drogen in the fuel with one atom of oxygen, and the contact of each atom of carbon with two atoms of oxygen.

Perhaps the best plan for realizing this condition yet reduced to practice is that employed in Roper's air engine. The fire is inclosed in an air-tight chamber, into which the air is forced by an air-pump, part below the grate and part above. The exit from this chamber is closed by a valve and opened at intervals, so that the air and the products of combustion are kept for some time mingled together in a close chamber where they are highly heated by the immediate presence of the fire. Under these circumstances it would seem hardly possible that a single atom, either hydrogen or carbon, could escape without coming in contact with oxygen. Could not this method be applied to furnaces of steam boilers?

The plans for getting the heat out of the gases are yet very imperfect. A certain portion must be lost. It is of course impossible, even in theory, to obtain any more of this heat than the surplus above the temperature of the water in the boilers. In practice the gases go away at a temperature far above that of the water. While the temperature of the water ranges from 260° to 360°, that of the escaping smoke and gases in the chimney ranges probably between 600° and 1,000°.

As every pound of oxygen in the atmosphere is accompanied by 3½ pounds of nitrogen, which performs no part in the combustion, but which absorbs and carries away heat, there is a loss in the introduction of more air than is necessary to complete the combustion. The quantity of air requisite in theory would be that which should contain just enough oxygen to combine with all of the carbon to form carbonic acid, and with all of the hydrogen to form water. But if only this quantity were introduced, it is not probable that the substances could be so mixed as to bring each atom of the carbon and hydrogen in contact with the atoms of oxygen. In practice, therefore, it is necessary to carry in a surplus of air, but it is important that no more should be carried in than is sufficient to secure complete combustion. It will probably be found, also, that there is a proper proportion to be introduced below the grate.

No plan has yet been devised by which an engineer of ordinary intelligence can ascertain whether the products of combustion are wholly carbonic acid and water; that is to say, whether the combustion is complete. If our chemists could furnish some simple test of the presence of carbonic oxide, and of the hydro-carbons in the chimney, they would make a valuable contribution towards the perfection of the steam engine.—*Scientific American.*

India-Rubber Packing.

Perhaps of all the improvements which the art of manufacturing india-rubber has undergone, none are more remarkable than those by which it has been rendered suitable for use in steam engineering. The days of the hemp gasket as a packing are fairly numbered, and in vulcanized india-rubber will be found a substitute better, under proper management, in every respect. We have already referred at some length to different systems of piston rod packing, and we would now wish to call attention to yet another, patented by the Messrs. Tuck. We strongly object to the indiscriminating praise too often awarded to new and untried inventions, but in this we have a system first experimented on years ago. We are constantly asked to recommend the "best packing," by correspondents. This we cannot do, but we can state that the packing to which we refer just now has borne the test of years, and that in consequence it is largely used by the Government, the Messrs. Penn, Maudlay, Rennie, and many of the largest steam shipping firms in the country. This should be quite sufficient for those who do not please to experiment for themselves. To such evidence in its favour we shall add but one word. After a tolerably close investigation, we have found that this packing gives such satisfactory results that we should feel no hesitation in adopting it under the most trying circumstances to which packing can be exposed.—*Mechanics' Mag.*

An English Atmospheric Hammer.

An atmospheric hammer and stamp is now being shown in operation in Birmingham, under the supervision of the patentee, Mr. Grimshaw, at 19½ Ryland street North, in that town. The way it works is as follows:—"An air-pump is worked by a band from a shaft, and forces air into a reservoir, which is so constructed as to form the framework of the machine. The reservoir, in its turn, communicates with a cylinder, in which a piston works with so little friction that it can be moved up and down by hand. This piston is, in fact, the hammer, inasmuch as at the end of it is fitted a head, which may be varied in form to suit any kind of work. The shaft, on which is fixed the pulley-wheel to which the pump crank is geared, has another wheel fitted upon it, which performs a very important operation. By means of a screw or lever (either will do), the last-named wheel can be so moved to or from the center of the revolving-plate, which is attached to the "cut off" valve, that the speed of the hammer can be varied entirely at the discretion of the operator. This wheel and plate work at right angles to one another, and when not in contact the hammer does not work. The reservoir is capable of bearing great pressure, and will store up, so to speak, a large amount of power, until it is wanted for a series of smashing blows. A valve attached to this reservoir prevents it bursting, and appears to be a valuable assistant means of regulating and variating the action of the hammer; and if it is true, as we have been assured, that these atmospheric hammers and stamps can be worked with much less power than steam stamps, costing less in the first instance, and cannot, from the simplicity of their construction cost nearly so much to keep in repair, there appears every probability of their coming into general use. The inventor is a practical mechanic, but the patent right has been sold."—*London Examiner.*

The errors of good men, an d the good deeds o bad men, should not be reckoned in our estimate of their characters.