confident opinion on it. The aim is to ſolve phenomena by attraction only, as if it were of more eaſy concep­tion than repulsion. Conſidered merely as facts, they are quite on a par. The appearances of nature in which we obſerve actual receſſes of the parts oſ body from each other, are as diſtinct, and as frequent and fa­miliar, as the appearances of actual approach. And if we attempt to go farther in our contemplation, and to conceive the way and the forces by which either the approximations or receſſes of the atoms are produced, we muſt acknowledge that *we* have no conception of the matter ; and we can only say, that there is a cauſe of theſe motions, and we call it a force, as in every caſe of the production of motion. We call it attraction or repulſion juſt as we happen to contemplate an access or a receſs. But the analogy here is not only flight, but imperfect, and fails moſt in thoſe caſes which are moſt ſimple, and where we ſhould expect it to be moſt com­plete. We can ſqueeze water out of a ſponge, it is true, or out of a piece of green wood ; but when the white of an egg, the tremella, or ſome gums, ſwell to a hundred times their dry dimenſions by imbibing water, we cannot ſqueeze out a particle. If fluidity (for the reaſoning muſt equally apply to this as to vaporouſneſs) be owing to an accumulation of the extended matter of fire, which gradually expanded the ſolid by its very minute additions; and if the accumulation round a particle of ice, which is neceſſary for making it a par­ticle of water, be ſo great in compariſon of what gives it the expanſion of one degree, as experiment obliges us to conclude—it ſeems an inevitable conſequence that all fluids ſhould be many times rarer than the ſolids from which they were produced. But we know that the dif­ference is trifling in all caſes, and in ſome (water, for inſtance, and iron) the ſolid is rarer than the fluid. Many other arguments (each of them perhaps of little weight when taken alone, but which are all syſtematically connected) concur in rendering it much more probable that the matter of fire, in cauſing elaſticity, acts immediately by its own elaſticity, which we cannot conceive in any other way than as a mutual tendency in its particles to recede from each other ; and we doubt not but that, if it could be obtained alone, we ſhould find it an claſtic fluid like air. We even think that there are caſes in which it is obſerved in this ſtate. The elaſtic force of gunpowder is very much beyond the elaſticity of all the vapours which are produced in its deflagration, each of them being expanded as much as we can reaſonably ſuppoſe by the great heat to which they are expoſed. The writer of this article exploded ſome gunpowder mixed with a conſiderable portion of finely powdered quartz, and another parcel mixed with fine filings of copper. The elaſticity was meaſured by the penetration of the ball which was diſcharged, and was great in the degree now mentioned. The experi­ment was ſo conducted, that much of the quartz and copper was collected ; none of the quartz had been melted, and ſome of the copper was not melted. The heat, therefore, could not be ſuch as to explain the elaſticity by expansion of the vapours ; and it became not improbable that fire was acting here as a detached chemical fluid by its own elaſticity. But to return to our ſubject.

There is one circumſtance in which we think our own experiments show a remarkable difference (at leaſt in degree) between the condenſible and incondensible vapours. It is well known, that when air is very ſuddenly expanded, cold is produced, and heat when it is ſuddenly condenſed. When making experiments with the hopes of diſcovering the connection between the elaſticity and denſity of the vapours of boiling water, and alſo of boiling spirits of turpentine, we found the change of denſity accompanied by a change of tempe­rature vaſtly greater than in the caſe of incoercible gaſes. When the vapour of boiling water was ſuddenly allow­ed to expand into five times its bulk, we obſerved the depreſſion of a large and ſensible air thermometer to be at leaſt four or five times greater than in a ſimilar ex­panſion of common air of the ſame temperature. The chemical reader will readily ſee reasons for expecting, on the contrary, a ſmaller alteration of temperature, both on account of the much greater rarity of the fluid, and on account of a partial condenſation of its water, and the conſequent diſengagement of combined heat.

This difference in the quantity of fire which is com­bined in vapours and gaſes is ſo considerable as to au­thorize us to ſuppoſe that there is ſome difference in the chemical conſtitution of vapours and gaſes, and that the connection between the specific baſes of the vapour and the fire which it contains is not the ſame in air, for inſtance, as in the vapour of boiling water ; and this difference may be the reaſon why the one is eaſily condensible by cold, while the other has never been exhibited in a li­quid or ſolid form, except by means of its chemical union with other ſubſtances. In this particular inſtance we know that there is an eſſential difference—that in vital or atmoſpheric air there is not only a prodigious quantity of fire which is not in the vapour of water, but that it alſo contains light, or the cauſe of light, in a combined ſtate. This is fully evinced by the great discovery of Mr Cavendiſh of the composition of water. Here we are taught that water ( and conſequently its vapour) conſiſts of air from which the light and greateſt part of the fire have been ſeparated. And the ſubſequent diſeoveries of the celebrated Lavoisier ſhow, that almoſt all the condenſible gaſes with which we are acquainted consist either of airs which have already lost much of their fire (and perhaps light too), or of mat­ters in which we have no evidence of fire or light being combined in this manner.

This consideration may go far in explaining this dif­ference in the condenſibility of theſe different ſpecies of aerial fluids, the gaſes and the vapours ; and it is with this qualification only that we are diſpoſed to allow that all bodies are condenſible into liquids or ſolids by abſtracting the heat. In order that vital air may become liquid or ſolid, we hold that it is not sufficient that a body be preſented to it which ſhall simply abſtract its heat. This would only abſtract its uncombined fire.— But another, and much larger portion remains chemically combined by means of light. A chemical affinity muſt be brought into action which may abſtract, not the fire from the oxygen (to ſpeak in the language of Mr Lavoiſier), but the oxygen from the fire and light. And our production is not the detached baſis of air, but detached heat and light, and the formation of an oxyd of ſome kind.

To proſecute the chemical conſideration of @@Steams farther than theſe general obſervations, which are applicable to all, would be almoſt to write a treatiſe of chemiſtry, and would be a repetition of many things which have been treated of in sufficient detail in other

@@@[mu] General Observations.