weight of about 170 lbs., (in addition to the friction of those pulleys,) by pulling down upon the cord."

"Now, the reason that he could not lift the safety valve, was not because it was fastened down, but simply because, being of less weight himself, he was not able to overcome that which he had to lift."

We will now conclude this subject by remarking, that the mystery which, in the opinion of Mr. Latrobe, seemed to hang over the causes of the explosion of the *Medora's* boiler, appears to be wholly removed, or cleared up, by the information derived from Mr. Reeder; for, as the steam pressure imposed by the weighted valve amounted, at the least, to 27 lbs. per square inch, whilst the maximum strength of the boiler was only 39 lbs., or but little more than 40 per cent., over the clear circumferential strain, even if we leave the longitudinal stress out of view, there was evidently not sufficient surplus strength to compensate for the imperfections in materials and workmanship, which are inseparable from such constructions, *and which always render a wide margin necessary between the maximum strength and the maximum pressure*—a margin, which a just regard to safety absolutely requires to be such, that the original strength of a steam boiler shall be, at the least, equal to treble the pressure to be ever imposed.

It would therefore seem to be a safe conclusion, that, in seeking for the causes of the explosion of the steamer *Medora*, *we need not go beyond the insufficient strength and injudicious construction of the boiler, to find a sufficient reason.*

We learn that Mr. Reeder has reconstructed the boiler of this steamboat upon the same general outline, but he has carefully avoided its imperfections; thus, he has placed the flues in regular order above each other, so as to admit of the insertion of stay bars, or braces, both vertically and horizontally; and alongside of the openings into the water legs, which occupy, in the aggregate, much less space than in the old boiler, he has secured broad bars of iron, in such manner as to substitute, or, in effect, to replace, in point of strength, the sectional area of iron removed; finally, he has continued the inner sheets of the side water legs vertically upwards to join the cylinder, and has formed the connecting flanch *internally*.

With these judicious alterations, and the great additional strength thereby imparted to the boiler, the *Medora*, under the new name of the *Herald*, is now, and for some time has been, working safely and successfully in the Chesapeake Bay.

On the Blowpipe. By THEO. F. MOSS, *Mining Engineer.*

The importance of the Blowpipe in analytical research is daily advancing with the progress of chemistry. The knowledge of its use is of the utmost importance to the mineralogist, for with the assistance of a few simple re-agents, he is enabled to determine in a few minutes most of the compounds of a mineral, which by the usual

process of analytical examination, in the wet way, would require hours and often days. When traveling, he is often compelled to let his curiosity rest satisfied concerning the nature of minerals, which he may find, till he returns to his laboratory; whereas with a knowledge of the use of the blowpipe, he would carry with him the means of determining minerals and their component parts on the spot, and of ascertaining the presence of substances, which if contained in small quantities would be detected only by the most accurate analysis. An examination before the blowpipe is to be considered as preparatory to a quantitative analysis by the wet-way.

It is not, however, meant that the blowpipe is infallible in detecting all the compounds of a substance, for one of its components may have such a strong re-action as to conceal the re-action of many others; nor is the following meant as a complete treatise on the blowpipe, but merely to give an insight into its importance, and some of its easier applications, which it is hoped may be of service to the Mineralogist in his summer excursions through our interesting country, and perhaps aid in adding the knowledge of the blowpipe to his other acquirements.

Supposing the reader to be acquainted with the form and manipulations of the blowpipe, I will proceed to describe the order of examination of a substance before the blowpipe and its different re-actions.

The quantity of mineral which serves for examination need be but small; for many operations a splinter the size of a millet seed will suffice, and for some even a much smaller quantity is more than sufficient; another advantage which the blowpipe possesses especially if we have to deal with valuable and rare specimens.

The first operation is to place a small portion of the substance in a thin glass tube closed at one end, then to heat it over a spirit lamp, and afterwards by the blowpipe flame. The object of this operation is to determine what volatile substance the mineral may contain, and sometimes to prepare it for succeeding operations. One of the volatile substances most commonly met with is water, either hygroscopic or chemically combined. The state in which it exists is easily determined by examining the deposit at the cool end of the tube, and ascertaining whether it has an alkaline or acid re-action. An acid re-action of the water results from the decomposition of acid salts, seldom from the decomposition of neutral salts, and then usually from the nitrates, which fill the glass tube with the vapors of nitrous acid, and from the sulphates when sulphurous acid is disengaged, which may be known by the smell.

Fluoric acid is also driven out of some of its compounds when water is present, and this is easily recognised by its pungent smell, and by its destroying the lustre of glass. Besides water, many substances when heated in a glass-tube closed at one end, are volatilized and deposited on the cooler parts of the tube; these sublimate are distinguished from one another by their color, fusibility and volatility.

A sublimate of red-brown globules, which on cooling become yellow, denote sulphur. A reddish sublimate, or one which in large

quantities is black, and which on being rubbed has a dark red appearance, shews the presence of selenium. This burns in contact with the air, with a blue flame, spreading a very characteristic smell like decayed horse-radish.

Arsenic sublimes also when the substance contains metallic arsenic or any of the arseniurets, and also some of the arseniates, and is easily known from the vapors, having a smell like garlic.

Quicksilver is easily known, and forms a grey sublimate which on being moved forms into small globules of metallic quicksilver.

Heat sublimes cadmium from most of its compounds, and the sublimate when heated in contact with the air is changed into a yellowish brown vapor of oxide of cadmium.

Tellurium sublimes at a strong red heat, and deposits on the cool end of the glass tube in metallic globules.

The oxide of antimony sublimes in shining needles, melting first into a yellow fluid.

The oxide of tellurium has a similar action, but is not so easily volatilized, and does not sublime in crystals.

Arsenious acid sublimes very easily.

Arsenic acid is changed by a high heat into arsenious acid, and gives the same sublimate.

Osmic acid sublimes in white drops and crystalline needles, and disengages a very characteristic smell which attacks the eyes and nose in a very unpleasant manner.

The chloride of mercury gives a yellow sublimate, which on cooling is greyish white.

After having examined the mineral in a glass tube closed at one end, the next operation is to heat another portion of the substance in a tube open at both ends, the object of which is to see if volatile substances are disengaged by contact with the air; by inclining the tube more or less from a horizontal position, we have it in our power to increase or diminish the access of air. The substances which are thus disengaged, escape either as gases or are sublimed in the cooler end of the glass tube.

Sulphurous acid is one of the substances which escape in this manner as gases. The smallest quantity of this, which may be easily detected, if, when heating, the tube be held nearly horizontal, and then immediately brought in as near a perpendicular position without letting the substance drop out, and held with its upper end to the nose, when the sulphurous acid is easily detected by its pungent smell.

Combinations of selenium, tested in like manner, give a red sublimate of selenium and the peculiar smell of selenium.

Combinations of tellurium give a grey or greyish white sublimate, which melts into clear transparent globules.

Combinations of arsenic give when heated in the glass-tube open at both ends, a similar sublimate to the combinations of arsenious acid, when heated in the tube closed at one end.

The sulphuret of bismuth and the metallic combinations of bismuth give a sublimate of oxide of bismuth, which by heating, melts into

yellowish brown drops. Minerals containing a small quantity of bismuth give a sublimate which is surrounded by dark yellowish sublimate of bismuth, which becomes paler on heating.

Lead has a similar action, but the sublimate is much lighter.

Sulphuret of lead and selinuret of lead give a white sublimate, which however melts to a grey color.

The sulphuret of tin gives a white flaky sublimate.

Molybdanic acid, a white powdery sublimate and light yellow shining crystals, which are easily volatilized.

(To be continued.)

Making Malleable Iron direct from the Ore.

The President in the chair.—In the conversation which was renewed upon Mr. Pole's paper, 'On the Comparative Friction of Beam and Direct-action Steam Engines,' the author further explained the nature and objects of his paper, which had not been fully understood on the former evening, and illustrated the mode of analytical reasoning, by which he had arrived at his conclusions. He then proceeded to answer the objection which had been raised against the laws of friction adopted by him, and to comment upon the mode of experimenting of Vince and others; showing, on the other hand, by quotations from the recorded experiments of Amonton, Coulomb, Rennie, and Morin, and from the works of Gregory, Brewster, Emerson, Playfair, Barlow, Farey, De Pambour, Posson, Pratt, Whewell, and Moseley, that the views he had taken were correct. He also noticed the variations produced by attrition, and by the introduction of unctuous substances between the rubbing surfaces. These views were corroborated by several members present; some of whom had been quoted as authorities, and the propositions involved appeared to be generally received.

'A new mode of making malleable Iron direct from the ore at one process;' it is the invention of Mr. Clay, and is used at the Shiroa works, near Kirkintilloch. By this process a mixture of dry hæmatite, or other rich iron ore, is ground up fine, with about four-tenths of its weight of small coal; this mixture is allowed to pass gradually through a hopper into an oven adjoining, and forming part of a species of puddling furnace, into which a given quantity is drawn at stated times, when thoroughly and uniformly heated. The charge is then puddled in the usual manner, but with less labor than when working plate iron; and in about an hour and a half the iron is produced in a malleable state, fit for shingling and rolling into bars. After another process of filing and rolling again, malleable iron bars are produced of a quality (as was stated by some members present) superior to the cable bolts or best iron usually made by the long and expensive process of calcining the ore, smelting in the blast furnace, and refining the pig-iron, and the saving of fuel is necessarily very great. The iron was stated, also, to be capable of being converted into steel of superior quality, and when worked by Mr. Heath's plan,