strength, strength requires weight, weight increases the friction, friction calls for additional power, and power can be procured only by an increase of weight. To reconcile these conflicting claims is not the task for a beginner in mechanical contrivance, but for one well versed alike in the theory and in the practice of the arts. Models are of no use, for, although the model be able to climb a considerable ascent, that fact is no guarantee that the full-sized instrument will be able to follow its prototype. Let those who speculate on this matter remember that the elephant inhabits the plains, and leaves the mountains to be tenanted by the smaller tribes; and let them also recollect, for the fact bears more upon the subject than at first may appear, that the larger animals are most easily exterminated; that we have the fox and the rat, though the wolf be long since gone.

In the remarks which I have made, it has been my wish to place the subject in such a light as might enable all to perceive the importance of its bearings; and I have refrained from being practical, lest, in making myself better understood by some, I had rendered my meaning obscure to others. My intention throughout has been to inculcate the important truth, that no machine can ever be enlarged or diminished in proportion.

[*New Edinburgh Philos. Mag.*

Observations on the Ignis Fatuus, or Will-with-the-Wisp, Falling Stars, and Thunder Storms. By L. BLESSON, Major of Engineers, Berlin.

The first time I saw the Ignis Fatuus, or Will-with-the-Wisp, was in a valley in the Forest of Gorbitz, in the Newmark. This valley cuts deeply in compact loam, and is marshy on its lower part. The water of the marsh is ferruginous, and covered with an iridescent crust. During the day bubbles of air were seen rising from it, and in the night blue flames were observed shooting from and playing over its surface. As I suspected that there was some connexion between these flames and the bubbles of air, I marked during the day-time where the latter rose up most abundantly, and repaired thither during the night; to my great joy I actually observed bluish purple flames, and did not hesitate to approach them. On reaching the spot they retired, and I pursued them in vain; all attempts to examine them closely were ineffectual. Some days of very rainy weather prevented further investigation, but afforded leisure for reflecting on their nature. I conjectured that the motion of the air on my approaching the spot, forced forward the burning gas, and remarked, that the flame burned darker, when it was blown aside; hence I concluded that a continuous thin stream of inflammable air was formed by these bubbles, which, once inflamed, continued to burn—but

which, owing to the paleness of the light of the flame, could not be observed during the day.

On another day, in the twilight, I went again to the place, where I awaited the approach of night: the flames became gradually visible, but redder than formerly, thus showing that they burnt also during the day: I approached nearer, and they retired. Convinced that they would return again to the place of their origin when the agitation of the air ceased, I remained stationary and motionless, and observed them again gradually approach. As I could easily reach them, it occurred to me to attempt to light paper by means of them, but for some time I did not succeed in this experiment, which I found was owing to my breathing. I therefore held my face from the flame, and also interposed a piece of cloth as a screen; on doing which I was able to singe paper, which became brown coloured and covered with a viscous moisture. I next used a narrow slip of paper, and enjoyed the pleasure of seeing it take fire. The gas was evidently inflammable, and not a phosphorescent luminous one, as some have maintained. But how do these lights originate? After some reflection I resolved to make the experiment of extinguishing them. I followed the flame; I brought it so far from the marsh, that probably the thread of connexion, if I may so express myself, was broken, and it was extinguished. But scarcely a few minutes had elapsed, when it was again renewed at its source (over the air bubbles) without my being able to observe any transition from the neighbouring flames, many of which were burning in the valley. I repeated the experiment frequently, and always with success. The dawn approached, and the flames, which to me appeared to approach nearer to the earth, gradually disappeared.

On the following evening I went to the spot, and kindled a fire on the side of the valley, in order to have an opportunity of trying to inflame the gas. As on the evening before, I first extinguished the flame, and then hastened with a torch to the spot whence the gas bubbled up, when instantaneously a kind of explosion was heard, and a red light was seen over eight or nine square feet of the surface of the marsh, which diminished to a small blue flame, from two and a half to three feet in height, that continued to burn with an unsteady motion. It was therefore no longer doubtful that this ignis fatuus was caused by the evolution of inflammable gas from the marsh.

In the year 1811, I was at Malapane, in Upper Silesia, and passed several nights in the forest, because ignis fatui were observed there. I succeeded in extinguishing and inflaming the gas, but could not inflame paper or thin shavings of wood with it. In the course of the same year I repeated my experiments in the Konski forests, in Poland. The flame was darker coloured than usual, but I was not able to inflame either paper or wood shavings with it; on the contrary, their surface became speedily covered with a viscous moisture.

In the year 1812, I spent half a night in the Rubenzahl Garden, on the ridge of the Reisengebrige, close on the Schneekoppe, which constantly exhibits the Will-with-the-Wisp, but having a very pale co-

lour. The flame appeared and disappeared, but was so mobile that I could never approach sufficiently near to enable me to set fire to any thing with it.

In the course of the same year I visited a place at Walkenried, in the Hartz, where these lights are said always to occur; they were very much like those of the Neumark, and I collected some of the gas in a flask. On the day after, I found by experiment that it occasioned cloudiness in lime water, a proof of its containing carbonic acid.

I observed accidentally another phenomenon allied to this, at the Porta Westphalica, near Minden. On the third of August, 1814, we played off a fire-work from the summit, to which we had ascended during the dark, and where no ignis fatuus was visible. But scarcely had we fired off the first rocket, when a number of small red flames were observed around us below the summit, which, however, speedily extinguished—to be succeeded by others on the firing of the next rocket.

These facts induced me to separate the ignis fatui from the luminous meteors, and to free them from all connexion with electricity. They are of a chemical nature, and become inflamed on coming in contact with the atmosphere, owing to the nature of their constitution.

I think it highly probable that the fires that sometimes break out in forests are caused by these lights.

Falling Stars.—I have frequently observed on meadows and fields that slimy leek-green matter, which is commonly taken for the product of falling stars, fire-balls, &c. It speedily passes into a state of putrefaction, and dissolves into a whitish form, which at length disappears. I cannot venture to speculate on its formation. This slime appears to me to be intimately connected with the plants which generally surround it, although I cannot deny its flattened roundish shape. Once, indeed, I observed it on the bare ground, at a distance from vegetables of every kind. In Finland, I observed it on rocks, but they were richly clothed with mosses. Whatever opinion may be formed as to it, the plants, particularly the cryptogamic ones in its vicinity, ought to be examined. I may add, that I observed this jelly in a forest under a fir tree, where there was no possibility of its having fallen from the sky.*

Thunder Storm.—On ascending a mountain which rises rather more than 2000 feet above Teschen, I encountered a storm, concerning which the following particulars are not without interest. The wind blew from the south, and, shortly after I commenced my ascent enveloped the upper part of the mountain in clouds. The oppressive feel of the air seemed to announce a coming thunder storm, but hitherto neither thunder nor lightning had occurred. The nearer I approached to the clouds, the darker was their colour, but still the sun

* The so called *Star-jelly* is said to be a kind of fungus, *Actionomyces Horkellii*.—*Vide* Oken *Isis*, 1830, ii. 135.

shone brightly upon Teschen. The clouds, as seen from below, which exhibited a remarkable rotatory motion, appeared sharply bounded, and I was therefore surprised, when I came near to them, to find, as usual, only a gradually denser and denser cloud, which speedily wet me through. A particular rotatory wind appeared to prevail in this region (above half way up the mountain,) occasioning a piercing cold, which was the more striking, as contrasted with the sultry heat and stillness below the clouds.

I had hardly entered the denser part of the cloud, when it was so dark, that I could with difficulty distinguish an object at my foot—(I name this dark, because I do not know any other expression for it; it is not, however, want of light; we have a white veil before us, which is constantly moving with a rotatory motion, which we cannot compare with any thing else.) I was scarcely in the cloud before I felt throughout my whole body a kind of expansive tension, which was excessively oppressive, and seemed to affect the walking of my companion, a poodle dog, even more than it did myself. The hair appeared to bristle up, and it seemed to me as if something was drawn out of the whole of my body. But this electric tension was of a very different character from that from an isolator. I bent down, in order to see the grass that surrounded me, and on which no dew was observed,—when I was suddenly enveloped in a bright sea of light, with a yellow lustre, and perceived, along with a violent noise, a sudden cessation of the former tension. The noise may be best compared with a distant dull cannon shot, only more continuous and louder, or may be compared with the explosion in a mine; but no rolling was heard. The grass was in motion, but I was too much surprised and confounded to make more particular observations. The convulsive motion of the cloud ceased for a moment, but immediately began again, and with it the tension was renewed. During the moments of rotation, the vaporic particles appeared to be arranged in rows into fibres, which moved still more violently amongst each other,—and after the explosion all was again calm, and a mere fog or cloud was visible. My poodle dog was the first object of my attention; it seemed to me to be thicker than usual, and his hair bristled up; I stroked it several times, and saw it bristle up under my hand. A new flash of lightning took place, and I could distinctly perceive, notwithstanding the light, that the whole body of my dog glimmered with a peculiar lustre, the hair, formerly bristled up, now fell flat, and he sunk down on his knees. This was a consequence of the stronger streaming of electricity from him than I experienced, and which seemed, as it were, to draw me from the mountain. Although during the tension, the feeling of drawing out was continuous and always increasing in intensity, still it was strongest at the moment when the electrical discharge took place; the hair bristled up more, and I felt something, as it were, passing from out my interior, and instantaneously all was passed, and the hair flat again. On the next flash of lightning, I noticed the appearance of the grass; on the discharge it appeared shining at its extremities; it became erect, when I felt the tension in-

creasing in my body, but became gradually wet, and then sunk down again. [*Ibid.*]

First British Experiment in Steam Navigation.

SIR,—The accompanying sketch, fig. 1, represents a lateral section of the original steam-boat, invented by my father, the late William Symington, and the efficiency of which was twice proved, though on different scales of magnitude, by him, viz. once in 1788, on Dalswinton Lake, Dumfriesshire—and another time, in 1789, on the Forth and Clyde Canal.

Fig. 1

Description.

A A, the two cylinders. B, the boiler. C, steam pipe. D D, paddle wheels, situated and wrought in a trough extending from the stem to the stern of the boat, which trough allowed free ingress and egress to the water. E E, connecting chains. F F, direction pulleys. G G, ratchet wheels, which communicated motion to the paddle wheels. I I, lower piston rods. H, beam. K, plug-frame and hand gear. L L, flotation line. M, water cistern.

The merit of these exemplifications has been in several publications erroneously awarded to the late Patrick Miller, Esq. The engine was of a peculiar construction, partly for the purpose of avoiding infringement on Mr. Watt's patent rights. It had two cylinders on