Abstract of Performances under Steam alone, and assisted by Sail.

	PER HOUR.			PER KNOT.		WHEELS.	
	Speed in knots.	Coal in lbs.	Rev's. of eng'es.	Rev's. of eng'es.	Coal in lbs.	Rev's. per min.	Slip in per cts.
Outward Passage,	7.656	3084	594	77.7	403	9.90	16.5
Homeward "	7.365	2944	575	78.1	400	9.58	17.1
Mean,	7.510	3014	584	77.9	401½	9.74	16.8

In the foregoing table, the performance in cruising has not been included, owing to the short passages, &c., requiring an undue consumption of fuel from lighting and extinguishing fires, &c., and to a want of knowledge of the influence of tides and currents. But the above covers a period of 231½ days, and certainly presents a remarkable economy and uniformity.

We hear much said of the slowness of our naval steamers, of their inefficiency, &c., and as it must be admitted that great cause for complaint has existed, it gives us pleasure to record such a log as the above. The *Susquehanna*, on her return, made the passage from Valparaiso to Rio de Janeiro, *around Cape Horn*, in 21 days and 2 hours, the quickest passage yet made. The run from San Francisco to Philadelphia in 77½ days, of which for 5½ days the ship was under sail and the paddles off; the average speed for that time being about 180 miles in 24 hours. The highest speed attained during any 24 hours, was 251½ knots.

In considering the above consumption of fuel, it ought in justice to be remarked, that the cut-off was set at half stroke and not adjustable, and that the boilers have for a long time been in a very leaky condition, both of which tended to increase the expenditure of coal. J. V. M.

On the Action of the Violet and Ultra-Violet Invisible Light.

By W. EISENLOHR.*

The phenomenon described by Stokes under the name *fluorescence*, led me to the supposition that this was caused by the interference of the shorter system of waves, blue-violet and ultra-violet (for the sake of shortness, the chemically acting invisible rays of the spectrum may be so designated). I think, with many others, that the eye has the greatest sensibility for a certain duration of vibration, (the yellow light,) and that it is the more sensitive for longer or shorter waves, the more these differ from the medium light in their depth or height.

Light itself consists of the visible systems of waves, and besides these, of such as are longer than red and shorter than violet. As the combination of two tones is always deeper than each single one, out of which the compound tone arises, so from the interference of yellow and blue there can result only light of greater length of undulation, and not violet light. Now, since red has the longest undulations of the visible light, the com-

* From the Lond., Edin., and Dub. Philos. Mag., Feb. 1855.

bination of red and yellow waves of light can only give a deeper tint than red, and consequently no visible light. A fluorescence in the dark space of the spectrum near the red is not therefore to be expected. It is quite otherwise at the other end of the spectrum. The ultra-violet is the light acting in the dark space of the spectrum near the violet; its existence could only be shown by its chemical action, before the wonderful discovery of Stokes. It consists of countless systems of undulations, the lengths of which, differing among themselves, have all a shorter duration than the violet light. Through their interference, waves of greater length than their own results; and by their great variety, tints of combination no less numerous; hence, in many cases, all kinds of visible light, or white.

In other cases a certain color prevails in the mixture of the tints of combination, which will partly arise from the length of the original waves, and partly from the distance of the reflecting layers of atoms of the fluorescent body.*

Starting from this view, I have made experiments to find sources of light in which high tints prevail, in order to test this idea. Violet and blue glasses, through which the sunlight was admitted into the room by means of a heliostat, separating single parts of the entire spectrum from the rest, and causing the light thus obtained to penetrate into the fluorescent bodies, proved, at least, not the contrary of my supposition. I ascribe the cause of the partially slight success to the circumstance, that I possessed no blue and violet glasses of sufficient purity, which on that account allowed fewer of the more intensely acting rays to pass through. At last the violet light occurred to me, which results in the so-called electric egg when it is exhausted of air. I tried its action on fluorescent bodies, and was delighted to see that it produced some of the appearances described by Stokes, with a splendor which I have never seen with the most beautiful experiment by means of the spectrum. Paper on which a design had been made with a solution of sulphate of quinine, showed at a distance of ten to twelve feet from the oval receiver in the dark chamber, all the details of the design in the most beautiful white on a *deep* violet ground. Ruhmkorff's induction apparatus is extremely convenient for the production of the electric light in the receiver, when the latter is almost exhausted of air. The appearance is so striking as to lead to the belief that the writing or design on the paper is itself shining and sparkling.

Hence, in my opinion, it follows, 1st, That the violet light produced *in vacuo* is mixed with a large quantity of invisible ultra-violet rays. 2d, That out of the ultra-violet rays of the so-called northern light invisible to the naked eye, there results by interference in fluorescent bodies a quantity of visible light, and that therefore this light, reflected from the surface of the paper which has been marked with quinine solution, appears brighter than direct light; that therefore, out of the ultra-violet light invisible to the naked eye, there is produced by mechanical means

* Of course, the comparison between the tone of combination, and the light produced by various kinds of ultra-violet or other waves, must not be taken literally, for otherwise the number of vibrations of the resulting color must be equal to the difference in the number of vibrations of the original rays.

actual light. 3d, That the so-called northern light has the strongest chemical action.

A further conclusion is, that the light *in vacuo* of Ruhmkorff's apparatus, or even that of the electric machine, is a much more powerful agent for testing the fluorescence of bodies than any hitherto employed.

I may here mention that I am still engaged on this subject, and reserve to myself further communications. The short time at my disposal compels me to limit myself to the statement, that a thick white glass in the dark chamber appears of a clear and splendid gray.

I scarcely doubt that the white *color* of the electric light in air has also its explanation in the combination of the higher systems of waves, which are formed in consequence of the manifold reflexion on the atoms of air, and the consequent interference. Even the sun's rays are, according to Sondhaus, violet, and we see the sun, as it appears to us, only through a mixture of tints, whose production can be explained by the combination of the shorter systems of rays of the violet light.—*Poggendorff's Annalen*, vol. xciii., p. 623.

On the Incrustation of Steam Boilers. By M. COUSTÉ.*

In the *Annales des Mines* for the present year, is an interesting paper by M. Cousté on the incrustations of steam boilers, and the methods for preventing their formation. He commences by pointing out that the prevention of incrustations, if realized, would produce a better preservation of the boilers, greater security against explosions, and considerable economy in fuel. For steam vessels, it would be attended with an increase of available space for cargo, and the use of steam at high pressure.

He then presents the results of his investigations on the nature of deposits, and the circumstances connected with their formation, whether in boilers fed with salt or fresh water.

M. Cousté suggests four methods for preventing incrustations. The first is, in fact, the well known method, which consists in extracting from the boiler, either at intermittent periods, or in a continuous manner, a certain quantity of water saturated with solid matter. He thinks this process imperfect for low pressure engines, and quite useless for those at high pressure. He proposes, however, to make some further improvements in it, as the greater number of marine steam engines work at low pressure, and may thus be in some measure benefited.

The second of the methods described is called by M. Cousté, *alimentation nonhydrique*, and requires the use of Hall's condensers. The principal objection to this method is the existence of a counter pressure in the cylinder during too considerable a part of the stroke of the piston. By calculation he finds that from about 25 to 30 per cent. of force is lost in a low pressure engine.

The third method consists in continually employing the same water for condensing the steam, and of course requires that this water must continually pass through a refrigerating process.

The fourth method, which belongs entirely to M. Cousté, consists in feeding the boiler with water heated to a very high temperature (at least

* From the London Mechanics' Magazine, January, 1855.