

the boilers, being scalded, although they were partially protected by a large quantity of freight on the deck.

The true cause was a pressure exceeding the resistance of flues of this diameter, only three-sixteenths of an inch in thickness.

I have before given my opinion of the impropriety of having the water space between the flue and shell so small; and although in this case it was two inches, being more space than a great many boilers in use have, yet the collapsed flue bears evidence of the softening effect, from the great amount of steam bubbles forming on its surface, or the repulsion of the water from this contracted space by the action of the fire on both its sides.

It is said that the inspectors have revoked the certificates of both engineers. This is no more than right; but it is rather late to punish these persons after the injury is done, considering the very loose manner in which "qualified engineers" were made. The inspectors have directed a new flue of the same thickness to be put in; so that it is probable that these boilers may be heard from again.

The new law giving ample power to the inspectors over the details of the boilers, there will be some hope of the removal of the cast iron steam connexion pipes, used on many of the boats of this section, some of which, in addition to the unavoidable settling of the boilers, use these cast iron pipes or steam drums *for the stancheons to set on* for the support of the cabin floor, this part of which is often used for the stowage of the trunks and light freight of the passengers. Several instances have come under my notice of the breaking of these pipes, in which loss of life resulted therefrom.

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For the Journal of the Franklin Institute.

Flying—Balloon—Parachutes.

When will the flying of insects and of birds be taken up for investigation by naturalists; or are the mechanisms and actions of their wings—than which no department of natural science offers stronger inducements—to be still thrown aside for the determination of species and genus, and to the accumulation of technical and minute details that have no bearings on truths precious to the engineer. It is marvelous that they have been so long neglected, and the more so, that few zoologists, if any, are yet awake to the fact that the contrivances by which power is conveyed and applied through the organs of motion in animals, involve mechanical novelties and problems in physics of surpassing interest and lasting value. Had they been appreciated, their solution had been attempted ere now. But a spirit of inquiry has arisen, and the demands for practical science have been so urgent, that the laws which govern the flight of birds through the air, and of fishes through water, cannot be much longer neglected. And certainly, on more pleasing and profitable fields of discovery neither the natural nor the mechanical philosopher ever entered.

Obvious, palpable, and ever occurring, as are the movements of birds and insects in the atmosphere, there is much in them that is inexplicable; much at all events which I cannot explain; whilst the constant repetition

of these movements, their apparent simplicity and their wonderful variety, —every species having paces or flights and manœuvres peculiar to themselves,—give piquancy to one's curiosity. Look at those pigeons as they sweep down to the street, and back again to their cotes on the church roof; don't their wings appear to move far too slow in the thin and yielding medium, to account for the velocity of their bodies through it? To go at the rate they do, every stroke should be as effective as the leap of a kangaroo; but observe, they flap them rather vertically than in the direction of flight; and therein is not the least difficulty to be got over. Some persons may imagine every thing plain and transparent, but I am almost sure they have never given close and prolonged attention to the subject, nor attempted to trace the various movements to their first principles.

Another perplexity is, how the upward strokes do not neutralize the effect of the downward ones, as in the waving of a fan, in which the resistance is the same in both directions. It cannot be that as much power is expended in elevating the wings as in giving effect to their downward strokes, for that would be consuming half the force to no useful purpose, a defect not allowable in artificial machines, and which unquestionably belongs to no natural one. The explanation is far from being obvious. As for the idea that the pinions act as valves, by opening when the wing is rising to let the air through, and closing when its movement is reversed, I have not been able to detect the process in practice, though this may be due to distance and imperfect vision. Still, no such device is essential to flying, since nothing of the kind can take place with bats, butterflies, house flies, flying-fish, and other soarers whose organs of flight are continuous or unbroken sheets. There is no doubt something like a sculling action—a drawing forward of the organs, edgewise, to repeat the strokes; though how even this is done, is not very perceptible. It is supposed, that the slight convexity of the upper surfaces, and corresponding cavity of the under sides, contribute somewhat to the result. Probably they do, but it cannot be much. The downward flaps are, it is believed, not made quicker than the upper. I have often noticed, and not without surprise, old weather-beaten crows passing quickly along, with one or more feathers out of their wings, and the rest more or less jagged and damaged; and have been almost ready to suspect the existence of an unknown element of buoyancy or of progression, or of both, to account for the phenomenon. Be this as it may, there *are* secrets in the flight of birds and insects, and their disclosure will contribute some exquisite additions to mechanical science.

As regards *Ballooning*, an idea that has often thrust itself on my attention is submitted to the consideration of aeronauts. It is this:—instead of an immense inflated sphere, or spheroid, adopt two, three, or more cylindrical and *vertical* tubes, long and closed on the upper ends, charge them with hydrogen gas, and connect their lower ends to a light wooden shaft, furnished with a ratchet and a crank or spokes to turn it, *i. e.* to a windlass fixed in the car. By this arrangement, the means of ascending and descending are secured; for by winding up more or less of the tubes on the windlass, their ascensional power would be diminished, the gas being driven by the act of winding into the upper or floating portions;

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.