep supplied the boys who prepare them for the boxes.

The boys take the slips or slices, and in quick succession place them upon a block which is gaged with thin pieces of metal. They then bring down upon the slice of wood, with some degree of strength, a block indented with a corresponding gage, which marks the grain of the piece of wood, so as to double it up into the shape of the box, and cut it off at the same time. One boy can cut or prepare twenty gross an hour.

Doubtless in our factories there are some improvements on these plans. If so we should be pleased to receive an account of them.

All Things in Motion.

In imagining the ultimate composition of a solid body, we have to reconcile two apparently contradictory conditions. It is an assemblage of atoms which do not touch each other—for we are obliged to admit intermolecular spaces—and yet those atoms are held together in clusters by so strong a force of cohesion as to give to the whole the qualities of a solid. This would be the case even with a solid undergoing no change of size or internal constitution. But solids do change, under pressure, impact, heat, and cold. Their constituent atoms are, consequently, not at rest. Mr. Grove tells us: "Of absolute rest nature gives us no evidence. All matter as far as we can ascertain, is ever in movement, not merely in masses, as with the planetary spheres, but also molecularly, or throughout its most intimate structure. Thus, every alternation of temperature produces a molecular change throughout the whole substance heated or cooled. Slow chemical or electrical actions, actions of light or invisible radiant forces, are always at play; so that, as a fact, we cannot predicate of any portion of matter, that it is absolutely at rest."

The atoms, therefore, of which solid bodies consist are supposed to vibrate, to oscillate, or better, to revolve, like the planets, in more or less eccentric orbits. Suppose a solid body to be represented by a swarm of gnats dancing in the sunshine. Each gnat or atom dances up and down at a certain distance from each other gnat, within a given limited space. The path of the dance is not a mere straight line, but a vertical oval—a true orbit. Suppose then that in consequence of greater sun heat, the gnats become more active, and extend each its respective sweep of flight. The swarm, or solid body as a whole expands. If, from a chill or the shadow of a cloud, the insect's individual range is less extensive, the crowd of gnats is necessarily denser, and the swarm, in its integrity, contracts.

Tyndall takes for his illustration a bullet revolving at the end of a spiral spring. He had spoken of the vibration of the molecules of a solid as causing its expansion, but he remarks that, by some the molecules have been thought to revolve round each other; the communication of heat, by augmenting their centrifugal force was supposed to push them more widely asunder. So he twirls the weight at the end of the spring, in the open air. It tends to fly away; the spring stretches to a certain extent, and as the speed of revolution is augmented, the spring stretches still more, the distance between the hand and the weight being thus increased. The spring rudely figures the force of cohesion, while the ball represents an atom under the influence of heat.

The intellect, he truly says, knows no difference between great and small. It is just as easy, as an intellectual act, to picture a vibrating or revolving atom as to picture a vibrating or revolving cannon ball. These motions, however, are executed within limits too minute, and the moving particles are too small, to be visible. Here the imagination must help us. In the case of solid bodies, you must conceive a power of vibration, within certain limits, to be possessed by the molecules. You must suppose them oscillating to and fro; the greater amount of heat we impart to the body, the more rapid will be the molecular vibration, and the wider the amplitude of atomic oscillation.—*All The Year Round.*

IN the reign of Darius gold was thirteen times more valuable, weight for weight, than silver. In the time of Plato it was twelve times as valuable. In that of Julius Cesar gold was only nine times more valuable, owing perhaps to the enormous quantity of gold seized by him in his wars,

Correspondence.

Solid Iron Floating on Molten Iron.

MESSRS. EDITORS:—In No. 15 of the current volume you give an explanation of the reason why solid iron floats on molten iron. You say that iron, like water, in changing from a liquid to a solid state, expands. If this be so, why is it that all patterns for castings are made one-eighth of an inch to the foot larger than the casting is required to be? Surely, when the molten iron is poured into the mold it is filled completely full, and by taking the caps off from any flask, you will see that the iron, in cooling, has shrunk away from the sand one-eighth of an inch to the foot in every direction. This being the case, a cubic foot of molten iron should be lighter than a cubic foot of solid iron. You say the reason why a pattern must be made larger than the desired casting is that the iron hardens while it is very hot, and then in cooling, shrinks. How do you reconcile this? Does not the iron occupy less space when hard and cold than the molten iron did? is iron when it is cooling not passing from a liquid to a solid state? and is it then both shrinking and expanding at the same time? Does iron continue to expand so long as its temperature of the mass is falling? if not, at what point is it the largest? Or, on the other hand, if it shrinks, at what point is it the smallest? By answering through the columns of your valuable paper, you will oblige your Canadian readers.

N. C. B.

Coaticook, April 8, 1866.

[It seems, in this case, that a few of our readers have failed to apprehend our meaning. Let us try again. Suppose that we have cast iron at a temperature of 2200°, and now pour it into a mold. It will begin to cool and will shrink in bulk, as may be seen by the surface of that in the gate settling. It will continue to contract until it reaches the temperature of solidification, about 1700°. It now changes from the liquid to the solid state, and in undergoing this change it expands. Any founderyman may observe this expansion in the case of a casting which has a large sprue in proportion to its bulk, so that the metal will continue liquid in the gate—as the surface of the metal in the gate will rise at the instant of solidification. Now we have the mold filled with solid cast iron of just the same size as the pattern, but this iron is at a temperature of some 1700°, and we let it cool down to a temperature of 70°. In this cooling, it shrinks about one-eighth of an inch to the foot; hence the necessity of making the pattern larger than the casting. But this contraction is not equal to the expansion which takes place in the change from the liquid to the solid state. The pattern must be made larger because it is made for solid hot iron.—EDS.

A Coin and Feather in Vacuo.

MESSRS. EDITORS:—I have noticed in your valuable paper, under the head of "Notes and Queries," in answer to L. S. B., of S. C., a statement that is exactly the reverse of that which I had supposed was correct. You say, a piece of metal will weigh more than a feather in vacuo. Neil Arnott, M. D., in his "Elements of Physics," Vol. I., page 346, says: "A small weighing beam, having attached to its opposite ends pieces of cork and lead which equipoise in the air, if placed under the receiver of an air pump quickly exhibits the cork preponderating." As I have no means of trying the experiment I cannot demonstrate the fact. Can you give me the philosophy of it? JAS. S. CONANT.

Joppa Village, April 13th, 1866.

[The correspondent to whom we replied, had an idea that the attraction of the earth is magnetism, and in proof of his theory he stated that a coin and a feather, if weighed in a vacuum, would have precisely the same weight, though in the air the coin, of course, would be heavier. In the case of a feather and piece of metal, which are of equal weight in the atmosphere, the one having the largest volume is of course buoyed up more in the air, and on removing the buoying fluid that one will preponderate.—EDS.

Hardening Dies.

MESSRS. EDITORS:—Please inform me the way to temper a steel die so it will not crack off at the edge in tempering. The dies are about two and a half inches in diameter, one inch thick, with the edges turned to one-eighth of an inch thick. I have had edges to fly half off sometimes, and some never crack at all. State whether I should have a composition to temper in. JAMES AYARS.

[The reason that a great many dies crack in hardening is, that they are hammered too much. A practice is gaining ground daily among our best machinists, of making dies directly from the bar or plate, where the size permits, without forging them at all. Dies so made are invariably safer in hardening than when hammered, and they last quite as well. Steel that is hammered, is, in most cases, of unequal density, so that the expansion and contraction in hardening is likely to destroy work. The twist drills of which so many are sold, are never hammered at all. and the manufacturers assure us that they never lose one by springing or breaking in tempering. Compositions, or baths, as they are sometimes called, may be of use in many cases, but cold water is as good as anything for general work. Cyanide of potassium, strewed over the die when hot, and the same plunged into water, will give a superior hardness to a die.—EDS.

Water Wheels for the South.

MESSRS. EDITORS:—We have been favored several times by your kindness in furnishing information on machinery, the address of manufacturers, etc , etc., and we feel much obliged by your attentions. Our Southern country is much in want of all descriptions of labor-saving apparatus, all useful inventions, etc.

Just at present we have pressing demands for a superior kind of patent cast-iron horizontal water wheel; one that possesses a concentration of power at the same time it economizes the supply of water; and is, withal, of cheap and simple structure.

We are not familiar with the merits of the several kinds heretofore used, known as the Jonval, turbine, Tuttle, Stephenson, and others, but believe there are some which are highly commended as certainly superior to all these, and are of comparative late introduction.

Will you be pleased to inform us in particular on the matter and give us the address of proprietors and manufacturers, if not inconvenient to you. The branch of business especially under my charge here is that of machinery, etc. W. G. ATKINSON

Richmond, Va., April 10, 1866.

[There is a great difference of opinion among practical men in regard to the relative merits of the different kind of wheels. We will not undertake to decide the matter, but would advise the different manufacturers to send to our correspondent such facts and figures as will enable him to decide the question for himself.—EDS.

The Long and the Short of it.

MESSRS. EDITORS:—In your last issue in your "Answers to Correspondents," you say that a long screw-driver gives no more power than a short one if the handle is no larger. For the sake of apprentices who can start a screw with the former which they cannot with the latter, allow me to explain what I believe to be the true principle of the "power." It is simply this: the depth of the slot allows them to slightly lean the driver, thus obtaining a longer lever with the longer driver. G. D. M.

Farmington, Me., April 13, 1866.

[Screws are not got out by prying on them with a lever. If our correspondent will take a screwdriver a foot long and another one six inches, with the same handle on each, he will do just as much work with one as with the other.—EDS.

Several Questions.

MESSRS. EDITORS:—Will you please answer the following questions through the medium of your valuable paper? Will it require more power to raise water to a pump which is twenty feet higher than the fountain, than it will to one that is only ten, except what is required to overcome the additional friction of the water in the pipe? A man who puts in a good many pumps, is a good mechanic, and reads the SCIENTIFIC AMERICAN, tries to make me believe that it takes no more power in one case than in the other. His idea is this: With a perpendicular pipe twenty feet long, with the lower end immersed in water, and connected with a pump at the upper end, it takes no more power to work the last stroke before water strikes the piston of the pump, than it does at the first one, when the water begins to rise. I would inquire how many degrees of heat an oven must be to bake bread? I would like to know if it has to be hotter than saturated steam at 30 pounds pressure? Is superheated steam hotter at 30 pounds pressure than saturated?

I have found by experience that a steam pipe covered so as to exclude the air, will rust through from the outside in from three to six months, according to the thickness of the pipe. A two and a half inch pipe, laid under ground in a wooden box, packed with fine charcoal was completely honey-combed in one winter—length of pipe 30 feet. Why is it?

H. P. W.

Lawrence, Mass., April 8, 1866.

[It takes just twice the power to raise a given quantity of water 20 feet that it does to raise it 10 feet. The temperature for baking bread, we believe, is about 220°. The temperature of saturated steam at 30 pounds pressure is 274°; that of superheated steam at the same pressure, is higher. Iron rusts in moist air more readily than in dry air.—EDS.

Taps.

MESSRS. EDITORS:—This is the second letter I have written on the same subject—namely, taps. The first letter I sent you was not published, and it is probable this one will share the same fate. That makes no difference with me, however; your paper is worth to me all I pay for it and more besides. There is one thing sure—the apprentice is in a fair way to gain the desired information on the tap question. Your correspondent, M. N., in the SCIENTIFIC AMERICAN of April 14th, throws no new light on the subject, if we except the taps being larger where it first enters the hole, which is a detriment in many cases. For instance, it will not start nearly so well; especially in cast iron. I would also ask M. N. how many taps in general are used in a machine, for there is a strong probability that the apprentice mentioned was not an apprentice to a bolt maker. M. N.'s theory of turning the tap larger where it first enters, and then filing it off tapering, which makes a wider cutting edge at the start, equalizing the cutting and strain, is right, but taps have been made thus for years where I work. But can you always get one made in that way out of a hole? For instance, in tapping a casting, instead of a nut, M. N. will find his tap not always come out the same road it went in, especially when bolt makers have around it. Yours, P. MCCORMICK.

Newark, N. J., April 13, 1866.

[We admire our correspondent's perseverance and spirit in writing again, and coincide with his views in general. The question of taps, and their adaptation to different works is a wide one, and not to be settled in one or two letters to an editor, or one or two answers to correspondents. Comparatively few taps are used in machines, and when it comes to running down a tap $1\frac{1}{2}$ inches in diameter in cast iron, and $1\frac{1}{4}$ in wrought iron (as is daily done on marine work) it is a matter of some consideration whether it cuts and clears. Many persons will say that a tap must never be turned back, as it breaks the teeth. So it does, if they are not made right, but how is one to get a full or a fair thread without doing so? As we stated first, tools that will cut like razors are easy to make, but those that are durable and conform to circumstances, are the most satisfactory. —EDS.

Popular Remedies for Disease.

MESSRS.—EDITORS:—As the cholera is anticipated here this summer, it is of the greatest importance that any preventive or cure should be made known to the public. An old gentleman who has attended a great many persons sick with the cholera, and who in his business uses the cyanide of potassium, the air in the room in which he works being at all times thick with the fumes or evaporations from it, states that if it had not been for the cyanide of potassium, he would have died long ago of the cholera, and that he is of the opinion that it can be used to great advantage as a preventive and cure. Will you please state through the columns of the SCIENTIFIC AMERICAN your views on the subject?

CHARLES A. GARDINER.

New York City, April 16, 1866.

[The science of therapeutics—the effect of medicines on diseases—is one of the most difficult problems that has ever been undertaken by the human mind. Constitutions differ; what will cure one man will kill another, and very frequently people recover in spite of medicines, instead of in consequence of them. It is only by the method pursued by Lewis, Velpeau, and other modern investigators, that any truths in regard to the effect of medicines can be established. They take large numbers of cases, divide them fairly in two equal portions, treat one-half with the proposed remedy, and leave the other half without treatment, and carefully record the result. We attach no weight whatever to the loose and careless method which usually prevails in observing the effect of medicine on disease. In this case it is our opinion that the man would not have had the cholera, had there been no fumes of the cyanide of potassium around him. There are several persons in this city who are not in the habit of breathing those particular fumes, and who have, notwithstanding, escaped the cholera.—EDS.

Hot and Cold Solutions.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of April 7th, your correspondent "F. T. E" asks the question: "Why does salt not dissolve in hot water in larger quantities than in cold?' He adds: "All *other* soluble substances dissolve more readily in warm than in cold water." "F. T. E." is mistaken in this last statement. About twice as much lime may be dissolved in water at the freezing point, than at the boiling point. May it not be because the lime expands more with a given amount of heat than the water? In this case the particles of lime would be forced further apart by heat than the particles of water, and cold water would dissolve more than hot.

In your article headed "Solid floating on molten iron," you say that Dr. Rowell has observed that several other substances besides iron expand in solidifying, and you mention lead as one of them. I have tried the experiment according to your directions, and think that it is a mistake. The lead floated, it is true, but it seemed to sink a little below the surface of the melted lead. I think it floated for the same reason that needles or iron filings will float on water when not wet on top; that is, on account of the repulsion between the melted lead and the dry surface. If you pour melted lead into a mold, it will be seen to fall in on the surface at the instant of solidifying, showing that it contracts.

CHARLES JANES.

Providence, R. I., April 7, 1866.

Photo-lithograpy with Half-tone.

(From the London Photographic News.)

The production of printing surfaces on stone, zinc, etc., by the agency of photography, has occupied the attention of experimentalists for many years, and in many respects a high pegree of success has been obtained. The process of Mr. Osborne, for the working of which a company has recently been formed in America, gives results in line and stipple which leave little to be desired. Mr. Ramage, of Edinburgh; Mr. Lewis, of Dublin; Col. James, and many others have also attained great excellence in the same direction. Messrs Simonau and Toovey, of Brussels, have attained some success in the production of half-tone, and the attempts of Col. James in the same direction have not been without promise. Still the fact remains, that no process for the actual production of photographs from nature by means of photo-lithography is in practical working, or has hitherto established a position, and that such a process remains an important desideratum, any means of meeting which would be hailed with a glad welcome by all concerned in the graphic arts.

Unless we are mistaken in our estimate of a series of specimens before us, by Messrs. Bullock Brothers, of Leamington, a process which they have recently patented bids fair to meet the long-felt want most successfully, and to render with a fair amount of delicacy, the true photographic gradation of negatives from nature. The subjects before us, consisting of landscapes with variety of foliage and architecture, are exceedingly excellent, and present all the good points of a good photograph, perfect gradation and half-tone, and great brilliancy, differing little in general effect from good silver prints from the same negatives.

Messrs. Bullock have followed in paths already partially trodden, but have made such practical deviations and modifications as have led them to success where others have only failed. Their aim is to secure in the transfer a suitable grain, so as to obtain the kind of gradation possible in lithography, without producing a coarse or woolly effect. Among the various methods by which they propose to effect this end, the plan used in producing these examples seems to be at once the most practical and efficient. A transfer paper is prepared with a plain solution of gelatin, and when this is dry a grain is printed on it from an aquatint plate. Paper so prepared can be kept in stock, and rendered sensitive when required by immersion in a solution of bi-chromate of potash. It is then ready for printing and transferring in the usual manner, and produces on the stone a photographic image, the continuous gradation of which is broken up into the stippled gradation of an aquatint plate. This is the broad principle; but it admits of much ingenious modification in practice, which is so far effective that it produces the most successful and promising examples of photo-lithography with half-tone, which we have yet seen.

New Process for Indigo Dyeing.

Before it can be used for dyeing, indigo must be rendered soluble in alkaline and caustic solutions by being treated by a reducing body; by this reaction indigo loses its color, but after being fixed on stuff and exposed to the air, it absorbs fresh oxygen and returns to its original color. This process, theoretically so simple, is practically complicated by serious difficulties, and requires, on the part of the dyer, much practice and great dexterity. Thus, for instance, with indigo reduced by fermentation with vegetable matters, in a caustic solution, the various acids produced during the fermentation combine with the alkali, the liquid soon ceases to be caustic, and loses the property of dissolving the reduced indigo. To remedy this a fresh quantity of alkali (soda, potash, or lime) must be added from time to time; but should an insufficient quantity be added, a portion of the reduced indigo remains undissolved, and soon decomposes under the fermenting matter. If, on the contrary, an excess of alkali be added, a certain quantity of white indigo is lost by its combining with potash, and forming an insoluble product.

According to M. Leuchs, of Nuremberg, all these objections are obviated by effecting the change from blue to white indigo by pectine. Pectine exists in considerable quantities in the turnips of different species, in pumpkins, melons, etc., it may be extracted from these fruits, or they may even be direcdy used to reduce indigo. The most simple process consists in heating 45 or 50 kilogrammes of the caustic lye to 75° C., adding half a kilogramme of well pulverized indigo, then suspending in the vat a kind of basket of iron wire, containing from 8 to 10 kilogrammes of fresh turnips, cut into small pieces. Then heat gradually to boiling point; the indigo soon loses its color, and the solution decanted into special vats and diluted with water freed from air, will be ready for dyeing purposes. Contact with air must of course be as far as possible avoided.

When the dye bath is exhausted it may serve for a fresh operation by adding indigo, a little caustic soda, and boiling it as above with a certain quantity of turnips.

On the iron wire trellis there will remain hardly 5 or 6 six per cent of the original quantity of turnips. This residue may used in paper making.

The simplicity of this new process may easily be proved by introducing into a closed tube a small quantity of indigo mixed with a few drops of soda or caustic potash, adding a small piece of turnip, and boiling; the indigo will rapidly lose its color, and redissolve and return to its original color by exposure to the air.

As turnips are not everywhere cultivated, and during certain seasons are not to be procured fresh, the author has found that the active principles may be extracted by boiling the turnips with water, under a pressure of two or three atmospheres. C. Leuchs & Co., of Nuremberg, now manufacture on a considerable scale an extract of turnips, 1 kilogramme of which will dissolve cold 4 kilogrammes of indigo. —*Annalen Chem. und Pharm.*

NEW INVENTIONS.

Let-off Motion for Looms.—This invention relates to a let-off motion which is governed by the force with which the batten meets the fabric in striking up, or in other words, by the density of the fabric itself. The invention consists in the arrangement of an angular roller shaft (or a shaft or roller supported by the arms of two cross levers), over which the warp runs, and on the end of which an arm is mounted from which extends a spring bar in combination with a lever carrying one or more pawls which gear into a ratchet wheel mounted on the end of the warp-beam in such a manner, that by the tension of the warp, produced by the latter in the act of beating up, the shaft or roller over which the warp passes, is depressed, and a longitudinally sliding motion is imparted to the spring bar, and thereby the lever, which carries the pawls, is caused to swing back more or less in proportion to the force exerted by the batten on the fabric in beating up; and the pawls are made to take one or more teeth of the ratchet wheel, and as the batten recedes, the angular rock shaft, or its equivalent, returns to its original position, and the lever which carries the pawls is moved back by the action of a spring or by the direct action of the spring bar, causing the pawls to act on the ratchet wheel and to turn the warp beam in proportion to the number of teeth previously taken by said pawls. Samuel Estes, Newburyport, Mass., is the inventor.

Lamps.—The object of this invention is to correct inequality or unevenness in the light of lamps wicks, and also to clear the wick of cinders and of any other matter which obscures the light or hinders the perfect burning of the fluid. It consists in placing around the top of the wick tube a supplementary tube which is pivoted or arranged in such a way as to be capable of being vibrated to and fro, for the purpose of clearing or cleaning the wick and the top of the wick tube from cinder and from any matter that adheres to the tube, and also of being placed in positions out of parallelism with the top of the wick tube so as to bring it into parallelism with the wick, when the latter has been trimmed to an angular line or has been forced up unequally by the wheel so that one side is higher than the other. The supplementary tube is operated by a lever which extends through the side of the burner. Edmund Brown, Burlington, Vt., is the inventor.

Grate Bar.—The object of this invention is to furnish a simple and cheap grate bar, protected by its construction, from vertical or lateral warping from the effects of pressure or heat, to take the place of the complicated and costly grate bars now in use for that purpose. This object is accomplished in a simple and effective manner, by corrugating the rib or lower part of the bar with one or more longitudinal corrugations. George O. Tupper, 23 Abingdon Square, New York, is the inventor.

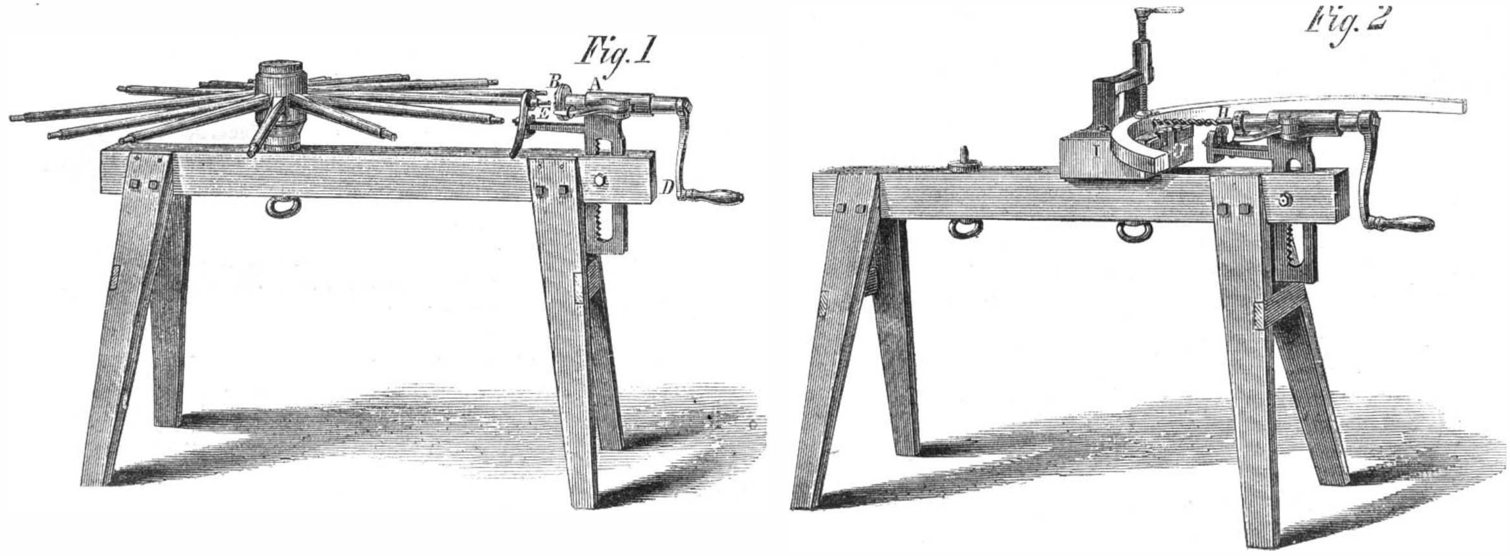
Apparatus for Distilling Petroleum and other Liquids.—This invention relates to an apparatus composed of a hollow drum and steam coil, which are heated by superheated steam, and surrounded or covered by a suitable jacket, in combination with a helical trough, commencing on the top of the steam drum and extending down to its bottom, in such a manner that crude petroleum, or other liquids, let into the top end of the helical trough, are gradually heated and partially evaporated, and those parts of the liquids which reach the bottom end of the trough, in a liquid state, drip down upon the highly-heated steam coil, where they instantly flash into vapors, and the distillation of petroleum, or other liquids, can thus be conducted without interruption, and without danger of an explosion or conflagration. L. V. Fichet, 440 Broadway, New York.

ONE of the strange properties of aluminium bronze is that after being forged it is annealed by precisely the reverse treatment to which iron is subjected, as it is heated to dull redness and then plunged into cold water.

Improved Spoke Tenoning and Felly Boring Machine

Many small wagon makers and wheelwrights scattered about the country, will find the device here illustrated a great advantage to them, since much more work can be done with it and with less exertion than by the common way.

The arrangement consists in applying a small machine to a bench or horse, as shown in the engraving, placing the wheel with the spokes in close to it, and then cutting the tenon on each spoke with rapidity and accuracy. In detail the machine consists of a casting, A, having a mandrel with an expanding cutter, B, on the end which can be set to cut tenons



DOLE'S SPOKE-TENONING AND FELLY-BORING MACHINE.

of various sizes. The mandrel has a series of grooves turned in it, which receive a lever, C, formed to suit them. This lever projects, as will be seen, and is intended to feed the cutter up to the spoke.

By turning the crank, D, and at the same time grasping the projecting lever, the cutter will be revolved and fed up, thus forming a tenon in a short time. The leg of the casting, A, has a rack formed in it in which a pinion, not seen, works. This is to elevate the whole machine so as to suit different hights, and there is an adjustable rest, E, which accurately centers and holds the spoke while being acted on. In Fig. 2 the same machine is shown adapted to boring fellies, a bit being substituted for the cutter shown in Fig 1. There are stops on the adjustable rest at H, which the bit holder brings up against, thus limiting the depth of the hole. At the front of the vise block, I, which holds the felly are two guide irons, J, to keep the same in position when dowel holes are bored. These machines will be found very handy. The invention was patented by L. A Dole, on Oct. 31, 1865. Address Dole, Silver & Deming for further information, at Salem, Ohio.

WESTERN STEAM BOILERS.

Mr. William H. Glynn, an engineer of Dubuque, Iowa, writes us to say that his experience, in regard to priming of Western steam boilers and the malproportion of them, accords with that of Mr. Schaeffer, which was recently published in the Scientific American.

Mr. Glynn states that he has frequently seen cylinders coated inside as it they were whitewashed—the result of priming; and, further, that many accidents also take place from the bursting of steam pipes. This, he thinks, takes place from a sudden checking of the water and steam, by the fall of the steam valve, which induces a sudden strain that the pipe cannot bear. He thinks priming is also caused, in many instances, by opening the throttle too wide, when the cylinder is cold. The steam will be condensed in the cylinder, forming a partial vacuum, which the water from the boiler naturally flows into. He also says that he finds no more trouble in keeping water in tubular boilers than in two flue boilers, if the former are clean.

A Spiritual Invention.

Mr. Frank Chase, of South Sutton, N. H., states that the blind fastener, illustrated on another page of this number, was revealed to him through Emma Hardinge, a spiritual medium, by the ghost of his uncle, a worthy mechanic sometime deceased. Acting upon the hint of Miss Hardinge, he made the fastening, which is certainly a good one, and if done by the spirits, as Mr. Chase claims, is certainly no discredit to their inventive genius. People often dream of valuable inventions, but they do not always turn out so well as they dream they will.

Album for Porcelain Pictures.

Mr. J. C. Spooner, photographist, of Springfield, Mass., has shown us a new album of his invention, designed for porcelain pictures. It has heretofore been impossible to preserve such pictures except in frames, for unless special care is taken the transparency of the picture, which gives it its chief value, is entirely lost. Mr. Spooner makes his albums with a glass front in one part of it, so that by sliding the picture back it can be readily held up to the light and sun and still be preserved from injury. Externally the album is handsomely finished and is so constructed that a number of pictures are alternately exhibited through the same glass.

CHRYSLER'S FRUIT JAR.

Many persons still use cement or wax in sealing fruit jars, and prefer that plan to others, as being cer-

tain under all circumstances. For this mode of closing fruit jars the cap shown in the engraving will prove a very convenient one.

It consists of a pasteboard disk, A, and a tin cap. B. The pasteboard fits tightly to the jar and is almost sufficient in itself to secure the desired end, but in addition to this the cover or cap, A, is placed on top and a small quantity of cement or wax poured in over it. This immediately runs into the groove, C, and makes a perfectly tight joint, while the air, pressing on the top of the cap with great force, keeps the pasteboard disk in close contact with the jar. By the use of the pasteboard the fruit is not injured, as is the case when brought in contact with india rubber, and no wax can enter the jar in sealing or unsealing. It is in all respects simple and reliable.

For further information address J. M. Chrysler & Son, No. 15 Pine street, Lockport, N. Y. Patented Nov. 21, 1865.

A SEVEN-TOOL LATHE.

The London *Artizan*, of April, gives an illustration of a new lathe for turning crank axles. All machinists know that there is a vast amount of work on these, and that it is necessarily slow and tedious. The body of the crank has not only to be cut out, but a vast amount of turning on the bearings beside. Where this is done on a common lathe the job is a long while in it, and both employer and workman get sick of the sight of it.

To expedite the process a lathe has been devised by Mr. Ramsbottom, of the Crewe Locomotive Works, England, which has a tool for every essential part. That is to say, the sides of both cranks are faced at once, making four tools and four slide rests at work on this part; the two bearings are also turned up at once, and one of the ends is faced, making seven tools at work at one time.

It is stated that these tools work well together, and that the workmen have no trouble in attending to them. Of course, since the lathe operates well, comment is superfluous, but it will occur to all practical men that axles cannot be true turned in this way, for the spring of the throw, in passing over, would be likely to cause the tools to jump into the bearings and mar them.

Most, if not all the crank axles in the Crewe Works are now made from Bessemer steel, and by another peculiar machine the throw of the crank is cut out from the blank in about ten hours, which is quick work.

M. Tardirel states, that if a perfectly smooth and polished plate of glass, ivory, or metal is caused to rotate with great velocity in a horizontal plane, it does not communicate its own motion to a highly finished ball which may be placed upon it.

[M. Tardirel need not have inconvenienced himself to have stated that.—Eds.

Good Idea.—On the *Chemin du fer du Nord*, tubular stays have been used for locomotive fireboxes to some extent, the escape of water through the stay showing at once that it has suffered from corrosion. These stays are made by drilling through the solid bar,

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Contents:

(Illustrations are indicated by an asterisk.

FOREIGN AND AMERICAN STEAMERS.

The advertising columns of the daily papers show that there are upwards of twenty five foreign steam vessels leaving this port at various intervals for ports in Europe. All the imports and exports to and from this country are brought by these ships, and the money earned by them goes abroad into the hands of foreign manufacturers, instead of into our own. The smallest repairs needed to the machinery are kept, if possible, until the vessels arrive home; none but the most urgent being made here.

Whatever the commercial cause of our maritime decline and fall may be, it certainly cannot be laid at the doors of our engineers. It is not that our vessels are so much more costly to run than foreign ones that we cannot, or do not, compete with them. The reverse is the case. Engineering has made great progress in the past ten years. Radical improvements have been introduced, and plans which were only put forth as experiments have been adopted in practice to manifest advantage. The difficulties with the surface condenser have been surmounted; the prejudice against it has passed away. A more intelligent system of working steam expansively prevails. Variable cut offs are being adopted more generally, and give satisfaction to the owners of the ships. And well they may, when it is found that less fuel is burned and better time made under equal conditions. If we want facts for this assertion they are at hand. Examples of the superior economy of American marine engines are to be found.

For purposes of comparison no better examples could be found than two steamers lately built to run between New York and Richmond, Va. These ships are exactly the same in measurement and model, and have similar engines. The only exception is that one has a fixed cut off of the Stevens's pattern, while the other has Herman Winter's rotary cut off, which can be used at all grades of expansion at the will of the engineer. The result is that the ship with the variable cut off makes $2\frac{1}{2}$ hours better time and consumes less fuel by three tuns than her consort.

Fifteen years ago, when the Collins ships were first started, they made their time (and good time it was) on 80 tuns of coal per 24 hours, and that was the day of fixed cut offs—for they had Stevens's long-toe movement. The *Fulton* and *Arago*, vessels of 2,500 tuns burthen, running between Havre and New York, make $11\frac{1}{2}$ knots per hour on 50 and 55 tuns of coal, and the *Cahawba*, a vessel of 1,800 tuns burthen, makes 11 and 12 knots on 40 tuns average consumption.

The Pacific mail steamships are the most economical vessels in the world. The largest are rising 3,500 tuns burthen, and can steam an average of 12 knots an hour on 35 and 40 tuns of coal per day of 24 hours. The *Persia*, an English iron ship of the Cunard line, burns more than three times as much. The *China*, one of the latest vessels added to the Cunard line, has oscillating engines of 80-inch cylinder and 66-inch stroke, geared so that the screw shaft makes $2\frac{1}{2}$ revolutions to one of the engines, and burns, on the statement of her chief engineer, Mr. Nixon, 80 tuns per 24 hours. Even the *Re De Italia*, a huge iron-clad vessel, nearly 300 feet long and 50 feet wide, clad with $4\frac{1}{2}$ inch plates, crossed the Atlantic at the speed of $11\frac{1}{2}$ knots on 40 tuns of coal per day.

We might continue to multiply instances at great length which would sustain the assertion that, compared with foreign ships, American steamers are more economical, but we have already cited enough.

It has been said that wooden steamships are so much more costly to run and keep in repair, and in point of durability so inferior to iron ships, that we are unable to compete with foreign lines, for all our ships are of wood. If this be true, then the carrying trade will be confined for some time to come to English bottoms. All vessels under that flag are of iron, and we cannot compete in the construction of them with labor and material at present rates. In 1821 the total per centage of the foreign trade was 11·3, and in 1864 it was 60 per cent of the whole tunnage, showing a rapid and alarming increase.

HIGH WAGES.

"Five years ago, I built a house for two-thirds less money than I can now," said a friend, recently, "and I notice that notwithstanding prices of living are tending downward, like Oliver Twist mechanics want more. Sugar is lower, butter is falling, flour is lower, beef is no higher than it has been, but in the face of all this, strikes are the order of the day, and I should like to know where it is going to end. What is the reason of it?"

"The reason is quite plain," we answered. "Mechanics cannot help wanting more; they are in demand. Did you ever hear of a merchant taking less than the market price for his goods because people wanted him to? Did you notice that butter became cheaper, or coal lower, when the press commenced upon the exorbitant prices charged for these articles?"

"No, I did not."

Yet you see on the approach of warmer weather, that coal and butter both fall, simply because the supply is greater than the demand. When the call was brisk, however, certain skillful operators were able to control the market. Kerosene oil, that three months ago, retailed for ninety cents a gallon, now sells at seventy-five cents. What made that fall? Daylight. The days grew longer; less oil was consumed; the demand was less, and the price came down, as a matter of course. It is precisely the same with wages. You will notice that mechanics get about the same rates all over the country; charging only with the state of the local market. Mechanics are in demand now, and their wages must go up; no power can prevent it. When building materials were high, capitalists held aloof, saying, "there will be a fall," and then wages remained at a fixed point. So soon as gold fell, and the political prospects of the country were brighter, increased activity was manifest in all branches of industry, and mechanics' wages rose as a natural consequence, for there were not men enough to do the work. This is the simple reason for the movements that are taking place.

They will continue until there are more men. In 1857, good mechanics could be had for \$1 25 per day, because there was nothing for them to do; nobody wanted them; their labor was a drug. Now it is the reverse; everybody wants them, and up they go.

Our advice is, that they hold on to their earnings so that when the evil days draw nigh they may have an anchor to windward to hold by.

ANOTHER EXPLOSION OF NITRO-GLYCERIN.

A telegram from San Francisco informs us that, "on Monday afternoon, April 16th, a terrible explosion of what was supposed to be nitro glycerin occurred in San Francisco, near Wells, Fargo & Co.'s building. The explosion shook the earth like an earthquake for a circle of a quarter of a mile. Samuel Knight, superintendent of Wells, Fargo & Co.'s express, died in half an hour of injuries received. G. W. Bell, supervisor and assayer, was instantly killed. Mr. Wallut, Wells, Fargo & Co.'s assayer, Joseph Elliot, John Gallagher, Frank Webster and William Justin were also killed. Eight dead bodies were so mutilated that they could not be identified. Louis McLane, Captain Eldridge, of the Pacific Mail Steamship Company, and Judge Hoffman were bruised and cut. Felix Lamax, D. Stacy, Jefferson Taylor, H. Blane, clothing dealer, Captain J. Ayres, Fred Leiz, Frank Moran and others were injured, but not fatally. The damage is estimated at least two hundred thousand dollars. The cause of the explosion is a mystery; the freight agent of the Pacific Mail Company says that two boxes, each measuring about four cubic feet, were taken from the steamer's dock to where the explosion occurred. One box was consigned to Idaho City and the other to Los Angelos. Both were stained with oil. The contents are not known."

This explosion, like the one that occurred in Greenwich street in this city, seems to have been the result of spontaneous combustion of nitro-glycerin. The various fats and oils from which soap is made, are composed of glycerin in combination with an acid; when brought in contact with an alkali, they are decomposed, the acid uniting with the alkali to form soap, and the glycerin being set free. By proper manipulation glycerin may be induced to combine with nitric acid, to form nitro-glycerin. The nitric acid being composed of nitrogen and oxygen, in the proportion of 14 pounds of nitrogen to 40 of oxygen, carries into the compound a large quantity of oxygen, which, being held to the nitrogen by a very feeble affinity, is ready on a change of conditions to enter into combination with the hydrogen and carbon of the glycerin, burning them with explosive violence.

Now, it seems that under certain conditions the oxygen may slowly enter into combination with the combustibles of the glycerin. In this case the heat generated is the same in quantity as in the case of sudden combustion, but if the oil is so situated that the heat may escape as rapidly as it is formed, the temperature of the liquid is not perceptibly raised, and no explosion takes place. But if the oil is packed in wooden boxes, or is surrounded by any kind of slow-conducting material, then the heat accumutates till the temperature of combustion is reached, when the whole mass explodes.

THE CHOLERA.

The cholera is a disease of the stomach and intestines, manifested by purging and vomiting, and running sooner or later into discharges like water with rice boiled in it. This is the essential nature of the disease, no matter where it appears. When it comes as an epidemic, commonly called "Asiatic cholera," there co-exists, to a greater or less degree, what is called malignancy; manifested by coldness of the surface of the body, depressed pulse, purple, shriveled appearance of extremities, and perhaps spasms. It is this quality that is the source of danger, and it may vary in intensity from the slightest to the most virulent degree, causing death in three hours, and before the purging and vomiting have had time, of themselves, to produce any effect.

There is now a very general impression that this dreadful scourge is to visit our country during the present season. Owing to the large amount of foreign immigration constantly flowing to this port, people are generally expecting that this will be the spot where the epidemic will first make its appearance. It is, however, quite as likely to break out in some other seaport; indeed, Halifax has had a very narrow escape, and one case is reported to have occurred at Portland.

In view of a probable visitation, we devote some space in this number to the treatment of the disease. We publish a communication from Dr. Hall, the well-known editor of *Hall's Journal of Health*. It was called forth by the criticism published on page 262 of the SCIENTIFIC AMERICAN. We also reprint from the *Missionary Herald* an article upon cholera and its treatment, written by Dr. Pratt, of Marash, who was at Constantinople during the prevalence of the epidemic in that city last year.

We do not undertake to recommend any special medical treatment for this disease, but would urge upon our readers the importance of cleanliness in every respect—a removal of everything that can possibly generate malarious influences; also, a regular diet of plain, wholesome food; a total disuse of stimulants—which invite, rather than, as many erroneously suppose, ward off the disease—and to avoid excesses and excitements of every description.

An acquaintance of ours was in this city in the summer of 1849, when cholera was very prevalent and fatal, especially among the unfortunate poor, who are so shamefully huddled together in this and other large cities. There was cholera in the air, cholera in the street, cholera in the newspapers, cholera in every man's mouth, cholera in the houses of the rich, cholera in the tenements of the poor, and a general tendency to bowel complaints among all classes. Our acquaintance, being attacked with strong premonitory symptoms, at once sent for his doctor, took to his bed, covered up warm (it was a hot July day), had bottles of hot water put to his feet, and applied a generous mustard plaster to his stomach and bowels, all of which worked like a charm.

Such treatment can do no harm; and if the doctor has wisdom enough to hit upon the right remedy, and the patient can hold on to his courage, there is not much danger. In cholera the whole system is rapidly drained off through the alimentary canal, like water through a fresh break in the dam. If the break is not stopped, the whole structure gives way. It is said that fear kills more than the disease itself.

STILL ANOTHER EXPLOSION OF NITRO-GLYCERIN.

Since the article on the editorial page, discussing the spontaneous combustion of nitro-glycerin, was written, we have accounts of a still more terrible calamity from this cause, which occurred at Aspinwall on the third of April.

The steamship *European*, an iron screw steamer of about 1700 tuns burthen, belonging to the West India and Pacific Steamship Company, arrived at Aspinwall from Liverpool on the second of April, and the next morning at seven o'clock the explosion occurred.

The wharf beside which the steamer was laying, was about four hundred feet long and forty wide, and was constructed in the most substantial manner, with a heavy flooring and roofed over its entire length. The *European* was on the north side, and her sister ship of the same line, the *Caribbean*, on the other side. The freight house was a splendid building, constructed of stone, slate and iron entirely, and was about three hundred feet long and eighty wide.

To those removed from the wharf the first visible effect of the tremendous force of the explosion was in the instant and almost entire demolition of the freight house—a structure of the most durable nature, and one that was apparently able to resist almost any explosive force except within the building itself. One track only ran through the building, the rest of the floor space being devoted to a platform for freight discharged from or to be loaded in cars. Both the end walls of this building were demolished, and the superb iron roof, rafters, girders, braces, etc., fell into the interior of the building, forming a huge unshapen mass of ruins and destruction, where a moment before everything was strength and symmetry. Of course, in an instant after the occurrence, when those unhurt recovered from the effect of the concussion, a rush was made for the wharf to succor those injured, and here it was that the whole scene burst upon the view—a scene heartrending and awful, and telling that many of those who a few moments before were in the enjoyment of life and health had forever passed away from earth. The iron plates of the ship's hull were torn out completely, and almost everything about decks was a mass of ruins. The wharf abreast of where the explosion occurred was completely cut through the piles, cross beams, flooring, and in fact everything was carried away, and the entire structure was shattered, every plank even being started from its position. On board the *Caribbean* the destruction was very great; her boats were all crushed, her deck houses shattered and many of the heavy iron beams and knees of the ship's hull were broken like pipestems.

The *European* was towed out into the bay by a naval vessel, when she took fire, a second explosion of moderate violence occurred, and she sunk.

It was some time before the true cause of the disaster became known. The bills of lading called for no gunpowder, and the ship had but a small quantity for firing signal guns. No steam was up, and all were at a loss for a knowledge of what it was until the seventy cases of glonorin, or nitro-glycerin, shipped at Liverpool for San Francisco, told the whole story, and brought to light how much more dangerous an article than gunpowder formed one of the principal items of the ship's cargo.

The number of killed and wounded is not accurately known, but it is stated at upwards of seventy.

FAILURE OF A LAUNCH.

Recently an attempt was made in England to launch a huge ironclad war vessel, called the *Northumberland*, but after running down about 170 feet on the ways, she stopped, and at latest advices was hard and fast. Our foreign contemporaries are full of accounts of the disaster, and attribute it to different causes. The most apparent one, however, is the slight incline given to the ways, and the immense weight of the ship, which crushed out the lubricants between the sliding timbers, and interlaced the fibers of them. A very forcible realization of the effect of friction is thus given, when it is seen that it can suddenly arrest the momentum of a mass weighing over 9,000 tuns, after sliding 170 feet in a few seconds.

From the *Mechanics' Magazine*, we take a portion of an article referring to the preparations which were made to launch the ship anew—all total failures:—

"To prevent the ship launching herself unexpectedly during some exceptional high tide, she has been shored and wedged in, in such a manner, that any downward movement on the ways seems impossible. In addition to this, two chain cables have been taken through the hawse holes and made fast to anchors buried in the ground, the ship's own capstans having been used to draw the cables taut. The arrangements for floating are more complex; her keel has been wedged up throughout its entire length, so as not only to secure and ease the weight up, but take some of her enormous pressure off the forward cradle. In addition to this, twelve large wooden pontoons have been constructed, each of which is 30 feet long by 9 feet broad and 9 feet deep, perfectly caulked and water-tight. They have all been prepared from molds, so that they fit close to the bottom of the ship, on each side of which they are made fast in pairs. The floating power of these is equal to 400 tuns, in addition to which 100 tuns more are obtained from a number of empty puncheons made fast under her stern, Eight lighters have also been moored under her stern at dead low water, which, with the previous appliances, give a floating power 1,000 tuns. Beyond this a dredging machine having a steam capstan on board, and moored in the river, is reckoned on for another 100 tuns, beside powerful purchases applied on both sides of the ship from the Millwall yard. Under the bows of the *Northumberland* three powerful hydraulic rams are placed, two of which, equal to a total pressure of 1,200 tuns, are fixed one against each cradle, and both are securely supported with timber backings down to the launching ways. The third, similarly held by a timber frame, is of nearly 1,000 tuns power. This, however, is fixed in the center, and upright, so that it can work from the ground up beneath the bows of the vessel, which it was assumed it would, to the full extent of its immense pressure, partly lift and ease off the ways forward.

But notwithstanding this array of power, the trial on Saturday to launch the vessel failed—not an eighth of an inch did she advance, although she moved vertically at the stern. So Monday, with its high tide, was waited for, and Monday came and went, but the *Northumberland* remained, although there was a great increase of power applied to move her. It is therefore now proposed to wait for Monday, the 16th inst., on which day it is anticipated the tide will be the highest of the year, and give nearly 25 feet of water under the *Northumberland's* stern post. In case of a favorable wind it may even rise as high as 26 feet—a depth that would place nearly 8 feet of water under her bows, which ought to be nearly sufficient to float her. But in order to make assurance doubly sure, it is intended to take every possible precaution against the contingency of low water by adding such powers of flotation to the ship as will enable her in a great measure to get off without an unusually high tide. To this end the lighters will be dispensed with and in their place two small frigates will be lashed astern at the low water preceding the high tide. Each will be fixed to the hull so as to have an independent action, while arrangements will be made to enable them to slip their fastenings and get clear of the vessel directly she begins to move quickly. In addition to these, four more large pontoons are to be placed under the stern. They will have a greater floating power than that of the whole ten now under the vessel, and will exercise their greatest power at the greatest advantage, and exactly where it is most needed. The ways will be well greased and two additional hydraulic rams will be brought to bear upon her.

A Flint Piano.

A curious novelty has just been brought to London and is about to be exhibited to the public. It consists of a remarkable-looking piano, made of flints suspended from an iron frame, which are struck with a short flint to produce the notes. The flints are about forty in number, and elongated, but of various lengths and thicknesses. They are arranged in the order of their tone, and the labor and investigation of years were required before the complete scale was formed.

The *Star* says that M. Baudry, the gentleman who has made the instrument, was two years seeking for one particular stone, or tone—the terms being here almost synonymous. Two other tones were, after an almost endless investigation of flints, obtained from pieces of schist, the only exception to the flint tones which form the instrument. M. Baudry entertained some friends on Saturday afternoon last with a performance on this curious instrument, which was much admired, not only for its novelty, but also for its musical effect. The tones are unlike those of any known instrument, as may be readily comprehended by any one who knows the ring of a piece of flint, and possess a sharpness that renders the performance peculiar, though by no means unpleasing. The flints are many of them very peculiar in form, and it would be a matter of no small difficulty to frame any coherent theory of the causes of the variety of tones observable, for they are by no means in the exact ratio of the size or weight of the different flints. M. Baudry's perseverance and skill in working out his ingenious idea have met with that success which he sought, and he deserves now to meet with a further successs, which it is to be hoped will be awarded to him by the public.—*Mechanics' Magazine.*

A Cheap Galvanic Battery.

M. Gerardin has sent a note "On a Battery of Iron Turnings," which he thus describes:—I replace the zinc of a Bunsen's battery by iron borings; an iron bar placed in the middle of the borings serves as a reophore. The iron is placed in common water. In the porous vessel I place a solution of perchloride of iron with *aqua regia* added. The electricity of this solution is collected by a carbon serving as the positive pole. The carbon is made of powdered coke agglomerated with paraffine. Such a battery may be made of large dimensions, and a great deal of electricity obtained at small cost.

ELECTRIC lights have been definitely established in the two lighthouses of the Heve, near Havre. The intensity of each of these new lights is estimated as equivalent to 5,000 carcel lamps, and it may be increased twofold, with little additional cost, whenever the condition of the atmosphere requires it.

RENEWING WORN BANK-NOTE PLATES.

A clean, crisp, comfortable bank-note is not a luxury to be indulged in every day by the majority of mankind; nevertheless, most people are familiar with its appearance. Its production involves no small amount of labor, although by subdivision and distribution a very large number are now produced in a very short time. Much care and nicety have always been bestowed upon it, and are especially demanded in the present day, when the means of imitation are so well within reach of the designing and unscrupulous. The chief object in the manufacture of bank-notes is to render forgery impossible, or at least easy of detection. This is sought to be effected by peculiarity of paper, design, and printing, or by a combination of these means, as is done in the Bank of England, and other banks. The mechanical design, however, has chiefly been relied on for security. It has been the constant aim to make the impression such as to render the genuine note readily distinguishable by the public for its high art, and to the bank officials by secret peculiarities in its execution. A further security was formerly afforded against forgery by a self registering machine, which was contrived by the Messrs. Oldham. By this machine each note was impressed with a distinctive mark known only to the bank authorities. Until about 1837 copper-plate printing was the only process in use for bank-notes. In that year, however, Messrs. Perkins and Heath effected their valuable improvements in practical engraving. This was the reproduction of designs by the mill and die by mechanical pressure, and which, when applied to calico printing, was attended with such extraordinary results. This invention simply consisted in engraving the pattern on a soft steel plate, which was afterward hardened, and the pattern transferred by pressure to a soft steel roller. The pattern was, of course, produced in relief on the roller, which was hardened to reproduce the pattern on the plate from which the printing was to be done. In 1855 electrotype printing was introduced in the Bank of England by Mr. Smee, and since that time the notes have been produced by surface printing by the electrotype.

In the bank of Ireland the plates are prepared according to Perkins and Heath's method. The separate designs forming the complete bank-note are first engraved by hand on separate steel blocks, which are afterward hardened, and are preserved as permanent patterns not to be printed from. These engravings are transferred to the steel rollers under heavy pressure, the rollers being afterward hardened and used as dies to impress the engraving upon the printing plates. The engraved plates for printing the bank-notes are made of soft steel, and are never hardened after being engraved. Being of large size—20in. by 16in.—they would most probably lose their flatness in hardening. Another reason for not hardening the plates lies in the fact that when worn, the soft plates are easily repaired again by means of a special arrangement, designed for the purpose by Mr. Grubb, the engineer to the Bank. By this arrangement the rollers are applied again to the plates with perfect accuracy for renewing the impression. The printing plate, when receiving its first impression from the master roller or die, is fixed upon the table of a strong press, from which a pressure of 5 tuns can be obtained, the pressure being regulated as required by means of a weighted lever. The position of two register points in the plate is accurately noted by means of micrometer microscope, and registered in a book kept for the purpose. The master roller is then passed over the plate by the machine under the heavy pressure, being very steadily guided by a special parallel motion arrangement. The table is provided with complete adjustments of peculiar delicacy, and the pressure of the engraving roller upon the plate is not produced by the roller descending upon the plate, but by the table being raised up to the roller.

Being of considerable weight, the table is balanced so that its vertical movement is effected with a force equal to a few pounds only. It is provided with two separate lever arrangements, for light and heavy pressures, whereby any pressure, from a few pounds up to 5 tuns, can be put upon the plate. When a plate requires renewing it is again fixed upon the table in the same position as before by means of the micrometer microscope and the register of its position; the roller being passed over it deepens those parts of the impression which the continuous printing has worn away. The renewal of plates is effected with the utmost accuracy; indeed, so perfect is the process that the finest lines in the engraving are preserved without becoming perceptibly coarser even after a plate has undergone many renewals. Thus, the most delicate engravings are restored as often as required in plates, when worn by the process, of printing, with the greatest certainty and facility. Should it be necessary to bring up the impression on any special portion of the plate, even this can be done. It is effected by a delicate adjustment in the bed of the table, by which the plate can be slightly tilted transversely to the direction of the motion of the roller, and thereby increasing the pressure at any particular point. In order to obtain this tilting motion the bed is made with a convex cylindrical segment lying within a concave one, the plate being in the center of motion. The movements for adjustment are effected by screws so finely set that they will adjust to a thousandth part of an inch.—*Mechanics' Magazine.*

The "Nautilus."

A trial has recently been made of a new principle of motion, as applied to vessels, called the Hydraulic Porpeller, Ruthven's patent. The *Nautilus*, to which the power has been applied, was built expressly to show that it can, with less horse power than ordinary river boats, equal them in speed. The *Nautilus* at the trial started from Vauxhall Bridge pier at eleven o'clock in the morning, and ran up and down the Thames in company with the *Citizen* and other river steamers, and held way with them steadily, gaining a little on some. She ran between Vauxhall and Westminster Bridges with the wind and tide in 4 min. 26 sec., and against in 8 min. 22 sec., being at the rate of 13·5 and 7·2 miles per hour respectively, or at an average speed of 10·35 miles per hour—say 10½. She then steamed down the river, and when off the Tunnel pier, with both strong wind and tide in her favor, going at full speed, was made to stop suddenly by reversing the valves. She stopped dead in less than ten seconds and in about a quarter of her length. Her Majesty's ironclad gunboat *Waterwitch*, now being built, is to be fitted with the new propeller, which is nothing more nor less than water taken in under her bottom and set in motion by simple machinery worked by a steam engine. The water is discharged in a heavy stream on both sides of the vessel; consequently there is nothing outside the vessel to be injured by any accident. Another important novelty is that the vessel is quite independent of her rudder, and is worked under the complete control of the master, officer of the watch, or man on deck, without any communication with the engine. The *Nautilus* is also fitted with Ruthven's steering apparatus—an invention which gives a large amount of power to the rudder.—*Mechanics' Magazine.*

[This principle has been repeatedly tried in this country, but to use a common expression, the boats so fitted have been unable to "get out of their own way."—Eds.

Pneumato-Electric Organ.

Electricity has been very ingeniously and effectively applied to form a connection between the keys of an organ and the valves which permit air to pass to the pipes. Complicated mechanism is thus got rid of, an extremely simple arrangement, whatever the distance between the keys and the pipes, being substituted. Its mode of action is easily understood. According to the *Scientific Review*, when any key is depressed by the finger, a small communicator under it completes communication with a galvanic battery by dipping its lower ends into minute cups of mercury. Electricity then passes along a wire to a small electro-magnet, that immediately becomes excited, and, attracting a keeper, opens a valve, allowing air to pass into the organ pipe, which sounds at once, and continues to do so as long as the finger presses down the key. It is clear, that, however powerful the organ or distant the pipes, the fingers are not in the slightest degree distressed in playing. The battery used is simple, inexpensive, and permanent in its action. It consists of glass vessels, arranged on the upper surface of the bellows, and each containing a solution of sulphate of mercury; into the latter plunges a plate of zinc, which is placed between two plates of gas retort graphite, when the bellows is raised by the action of blowing. No effect, therefore, is produced, except when required, which prevents waste of battery power.

SPECIAL NOTICES.

Jesse S. Lake and David Lake, of Smith's Sanding, N. J., have petitioned for the extension of a patent granted to them on the 20th day of July, 1852, for an improvement in grass harvesters, and re-issued in four several divisions, dated 1st day of January, 1861, and numbered respectively 9, 10, 11, and 12; this petition being for the extension of each of these reissued patents.

Parties wishing to oppose the above extension must appear and show cause on the 2nd day of July next, at 12 o'clock, M., when the petition will be heard.

Eliakim B. Forbush, of Buffalo, N. Y., has petioned for the extension of a patent granted to him on the 20th day of July, 1852, for an improvement in grain and grass harvesters, and reissued the 25th day of May, 1865 in four several divisions, numbered respectively 1,972, 1,973, 1,974, and 1,975, this petition being for the extension of each of these reissued patents.

Parties wishing to oppose the above extension must appear and show cause on the 2nd day of July next, at 12 o'clock, M., when the petition will be heard.

French Iron-clad Navy.

In an account of British and French Navies, Furnished by Mr. Donald McKay, of Boston, to the *Herald* he appends the following statement of the French iron-clads at the present time, said to have been made up from personal inspection of the vessels:—

Magenta and Solferino.—Displacement, 6,750 tuns; 1.000 horse-power mean draft, 26 feet; length of load line, 280 feet; breadth, 57 feet; wooden hull; 4½ inch armor plating; weight of armor, 900 tuns; speed in smooth water—*Magenta* 13½ knots; *Solferino* 14 knots.

Couronne.—Displacement, 6,000 tuns; 900 horse-power; mean draft 25 feet. length of load line 260 feet; breadth 55 feet; iron hull 4½ and 3 inches armor plating; weight of armor 700 tuns; speed in smooth water 13 knots.

Gloire.—Displacement, 5,650 tuns; 900 horse-power; mean draft 25½ feet length of load line, 255 feet; breadth 56 feet wooden hull; 4½ inch armor plating; weight of armor, 800 tuns; speed in smooth water, 13¼ knots.

Invincible.—Displacement, 5,525 tuns; 900 horse-power; mean draft 25½ feet length of load line, 255 feet; breadth 56 feet; wooden hull; 4½ inch armor plating; weight of armor, 800 tuns; speed in smooth water 13½ knots.

Normandie.—Displacement, 5,650 tuns; 900 horse-power; mean draft 26 feet; length of load line, 255 feet; breadth 56 feet; wooden hull; 4½ inch armor plating; weight of armor, 800 tuns; speed in smooth water 13½ knots.

Flandre, Gauloise and Guyenne.—Displacement, 5,700 tuns; 1,000 horse-power; mean draft 25 feet; length of load line, 260 feet; breadth 56 feet, wooden hull; 6 inch armor plating; weight of armor, 1,000 tuns.

Heroine.—Displacement, 5,700 tuns; 1,000 horse-power; mean draft, 25 feet; length of load line 260 feet; breadth, 56 feet; iron hull; 6 inch armor plating; weight of armor 1,000 tuns.

Magnanime, Provence, Revanche, Savoie, Surveillante, and Valeureuse.—Displacement, 5,700 feet; 1,000 horse-power; mean draft 25 feet; length of load line, 260 feet; breadth 56 feet; wooden hull; 6 inch armor plating: weight of armor 1,000 tuns. The *Provence* has made 14 knots in smooth water.

Taureau.—Displacement 2,450 tuns; 908 horse-power; mean draft 16 feet; length of load line 200 feet; breadth 47½ feet; wooden hull; 4½ inch armor plating; weight of armor, 800 tuns.

Belliqueuse.—Displacement 3.350 tuns; 900 horse-power; mean draft, 19½ feet; length of load line, 230 feet; breadth, 40 feet; wooden hull; 6 inch armor plating; weight of armor 100 tuns,

Paixhans and Palestro.—Displacement, 1,540 tuns; 150 horse-power; mean draft, 8½ feet; length of load line, 156 feet; breath 40 feet; wooden hull; 4½ inch armor plating; weight of armor 275 tuns; speed in smooth water, 7 knots.

Peiho.—Displacement, 1,500 tuns; 150 horse-power; mean draft 10½ feet; length of load line, 150 feet; breadth, 45 feet; wooden hull; 4½ inch armor plating: weight of armor, 275 tuns; speed on smooth water, 7 knots.

Saigon.—Displacement 1,500 tuns; 150 horse-power; mean draft, 10 feet; length of load line, 156 feet; breadth 46 feet; wooden hull; 4½ inch armor plating; weight of armor, 275 tuns; speed in smooth water, 7 knots.

Embuscade, Impregnable, Protectrice and Refuge.—Displacement, 1,225 feet; 150 horse-power; mean draft, 9½ feet; length of load line 130 feet; breadth 51 feet; iron hull, 5½ inch armor plating.

Arogante, Implacable, Opiniatre.—Displacement, 1,340 tuns; 150 horse-power; mean draft 8½ feet; length of load line, 145 feet; breadth 48 feet; iron hull, 5½ armor plating. The *Implacable* has made 7½ and the *Opiniatre* 8 knots per hour, in smooth water.

TREATMENT OF CHOLERA.

To meet the conditions of this disease, the nature of which is explained in our editorial columns, the following directions are given by Dr. Pratt in the *Missionary Herald*:—

"(1) For the *stage of diarrhea.* This may come on insidiously, painless and hence not alarming, but should be met promptly. The remedy is, 'The cholera mixture,' so called, consisting of equal parts of—

Laudanum,
Tincture of Rhubarb, and
Spirits of Camphor.

"Begin with 30 drops, taken clear and unmixed, with a little sugar placed in the mouth afterward. Repeat the dose *after every evacuation*, increasing it if the case becomes urgent to 60 drops (a teaspoonful), or 90 drops if necessary. If the diarrhea is not controlled by this means, an injection of from 30 to 90 drops of laudanum, in a tablespoonful of starch, will prove a valuable help. This may be often repeated. If the diarrhea ceases, do not entirely intermit the medicine, but give in gradually diminished doses, every one or two hours, for a period of twelve or even twenty-four hours.

"(2) *For the vomiting stage,* the best remedy is—

Laudanum,
Tincture of Capsicum,
Tincture of Ginger, and
Tincture of Cardamom seeds,

equal parts; to be given, from 40 to 60 drops, undiluted and followed by sugar, after every fit of vomiting; taking care to give it as soon as the fit ceases, when it will be more likely to be retained. An excellent adjuvant to this is a large mustard poultice to the abdomen.

"(3) *For the stage of malignancy,* the only remedy is *stimulants,* especially brandy, which must be given with great freedom, from two to four teaspoonfuls every half or even quarter hour, till heat returns, and pulse and sensibility of extremities are restored. It is always to be given undiluted. Alcohol, or other spirits, will answer the purpose, if brandy is not to be had. It will be necessary to combine with this, artificial heat—bottles of hot water to the body and extremities—friction of the limbs (which no one need fear to apply), and mustard, perhaps, to the feet and hands, stomach and limbs. Remember that *boldness,* to the verge of rashness, is better than excess of caution, and that no danger is to be apprehended from any of these remedies so long as the symptoms for which they are given are uncontrolled.

"The use of cold water must be *strictly forbidden,* except merely to gargle the throat; a very small quantity, swallowed, will bring on the diarrhea after it has been stopped for hours. A little water of gum arabic may be allowed, a teaspoonful at a time; or, perhaps, lumps of ice might be taken with safety.

"For the *typhoid fever,* which often follows an attack, chamomile or sage tea, and diaphoretic treatment, will be all that is needed, beside a moderate use of stimulants, for convalescence."

CHOLERA PREVENTIVE.

A Burgundy-pitch plaster worn over the region of the stomach during the prevalence of the disease. It should be warmed a little before it is put on, the person standing erect when it is applied, so that the plaster shall not interfere with the motions of the body. It is asserted that a British regiment supplied with such plasters, lost only five men during a severe visitation of cholera, and they had refused to wear them. This remedy was used by Dominie Westbrook, in his Academy, at Harlem, as far back as 1832, and in a school of 60 boys, there was not a case of cholera, although the disease was very violent in the village.

CHOLERA—DR. HALL'S LETTER.

MESSRS. EDITORS:—The article on "Cholera" in the January and February Nos. of *Hall's Journal of Health*, advance the following sentiments:—

1st. Of all curable diseases, the cholera is among the easiest cured, if promptly attended to in its first stages of two or three thin and weakening passages from the bowels, within any twelve or fifteen hours.

2d. Any remedy swallowed to prevent cholera, will increase the liability to an attack.

3d. It is almost suicidal for any man to attempt to treat his own case.

4th. That a physician should be called always on the instant of an attack, but when it is impossible to procure his services within an hour, ten or twenty grains of calomel should be taken in pill or powder, as a means of stopping the discharges, and of thus arresting the disease, until the physician arrives; because it is easiest to be procured generally—will remain on the stomach, from its heaviness, when even cold water is ejected as soon as swallowed—and because it is the most certain of all medicines known to stimulate the liver to action, this want of action being the fundamental cause of the disease.

5th. The calomel treatment has been more universally relied on in India, England, and the United States, than any other one remedy hitherto; but, as all diseases assume varying phases from year to year, it is better to rely on no previous treatment, should the cholera appear among us in 1866, but to send promptly for a physician; who, being among the affected all the time, can the quickest detect these changes, and is most competent to adapt means necessary to meet these varying phases.

6th. When cholera is prevailing, a single large, thin, painless, weakening, action of the bowels is cholera begun, and the business man should start for home in a vehicle instantly, calling on his physician on his way, and take him home with him; or if he cannot be had for an hour or two, get into bed as soon as possible, dress up warm, eat ice if thirsty, bind a thick warm flannel tightly around the abdomen, and wait with a calm, courageous confidence for his doctor's arrival; but if that arrival is delayed, and the symptoms seem to increase, then take the calomel where its healthful effect is to stop the passage within two hours. W. W. H.

MISCELLANEOUS SUMMARY.

A CONFERENCE of professors and teachers, with others interested in education, convened by the Metric Committee of the British Association for the Advancement of Science, met last Friday evening in the Lecture Theatre of the Museum of Geology, Jermyn street. The object of the meeting was to discuss the introduction of the metric system of weights and measures. A resolution was passed approving of instruction generally in the system, and that as Government practically prescribed the curriculum of the training colleges, they should be asked to make questions in the metric system a portion of the examination of teachers for certificates.

A WESTERN CLOCK FACTORY.—A clock and brass manufacturing company has been organized in Chicago, with a capital of $200,000. Forty acres of land within six miles of the city have been purchased, and the buildings are to be erected forthwith. The capacity of the manufactory will be two hundred thousand clocks per annum, and from four to five hundred tuns of brass for the market, in addition to what will be worked up in the establishment. The material for the manufacture of brass will be obtained from Lake Superior and La Salle, copper from the former and zinc from the latter. It is to be expected that the establishment will be in operation some time in July.

THE rinderpest—which we are glad to notice is generally on the decrease—has appeared in Cadzon Forest, among the famous breed of wild cattle, belonging to the Duke of Hamilton. The duke, with the view to preserve his valuable herd of Ayrshires, has put them down in his coal pits, where they are enjoying complete immunity from the plague though it is raging above.—*Mechanics' Magazine.*

DR. PARRY accounts for the non-destructibility of the stomach by digestion, as follows:—In a state of health the blood is always alkaline, and the gastric juice acid. The introduction of food to the stomach attracts the blood to that organ, as well as determines a secretion of gastric juice, and the alkalinity of the blood protects the stomach from the action of the acid.

THE cannon cast for the Austrian navy are composed of—copper, 600 parts; zinc, 382 parts; iron, 18 parts. This alloy is reported to be excessively tenacious and easy to forge and drill.

A VINEYARD was lately sold by auction at Gevrey, in the Cote d'Or, at the rate of $5,000 an acre, the highest price known to have been given in that country.

THE Paris Universal Exhibition of 1867 will offer to the public, among other curiosities, says the *Moniteur*, an aquarium which will be thirty metres long by twenty metres in hight. It is intended, as in the aquarium of the Acclimatization Society, to bring together as complete a collection as possible of the most curious specimens of the submarine world. The size of the aquarium will cause spectators to fancy that they are under water. On looking upwards, the rare opportunity of seeing sharks, tunny fish, cod, and porpoises disporting themselves in their own element, will be given; and it is expected that this will form one of the many interesting features of the forthcoming exhibition.

M. SCHLŒSING has succeeded in discovering an arrangement by which an intense heat, sufficient to melt iron, can be got from ordinary gas. The principle of his contrivance is the complete combustion of the proportionate amounts of gas and air within a confined space, and the continuous supply of the combustible materials. A copper tube, carefully pierced, is the chief instrument in securing those results. M. Schlœsing was able to melt a piece of iron, weighing 400 gms., in twenty minutes, by his plan.

IT appears that the common salt occurring in nature in the Andes in process of time undergoes nitrification, being now in company with lime and the nitrogen of the air, by a process not easily explained —the chlorine of the salt going to the lime, forming chloride of calcium, and nitrate of soda being produced.

DR. GALLARD stated, in a paper to the French Academy, that in many districts where intermittent fevers had prevailed from time immemorial, the drainage effected by railway works removed these disorders.

Notes & Queries

E. F. C. D., of Md.—The best oil for light machinery is sperm oil. Any kind of wood may have gold leaf applied to it You can obtain gilding size of any painter.

N. J., —— of.—A horizontal engine and boiler of the best make will give good satisfaction in a saw mill.

J. G. A., Ga.—We fear your broken amber pipe is a hopeless case. As all cements are dissolved or softened by heat, it follows that you cannot mend it that way. Possibly bands of silver in connection with a good cement may do. Try some good jeweller.

T. E. F., of N. H.—You ask "which bearing has the most friction, one that is six inches long and six inches in diameter, or one that is six inches in diameter and nine inches long? We will take, for instance, a locomotive axle with the same weight on each." According to Morin, the friction will be the same.

J. S. W., of N. Y.—In your estimate of the actual power of a horse you omit the hight to which the coal is raised—one of the essential elements.

G. C. D., of Tenn.—We think the purple ink of your letter is one of the animal dyes; it would cost ten dollars to have it thoroughly tested, and a bottle of it would be required.

J. E., of N. Y.—Smee says that the auro-cyanide of potassium is the best salt for electro-gilding. For the mode of its preparation we must refer you to his work; it is published by John Wiley, of 535 Broadway, New York.

H. G. R., of Ohio.—Your mode of computing the velocities of pulleys is right. The velocity is in inverse proportion to the diameter. Cannot your foreman understand that the proportion of 6 to 7½ is the same as the proportion of 1,200 to 1,500. One and a half is one-fourth of six

J. S., of Ind.—We have published the mode of making papier mache so often, we must refer you to back numbers for it

N. C., of N. Y.—The bright scales in the stone that you enclose are mica. There is no probability that the specimen contains gold, but this can be positively ascertained only by careful assay, which will cost ten dollars.

TO OUR READERS.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine to accompany the claim, at a reasonable additional cost. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

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EXAMINATIONS.—If an inventor wishes our opinion in regard to its probable novety of his invention, he has only to send us a pencil or pen-and-ink sketch of it, together with a description of its operation. For an opinion, without examination at the Patent Office, we make no charge, but if a

PRELIMINARY EXAMINATION AT THE PATENT OFFICE

is desired, we charge the small fee of $5. This examination involves a personal search at the Patent Office of all models belonging to the class, and will generally determine the question of novelty in advance of an application for a patent. Up to this time we have conducted over ELEVEN THOUSAND Preliminary Examinations, thus showing a more intimate knowledge of inventions at the Patent Office than can be possessed by any other person or firm.

If an inventor decides to apply for a patent, he should proceed at once to send us by express, charges prepaid, a model not over one foot in size, and substantially made. He should also attach his name and residence to the model.

PATENTS ARE GRANTED FOR SEVENTEEN YEARS, the following being a schedule of fees:—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filing application for Design (seven years)	$15
On filing application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Canadians have to pay $500.

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If an inventor wishes to apply for a patent, all he has to do is to write to us freely for advice and instruction, and he will receive prompt attention. If his invention contains any patentable features, he can depend upon getting his Letters Patent. All communications considered confidential. Send models and fees addressed to MUNN & CO., No. 37 Park Row.

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RESULT OF THE VAN DE WATER CHALLENGE.
—MESSRS. EDITORS:—The readers of your valuable paper will recollect that in your issue of Nov. 11, 1865, Mr. Van De Water challenged any water-wheel builder to compete with his make of wheel for $500. In your issue of Dec. 9, 1865, I accepted his challenge, and named $5 000 as the competing sum, and appointed Fairmount Water Works, Philadelphia, Pa., as the place of trial, where not only the relative merits but the actual percentage of each wheel (large or small) would be made known to the public.

Mr. Van De Water evaded this by proposing the test should be made in Rochester, N. Y. I had some thirty of my wheels at work in Rochester—one of them in G. W. Burbank's mill, that had been running three and a half years, which had three or four buckets knocked out. Mr. Van De Water put one of his wheels in the same mill, and by running against my wheel in that condition, deluded himself into the belief that his wheel was equal to mine. Hence the challenge. I replaced my wheel in Burbank's mill with one that was in order. Without my knowledge a test was recently made; for the result I refer you to the article below, signed by six responsible millers and mill owners of Rochester. This, Messrs. Editors, we suppose is the reason Mr. Van De Water evades the test after having made a public challenge. JAS. LEFFEL & CO.,
Springfield, Ohio, March 6, 1866. for Jas. Leffel.

ROCHESTER, N. Y., Feb. 28, 1866.

We, the undersigned millers, of the City of Rochester, N. Y., saw at the Crescent Mills, owned by G. W. Burbank, a practical test of the capacity for grinding wheat, of the Van De Water wheel (36 inches in diameter), and the "Leffel Double Turbine" wheel, (35 inches in diameter.)

The amount ground by the Leffel wheel exceeded that of the Van De Water wheel by twenty-four (24) barrels of flour in twenty-four hours.

The two wheels are in the same flume, and this is as fair a trial as can be made, in our opinion, without measuring the water. We consider the Leffel Double Turbine Water-wheel to be the best wheel in existence.

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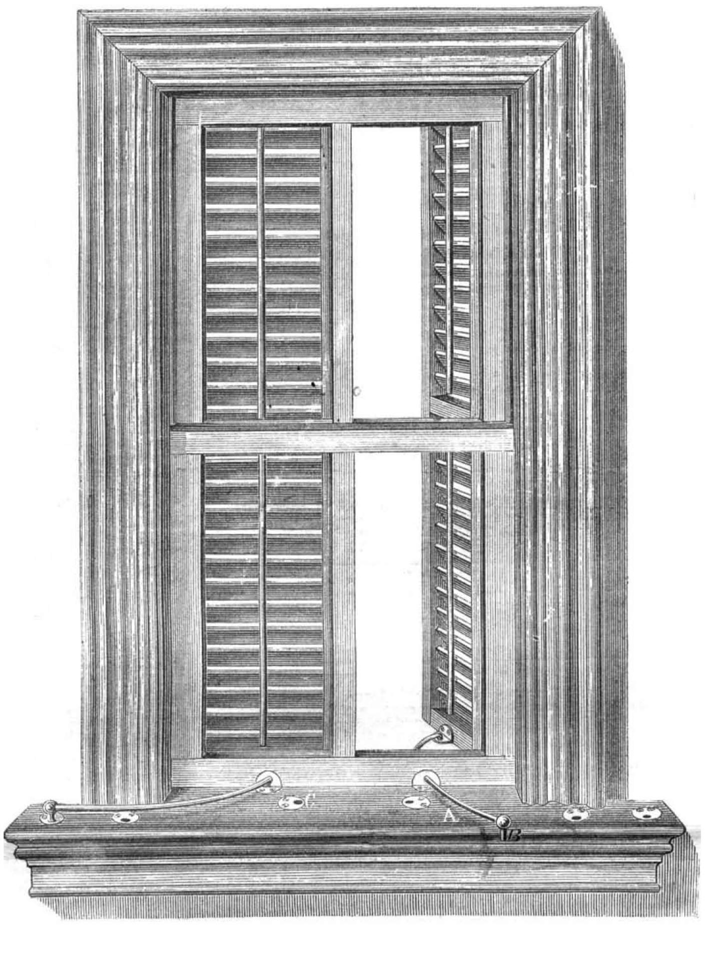

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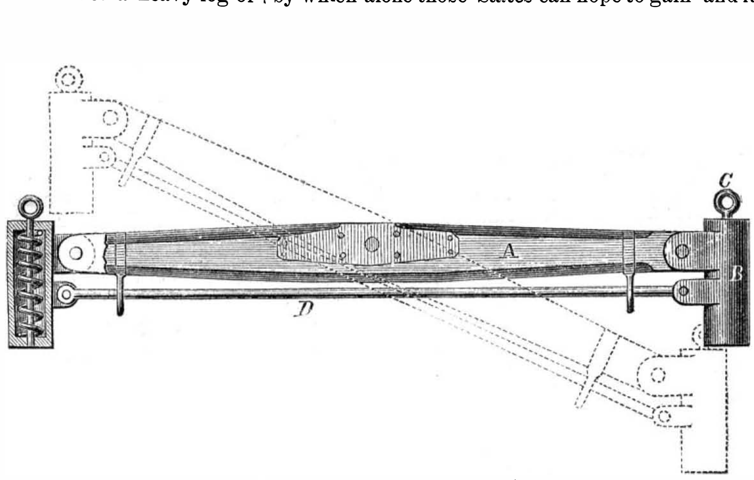

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For further information address W. Dowell, Hicksville, Ohio, by whom it was patented through the Scientific American Patent Agency on June 23, 1863.

Southern Cultivator.

We welcome among our many exchanges the return of this valuable monthly, which is devoted to the interests of Southern agriculture. It advocates recuperative prosperity for the South through industrial agencies—by which alone those States can hope to gain and far surpass their former renown. The *Cultivator* will prove a strong auxiliary to the promotion of these ends, and deserves a liberal patronage. W. N. White, Athens, Ga., publisher.

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This *is* a novelty.—Eds.

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On the South Farralleone Islands, on the coast of California, is a remarkable subterranean passage, connected with a rocky *gulch*, open to the ocean. Through this passage the waves of the sea force the air with much violence, and an observation of the peculiar character of the wind current some years ago induced Colonel Bache, of the engineer corps, United States army, to undertake to arrange a fog whistle which would give an alarm to mariners approaching the place. This he succeeded in doing, and the wind instrument performed at nearly all times, but with different degrees of force—sometimes "piano passages," and at others fortissimo ones. About the time of low water, when the waves do not enter the gulch, it would cease for about two hours, when its shrill music would begin again. The force of the wind in stormy weather is so great that the first whistle erected by Colonel B. was carried away, and he subsequently constructed one of a disk of iron perforated with a hole six inches in diameter. This was securely fastened by heavy bolts to the solid rock, and it proved entirely successful.

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