(For the Scientist.) IRON COMBUSTION.

I have here before you a jar of pure oxygen gas, and there is a spiral made of a strand of fine iron wire. Before attaching it to this jar cap, my assistant, who is weighing it before your eyes, will write its weight upon the board. There it is, 165 grains. I take the spiral and heat the extremity of it in the flame of the lamp. I next touch it rapidly with this flour of sulphur, and immediately plunge it while flaming into the oxgyen jar. You see the sulphur instantly consumed, and a fierce white light seize hold of the iron spiral. There it goes, spattering showers of sparks, melting the wire which falls in white-hot liquid drops into the water-covered tray beneath.

As this miniature metallic fire-storm slowly follows the spiral, let us examine what takes place. Within the jar we have but the two elements oxgyengas and solid iron.

The oxgyen is fast disappearing, and the air of this room is rushing in through the cap to fill the vacuum. Soon the amount of oygyen will be too small to support this vivid combustion and it will suddenly die out. What becomes of it? The heated iron combines with the adjacent gas, and in doing so becomes still futher heated. Α large portion of the iron becomes an oxide, and with a considerable amount of molten and yet unoxidized iron it drops into the water. The chemical affinity or attraction which compels the two elements to combine is changed into this intense melting heat. There is no flame, because the oxide produced is neither a vapour nor a gas. But now the fury of the liquid fire ceases. The white glow darkens, and congeals into a metallic sphere. This I break off after withdrawing the remains of my spiral strand, which my even a greater amount of heat would

assistant weighs. He makes the unburned wire 99.3 grains. As 165 grains were put into the jar, it follows that the remainder 65.7 grains have been burned. Now let us collect the ashes of our little conflagration, to see whether the burned 65.7 grains of iron appears diminished or increased by the fiery operation. I collect all the metallic globules and fragments, and place them on this pan which is heated by a spirit lamp. The fragments soon become heated and perfectly dry; and remember they are the products of the combustion of 65.7 grains of pure My assistant weighs them. He iron. makes it 77.5 grains. The process of combustion has therefore added 11.8 grains of weight to the 65-7 grains of This 11.8 grains must thereiron. fore be the weight of the oxygen combined with the iron, or as, you can easily calculate, between 30 and 40 cubic inches of oxygen combining with iron produce all the light and heat developed in our experiment. But by careful experiments it has been found, that were the iron thoroughly burned in this operation 3 grains of oxgyen would combine with 21 grains of iron forming what is called the magnetic oxide of iron F₃ O₄. If 8 grains of oxgyen combine with 21 grains of iron, then 11.8 grains of oxygen have combined with 30.97 grains of iron in our experiment. Therefore of the 65.7 grains of iron burned, only 30.97 grains have been truly burned into the magnetic oxide, while 34.73 grains of uncombined iron remains mixed with the oxide in these globules. Our metallic fire therefore is the product of the chemical combination of 30.97 grains of iron and 11.8 grains or about 35 cubic inches of pure oxygen. By the slow oxidation of the same amount of iron to the red oxide, F2 O3, by leaving the iron exposed to the weather,