while by letting out more, the levity of the whole would be increased; although this mode would not facilitate lateral progress, (and lateral progress of balloons by artificial means has not yet been, if it ever be attained, except in still atmosphere,) it gives the aeronaut the power of ascending and descending without loading his apparatus with ballast, and that is something, besides enabling him to reduce the dimensions of balloons. The tubes might of course be inclosed in the usual netting, and a single one might be sufficient for connexion with the windlass.

Parachutes.—Cannot these be made to come down uniformly and without violence? Can either form or motion, or both, be given them that will cause them to descend, in a circuitous instead of a direct path, and thereby prolong the time of their descent? These questions are to some extent answered by the following experiment:—Take a slip of letter paper, an inch or an inch and a half long, and $\frac{1}{4}$ or $\frac{3}{8}$ inch wide; let it fall edwise from your fingers, when it will reach the floor at once, and almost in a straight line: but stand on a chair, and let it drop horizontally from near the ceiling, and it will turn rapidly on its longer axis, and will descend to the carpet in a wide spiral of several turns. It will be three, five, or ten times longer in the air than when it falls without turning on its axis. The faster it turns the longer is it detained in the helical orbit of its descent. (To insure its evolution on its axis, a slight twist in opposite directions might be given to the slip; but this is hardly necessary in small pieces.)

Some important truths may receive illustration from this simple experiment, but the question here is, can the principle evolved be applied with advantage to parachutes? I think it can—for if they and more or less of their appendages, be composed of light revolving slats, the result sought for would at least be partially attained. Now there is no great difficulty in substituting such slats for the cloth or silk covering of parachutes, of introducing strings of them between a parachute and its car, and if need be of attaching them to the latter itself; but it is the principle, not details of its application, to which the attention of those who have faith in the navigation of the firmament is invited.

E.

For the Journal of the Franklin Institute.

Notes on the U. S. Steamship Powhatan. By B. F. ISHERWOOD, Chief Eng., U. S. Navy.

The following particulars in relation to this vessel will be of interest, in connexion with the article under the same title in the last February No. of this Journal.

Before leaving Norfolk, Va., (after the steaming recorded in the Feb. number,) an alteration was made by the Chief Engineer, Mr. George Sewell, in the arrangement of the valve gear, for the purpose of obtaining better results. The accompanying indicator diagrams were taken as the vessel was bound out, and sent back to me by the Pilot. By comparing them with the indicator diagrams in the February number, a very great improvement will be observed; the exhaust end of the diagram is much squarer, and the condensation reaches its maximum much sooner.

The paddle wheels had been increased 8 inches in diameter, to give them greater dip. Sea smooth, weather calm.

Diagram No. 1.—Revolutions of the wheels, $10\frac{1}{2}$ per minute; steam pressure in boilers above atmosphere per square inch, $10\frac{1}{2}$ lbs.; throttle, $\frac{3}{4}$ th open; back pressure in condensers per gauge per square inch, $2\cdot2$ lbs.; temperature of hot well, 98° F.

Diagram No. 2.—Revolutions of the wheels, 11 per minute; steam pressure in boilers above atmosphere per square inch, 15 lbs.; throttle, $\frac{1}{4}$ th open; back pressure in condensers per gauge per square inch, $2\cdot2$ lbs.; temperature of hot well, 100° F.

At my request, the temperature of the smoke chimney was taken; the thermometer was put in a few feet above the top of the steam chimney, and stood with bright fires in the furnace at 452° F. Calculated from this temperature by Buchanan's formula, the velocity of the draft would be 33.54 feet per second. The length of travel of the heated gases from the centre of the furnace to their delivery in the smoke chimney is 39 feet; from which will be perceived how short was the time the heated gases were in contact with the heat-absorbing surfaces. The proportion of the heating (copper) to grate surface was nearly 22 to 1, and seems to have been much too small for the proper reduction of the heat of the gases.

According to the experiments of Professor Walter R. Johnson, one pound of Cumberland bituminous coal requires for its complete combustion the oxygen of 237·31 cubic feet of air, at 60° F. temperature and 30° barometer. From the steam log of the *Powhatan*, it appears that the mean consumption of Cumberland coal for all the steaming done is 3808 pounds per hour, which would require 903,676·48 cubic feet of air, containing 180,735·296 cubic feet of oxygen, weighing 15,023·03 pounds; from this must be deducted the oxygen already in the coal, viz: 9½ per centum of 3808 pounds, or 361·76 pounds; leaving 14,661·27 pounds to be supplied from air. The combustible materials of the coal consist of carbon and hydrogen, in unequal parts, and these elements unite with oxygen in different proportions. The average composition of Cumberland coal may be taken as follows:

Carbon,	75·0 per centum.
Hydrogen,	4·5 “
Nitrogen,	1·5 “
Oxygen,	9·5 “
Earthy matter,	9·5 “
	<hr/>
	100·0 “

Of the above, the carbon and hydrogen only are combustible. As one pound of carbon unites with $2\frac{3}{8}$ pounds of oxygen, and one pound of hydrogen with 8 pounds of oxygen, and as $75 \times 2\frac{3}{8} = 200$, and $4\frac{1}{2} \times 8 = 36$, the total weight of oxygen (14,661·27 pounds) required for the combustion of the 3808 pounds of coal, would be disposed of in the proportion of 200 to the carbon and 36 to the hydrogen, or 12,022·24 pounds to the carbon, and 2639·03 pounds to the hydrogen. Now, 75 per centum of 3808 pounds is 2856 pounds, and $4\frac{1}{2}$ per centum of 3808 pounds is 171·36; and 2856 pounds of carbon united with 12,022·24 pounds of oxygen = 14,878·24 pounds of carbonic acid gas, and 171·36 pounds of hydrogen united with 2639·03 pounds of oxygen = 2810·39 pounds of steam.

Of the total products of combustion of the 3808 pounds of coal, there would be—

Uncombined Nitrogen from the air,	705,532·50 cubic feet.
Nitrogen in coal, ($1\frac{1}{2}$ per centum,) 57·12 pounds, or	780·51 “
Steam, 2810·39 “	76,177·20 “
Carbonic Acid Gas, 14,878·24 “	129,664·53 “
	<hr/>
Total,	912,154·74 “

The uncombined nitrogen from the air will be the quantity of that element in the amount of air required for the combustion of the coal, less the quantity of nitrogen corresponding to the oxygen in the coal in the proper proportion for forming atmospheric air. Now, in the coal there was 361·76 pounds of oxygen, occupying in the gaseous state 4352·17 cubic feet; the quantity of nitrogen corresponding to this to form atmospheric air would be 17,408·68 cub. ft., which deducted from 722,941·184 cubic feet, ($\frac{1}{3}$ ths of 903,676·48) leaves 705,532·50 cubic feet.

Thus the ultimate fact of which we were in search is, that for the complete combustion of 3808 pounds of Cumberland coal, there must pass per hour through the flues of the boiler 912,154·74 cubic feet of gaseous

matter at a temperature of 60° F. and barometer 30°. If we consider these gases to have entered the flues at a temperature of 1020 Fah., their bulk will have been increased three-fold, or will have become 2,736,464.22 cubic feet.

Now, the least cross area of the flues is 55,906 square feet, and at a velocity of 33.54 feet per second, or 120,744 feet per hour, there would be passed 4,049,753.76 cubic feet of gaseous matter, or 48 per centum more than required. Hence it appears that, so far from being any deficiency, there must have been a superabundance of oxygen supplied to the furnaces.

*The Magnetism of Torsion.**

We translate the following article from the French scientific journal *L'Institut*, of the 19th instant, on the subject of magnetic currents of induction produced by the torsion of iron. This was a communication from M. Merthem to the Academy of Sciences at its last sitting, and details the results of his experiments, which will be found to have an important bearing on several mechanical questions:

It has long been known that a thread of iron, submitted to the action of terrestrial magnetism, becomes permanently magnetic when made to undergo a considerable amount of torsion equally permanent. An explanation of this circumstance has been attempted, in saying that the torsion acts in the same manner as every other mechanical disturbance, that it promotes the decomposition of the two magnetic fluids, and that at the same time it gives to the iron a certain coercive force. That opinion rests upon facts imperfectly observed. Torsion acts in a manner quite peculiar, in forcing the metallic molecules to arrange themselves spirally, and in thus giving to matter itself the form which Ampère has assigned to inferior currents. Torsion produces temporary magnetic effects when it is temporary, and permanent effects when it is permanent; and these effects cannot be produced by any other mode of action of mechanical forces.

Temporary Effects.—A bar of iron, magnetized to the point of saturation, becomes partially demagnetized at the moment it experiences a temporary torsion, and remagnetized at the moment of contrary torsion, (*detorsion*), or, in other words, it is traversed by an inverse current during the torsion and by a direct current during the contrary torsion, whatever may be the direction in which this torsion takes place.

We understand by "magnetization to saturation," the state of magnetic equilibrium in which a bar of iron is when it has received all the magnetic excitement it is susceptible of acquiring under the action of a given current, or which, after the interruption of that current, has already lost all which it was unable to keep. So long as that equilibrium is not established, torsion and contrary torsion only act as other mechanical disturbances.

The manner in which the experiment is made is as follows:—A bar of iron, well heated beforehand, 1 metre in length (nearly 40 inches), and 15 millimetres in diameter (nearly six-tenths of an inch), is rigidly fixed at

* From the London Mechanic's Magazine, December, 1852.