and referred it to the phosphorescence of the cloud. I have no doubt that that is the true explanation. Other phenomena, having relation to fluorescence and phosphorescence, as the difference in the light of oxygen and hydrogen exploded in glass globes, or in the air, were referred to, with the expression of strong hopes that Becquerel's additions to that branch of science would greatly explain and extend them.

On the Progress of Steam Navigation at Hull.*

By JAMES OLDHAM, M. Inst. C.E.

For generations past, Hull has been noted for its Greenland and Davis Straits fishery, and for many years this has constituted the chief feature of the port. Within the last two or three years steam has been put into successful requisition to aid the dauntless and hardy mariner in the pursuit of this hazardous calling, and now we have several screw steam ships employed; and although some of them are fitted with comparatively small power, they have proved to be possessed of great advantage in the service, and in some instances satisfactorily to the owners. We have had two descriptions of steam vessels employed in the fishery; the first, the old wooden sailing ships, which had been engaged in the service for some years, but which were afterwards fitted with screw machinery and auxiliary steam power. The second, iron-built ordinary screw steam vessels; but which proved, I believe, almost a total failure: the material of which they were built and the want of strength for such a purpose proving them altogether unfit to contend with the severity of the climate and rough encounters with the bergs and fields of ice, some becoming total wrecks, while others returned bruised and rent, and were with difficulty kept from sinking. A question here arises, how far iron ships are calculated to bear the severe frosts of high latitudes, and whether wooden-built vessels, with all their defects, are not the best adapted for encountering such a climate? The screw steam ship which was first sent from Hull, or any other place, to the fishery as an experiment, was the *Diana*, timber-built, 355 tons and 40 horse-power, high pressure, the property of Messrs. Brown, Atkinson & Co., of Hull. This vessel had been some time engaged in the fishery as a sailing ship; but her spirited owners, thinking an important advantage could be gained, determined upon the adoption of steam power, and at once had the *Diana* fitted up for the spring of 1857 by Messrs. C. and M. Earle, who put in the engines, and made the screw to lift out in case of need. The experiment fully answering their expectations, Messrs. Brown, Atkinson & Co. bought the *Chase*, a fine American built ship of immense strength, and of 558 tons. She was fitted by Messrs. Martin, Samuelson & Co. with condensing engines of 80 horse-power, and dispatched to the fishery in the early part of 1858, and with good results. By the application of steam, ships in this service can now make a voyage first to Greenland, and afterwards to the Davis Straits. In the commencement of this year several ordinary iron screw steamers were dispatched to Greenland,

* From the London Civ. Eng. and Arch. Jour., Dec., 1859.

viz: the *Corkscrew*, *Gertrude*, *Emmeline*, and *Labaun*; the latter only of this class, which is the property of Messrs. Bailey & Leatham, had any success; but in consequence of her great strength and peculiar form, succeeded in a tolerable way; the others were much damaged, and, as I have already remarked, returned in a bad condition. The *Labaun* is 584 tons burthen and 40 horse-power.

The next point of interest connected with the steam ships of the port of Hull refers to alterations made in some of the vessels. The *Emerald Isle*, a paddle timber-built ship of 1835, the property of Messrs. Gee & Co., originally 135 $\frac{8}{10}$ long, lengthened 35 feet, with a gain of 14 inches draft of water, and an increased capacity for 100 tons dead weight. The *Sultana*, iron screw steam ship of 1855, the property of the same house, originally 150 feet long, lengthened 30 feet, with a gain of 10 inches draft of water, and an increased capacity of about 100 tons. It is interesting to observe that in both cases we have no diminution of speed through the water, and that both vessels are improved as sea boats. Daily experience teaches the advantage gained, in almost every point of view, by ships of great comparative length. The iron steam-ship *Lion*, of Hull, formerly a paddle-boat 249 feet long, but now converted into a screw steamer by her owners, Messrs. Brownlow, Lumsden & Co., under the direction of Mr. Anderson, their engineer, exhibits the great advantage gained by the alteration. Her register tonnage is 690, and the total tonnage 1014. She was formerly fitted with steeple engines of 350 horse-power, and had four boilers, two before and two abaft the engines; but these were substituted for direct action engines of 150 horse-power, and two of her old boilers replaced, and by this alteration a clear length of hold in midships of 23 feet is gained. She required before the conversion 650 tons of coal for a St. Petersburg voyage, and consumed 30 to 40 cwt. per hour; but now 350 tons for the voyage, and a consumption of 20 cwt. per hour. By the change of machinery about 130 tons of dead weight is removed from the ship, and she is now able to carry 400 tons more cargo. Her speed is also improved considerably; before the alteration, when drawing 14 feet, the rate was six knots and a half, but since the change, when drawing even more water, they can steam eight knots. Thus, throughout, a saving in almost all departments of the ship, and other advantages, have been effected by this important change. During the last two years many fine steam ships have been built in Hull, and others are in process of building for English and foreign service by Messrs. Brownlow, Lumsden & Co., Messrs. C. and W. Earle, and Messrs. Martin, Samuelson & Co. The last-named firm are making rapid progress in the building of two large paddle steam ships for the Atlantic Royal Mail Steam Navigation Company, of the following dimensions, power, &c.—

	Fcet.
Length between the perpendiculars, ...	360
Beam moulded, ...	40
Depth, ...	30
Tonnage, builder's measure, ...	2860
Nominal horse power, ...	800

These ships are to have three decks, and to be fitted fore and aft for passengers. Speed through the water, twenty miles per hour. They will be of immense strength, and their build and form such as to insure their becoming fine sea boats.

Since the meeting of the British Association at Dublin, considerable advance has been made in London and other ports in the application of superheated steam, and, I believe, with great success and satisfaction in the results; Hull, however, before taking a decided step in this important discovery, is anxious to see and adopt the best mode of the application of the principle, being assured that in every onward movement it is better "to make no more than good speed." Some attention has been paid to the consumption of smoke in the furnaces of our steam vessels, and with a considerable amount of success. I may here mention the mode of Mr. Ralph Peacock, of New Holland, Hull, for which he has taken out a patent. It consists of a double furnace-door, the chamber or space between the inner and outer surfaces being five to six inches in width. The inner plate is perforated very full of small holes, and in the outer plate a revolving ventilator is inserted, which is on the principle of that invented by Dr. Hale to supply close places with fresh air. The apparatus is in use on board the *Helen Macgregor*, one of Messrs. Gee & Co.'s large sea-going steam ships, and has given very general satisfaction, for by the report of the chief engineer, Mr. McAndrew, a saving of fuel is effected, and the steam better sustained. Another great advantage, as reported by the master, Captain Knowles, derived from this invention is, that on running before the wind they are never now annoyed and endangered by a dense cloud of smoke in the direction of the ship's course, which, particularly at night time, creates so much risk of collision. This apparatus is also in use on board several other steamers, viz., the *Yarborough* and *Grimshaw*, belonging to the Anglo-French Company, the *Albert*, of Hull, and also a number of river steamboats. I have great pleasure in noticing also an improvement introduced on board the *Queen of Scotland*, another ship belonging to Messrs. Gee & Co., for the same object, by the chief engineer, Mr. Smith, and having furnaces of ample capacity, answers the purpose in a most satisfactory manner. Mr. Smith's mode consists simply in keeping a few inches off the front ends of the bars quite clear and clean from side to side of each furnace, thus admitting at the right place a sufficient amount of air. The report of the master, Captain Foster, is very satisfactory. I have witnessed also the effect of this mode on the furnaces of stationary boilers with perfect results.

I have now to refer to the application of Silver's Marine Governor, as applied by John Hamilton, of Glasgow. Several of these ingenious and effective instruments are now in use on board steam ships in the port of Hull, giving the highest satisfaction. They are so sensitive in their action, that the slightest pitching motion is at once indicated, and the steam admitted or excluded as the case may be. By the use of this governor the full power of the engines is in immediate requisition, producing the effect of saving of time, saving of fuel, and pre-

venting of accidents by what is termed racing and otherwise. The ordinary mode, in the absence of the governor, is for the engineer in stormy weather and heavy seas continually to stand at the throttle-valves, or, to save himself this trouble, to throttle the engines; and thereby when the full power of the engines is most required, it is frequently reduced to one-half or less, and consequently there is occasioned a loss of time on the voyage, and the risk of falling on to a lee shore.

For the Journal of the Franklin Institute.

The Meteorology of Philadelphia. By JAMES A. KIRKPATRICK, A. M.,
Professor of Civil Engineering in the Philadelphia High School.

FEBRUARY.—The month of February, 1860, was remarkable for its many extreme changes, both in the temperature and pressure of the atmosphere. During the night between the 1st and 2d days of the month, the register thermometer indicated a temperature as low as 1 degree; while, at 2 P. M. of the 23d, it reached 70 degrees. At no other period during the last nine years did the temperature rise so high in the month of February; and only once during the same time and month did it descend lower. That was on the morning of the 7th of February, 1855, during a snow-storm, when the temperature indicated was 1° below zero. In like manner, the barometer ranged from 30.358 inches on the morning of the 3d, to 29.099 inches at 4 P. M. on the 18th; showing a difference of height in the column of mercury of 1.259 inches; greater than has been noticed in February, since 1853.

The first three days of the month were very cold; but, after that, the weather moderated, and continued mild until the end of the month.

About 11 P. M. on the night of the 9th, the wind suddenly changed to the north-west, and blew a gale which continued until about 4 P. M. of the 10th. The force of the wind was so great at 7 o'clock on the morning of the 10th, that a new stone retort house at the Point Breeze Gas Works, was blown down, two men being killed by the falling walls. The house was one story high, with a very sharp roof, being 57 feet from the ground to the ridge of the roof. It was 57 feet wide, and 250 feet long, and built of Trenton brown sandstone, the walls being 2 feet thick. The roof was of iron covered with slate, and the greatest care was taken in the construction of the building. A similar building near it was not injured, and other structures, old houses, and frame shops in the immediate neighborhood, were left standing. The retort house destroyed, must have been in the very centre of the tornado.

Snow fell on the 11th, 15th, and 18th days of the month, covering the ground in the aggregate to a depth of about 12 inches.

The coldest day of the month was the 2d, the average temperature of that day being 9.2°.

The warmest day was the 23d; mean temperature, 56.5°.

There were but three days of the month entirely clear or free from