to Mr. Wm. Melbourn, of North Shields, was offered for the purpose, and a series of experiments were made upon the furnaces, the plan adopted being very simple, consisting of a proper admission of air into the furnace, which, combined with careful stoking, was expected to consume the smoke. After certain alterations were effected, the tug was taken to sea, with a party of steam-tug owners, and their solicitor, Mr. Kewney, and the inspector of nuisances, on board. It was found that the improvement effected was very great, upwards of 75 per cent. of the smoke being consumed, and the remainder being of a character far less offensive, being thin and light colored. The inspector considered that the result was very satisfactory.

Dr. Richardson and Mr. Reed were determined, however, to effect a perfect consumption of smoke, if possible; and made further alterations. On the 5th ult. the *Expert* proceeded to sea, on a voyage from Newcastle to Warkworth, a distance of 30 miles, having on board Mr. Miller and Mr. Taplin, government engineers (sent from Woolwich and Portsmouth to test the experiments going on at Elswick to consume the smoke, with a view to re-introduce the Northern coal into the naval yards); and also Dr. Richardson and Mr. Reed, and a party of steamboat owners and their solicitor. It was found that the alterations, which were of a simple character and comparatively inexpensive, entirely effected the consumption of the smoke, there being none whatever visible throughout the voyage out or home, except when Mr. Reed, in order to exemplify the efficiency of the system, stopped the admission of the air, and allowed the production of the smoke at pleasure, or the entire consumption, as he thought fit.

The other steam-tugs in the association, and the steam-ferries on the Tyne, will be fitted up with the apparatus forthwith, and it is anticipated that a great nuisance to the river and harbor towns of the Tyne, occasioned every sea-tide by a black fall of smoke hanging over them, and sometimes entirely obscuring the view of the sea, will be entirely removed.

*On the Influence of Pressure on Chemical Affinity.** By Dr.

LOTHAR MEYER.

In the twelfth volume of Poggendorff's *Annalen*, there is a note by Babinet which contains the proposal to use, as a measure of chemical affinity, the pressure which a gas generated by chemical decomposition must attain in order that the decomposition may cease. The author states that for zinc and sulphuric acid the limit is reached when for 0°C . the pressure of the liberated hydrogen amounts to thirteen atmospheres; at 25°C ., on the contrary, this pressure exceeds the height of thirty-three atmospheres.

Experiments which I have made in Prof. Werther's laboratory do not agree with these statements. With the most varied strengths of sulphuric acid, even in the presence of large quantities of different

* From the Lond. Edin. and Dub. Phil. Mag., Aug., 1858.

sulphates, and by the use of citric and acetic acids, the pressure of the hydrogen liberated by zinc far exceeds the limits given by Babinet. The reason of this appears to lie in the fact that Babinet used copper vessels closed by a cock, while I used sealed glass tubes.

The decomposition appears, however, to attain a limit; at any rate the liquid, even with excess of zinc, has still a strong acid re-action after standing for months. But what the maximum of this pressure may be I have not been able to determine, inasmuch as the only tubes I could obtain which would stand the pressure were too narrow to allow a manometer to be introduced. The greatest pressure which I observed directly at the manometer was 66 atmospheres. The acid consisted of one volume SH^2O^4 , and three volumes of H^2O ; the temperature was 0°C . The tube exploded shortly after observing this pressure.—Pogendorff's *Annalen*, vol. civ., p. 189.

*On an Experiment in Melting and Cooling some of the Rowley Rag.**

By W. HAWKES, Esq.

About 31 cwt. of basalt was melted in a large double reverberatory furnace, and after a slow cooling during thirteen days, it presented an upper stratum of stony vesicular matter, about 1 inch thick, next a layer of black glass, from 2 to 8 inches deep on that side of the mass which was exposed to the air from the door of the furnace (elsewhere, immediately under the vesicular layer was solid stone, interspersed here and there with air-bubbles). Mr. Hawkes added some observations relating to the results of experiments which he had made to ascertain the temperature of melted cast iron, and of melted basalt.

Aluminium.†

We glean a few interesting particulars respecting this curious metal, from a work entitled *L'Aluminium et les Métaux Alcalins*, just published by MM. Tissier, gentlemen whom we have several times had occasion to notice in our accounts of the labors of the Academy of Sciences, and who, in the work alluded to, have enriched the history of that metal with many important observations of their own. It had generally been stated that aluminium could resist the highest temperature without absorbing oxygen, but we now learn that if the temperature be raised from a white to a welding heat, aluminium will burn with great intensity until a stratum of alumina be formed on its surface sufficiently thick to exclude the atmosphere. As regards alloys, that made with iron is not malleable, but will crystallize. An alloy of 100 parts of aluminium and three of nickel is more fusible and harder than the pure metal. Bismuth forms with aluminium, in the proportion of one to three, an alloy which is very fusible, but also very subject to oxidation when in a state of fusion. If two equivalents of aluminium and

* From the Lond. Edin. and Dub. Phil. Mag., Sept., 1853.

† From the London Mining Journal, No. 1201.