pretty sure either to fall short of, or exceed, actual requirements.

In view, then, of the superiority of a well-arranged system of pipe-distribution, as compared with the existing primitive apparatus of coal-waggons, cellars, and scuttles (which are in a measure necessitated by the use of a solid fuel), any fuel which does not admit of being so carried should have very great compensating advantages to justify its use. The question then arises, is coal so much the best available form of fuel as to overbalance the drawbacks of want of portability, weight, and bulk, inseparable disadvantages from which a combustible gas would be free?

If it were possible to effect the complete combustion of coal, and in addition to utilise the whole of the heat produced, the thermal value of a fair average coal would be nearly, or quite, equal to that of any practicable substitute, the calorific power of hydrogen being for ordinary purposes purely illusory. But it would be Utopian to expect ever to attain to such a result on a small scale, and even with the special contrivances and constant attention which can be afforded only in a large establishment, it could only be approximated to; as it is, the use of coal in an average fireplace implies the loss of at least 50 per cent. of the total potential heat. It should be borne in mind that the heat absorbed by the products of combustion may be considered as lost for all purposes of sensible thermal effect, unless elaborate devices be resorted to for its recovery, whence it by no means follows those bodies which have the highest calorific power, have a corresponding value in the scale of fuels for domestic purposes. That the *theoretic* calorific intensity, or sensible temperature, resulting from the combustion of coal, varies between 2200 deg. and 2400 deg C., that of carbonic oxide is variously reckoned at from 2100 deg. to 2800 deg. and upwards; while that of hydrogen, owing to the high specific and latent heat of its product of combustion, and notwithstanding its higher "calorific power," is little over 2000 deg. C.; the best sorts of dried peat give a temperature fully equal to that of hydrogen, but wood has a much lower thermometric effect. It may be said that these figures show coal to have as high a value as carbonic oxide, for instance, but they represent not the actual temperatures, but only the maximum theoretical possible capabilities of the respective bodies, without making any allowance for loss, and on the assumption that the combustion takes place in the minimum of time. It is when these two factors of time and loss, which play an all-important part in the practical application of fuel, are taken into account that the palm must be yielded to combustible gases in preference to solids.

It may seem to some that an allowance of 50 per cent. is an excessive estimate of the waste of a coal fire, but far from this being the case, it is probably too low a percentage. The main causes of waste are imperfect combustion, the necessity of keeping up an excessive draught and the quantity of air required to be drawn though a coal fire to maintain its combustion. The loss under all these heads with a well arranged gas fire is almost *nil*. The loss from imperfect combustion is due; first, to the escape of volatile hydro-carbon vapours; secondly, to a portion of the carbon being burnt only to carbonic oxide; and thirdly, to the loss in coal-dust and clinker: of a total of 80 per cent. carbon, 20 per cent. is frequently lost under the first and third of these forms. A gas such as carbonic oxide, or carbonic oxide mixed with hydrogen, would be entirely exempt from the waste arising from imperfect combustion, as, owing to the mobility of its atoms, the air has free access to every separate particle of the fuel, under conditions the most suitable to promote active chemical union. This same property of mobility allows of perfect combustion taking place when only just so much air is passed through the fire as suffices to supply the exact quantity of oxygen necessary for combination with the fuel, while a coal fire requires at least double the supply of air that the chemical exigences of the fuel would call for, on account of the difficulty the air experiences in permeating the solid lumps of which the firing consists. Yet a further squandering of calorie occurs in the chimney, which has to be kept at an excessive heat to enable it to draw this superfluous bulk of air through the fire, on its way to dissipate its heat-burden in the atmosphere.

That gas produced at a distance from the furnace in which it is burnt can be substituted with the best results for the direct use of the fuel which gives rise to it, has been proved to practical demonstration by the Siemens' furnace, which is heated by gases only some 40 per cent. of which are combustible.

We have before us a proposal for heating towns by "pyrogen" gas, which consists of a mixture of nitrogen and carbonic oxide, three-fourths by weight of the mixture consisting of the latter gas. This mixture is said to have a temperature of combustion of 2700 deg C., and it is suggested it should be used to heat some good radiating substance, such as fireclay, in an ordinary grate, by which means heat would be radiated out as in the present coal fire. A fact which must always militate strongly against the use of carbonic oxide, without special precautions to prevent leakage, viz., its poisonous character, would probably render it more expedient to confine the actual combustion to a single apartment, trusting to air traversing heated pipes of *earthenware* (to prevent the possibility of carbonic oxide diffusing though) for the equable transmission of the heat through the house. One can hardly fail to speculate on the applicability of this new pyrogen to lighting as well as heating whether by making the lime-light a commercial possibility, or by the addition of a small proportion of a volatile oil, which would cause it to yield a light as bright as that of coal gas, at a much less cost. Such a consummation as that our light and warmth should be derived from the same source is indeed one to be devoutly wished for, and is in entire accord with the teachings of science.

The scheme we have alluded to is confessedly only tentative, and its author, an F.R.S not unknown in the domain of practical metallurgy, will doubtless make such modifications in his process as the practical trials about to be made may suggest.

We are chiefly concerned in pointing out in a general way the superiority of a well-selected gaseous fuel in crowded centres, and are far from adopting the defence of any particular system. The proposal more immediately under consideration appears to us, whether rightly of wrongly to be defective in the following points. The noxious properties of carbonic oxide are ignored; the proposed method of gas generation would not produce nitrogen and carbonic oxide alone, but in addition a not inconsiderable proportion of carbonic acid; no sufficient allowance is made for the absorption of heat during the vaporisation (or solution) of carbon during the deoxidation of the carbonic acid—how considerable this absorption may be, is evidenced by the decrease of temperature in that zone of the blast-furnace in which a similar reduction takes place; the heat of combustion is also probably overstated; and, finally, the suggested method of regenerating the manganese by throwing the Mn_3O_4 into water, or passing air over it, till manganic dioxide is reproduced, is, to say the least, a startling novelty. Nevertheless, we believe the vitality of the idea is strong enough to surmount the defects we have indicated, and the magnitude of the proposed revolution in practical thermics is so great that a satisfactory solution could hardly be hoped for except at the expense of numerous failures and disappointments, yet the importance of the subject may well reconcile one to its difficulties.

The new proposal is thus contrasted with the present system in its application to London:—

"Five millions of tons of coal (and coke) are at present carted to every man's door by means which are rude, cumbrous, inconvenient to the public, and involve a needless waste of capital and of labour. When arrived there, three fifths of it are totally wasted.

"Instead of this, not quite seven millions of tons of gas are conveyed by steam-power along what is in effect a railroad, not only to every man's door, but to every man's fire-place, and at a comparatively nominal cost.

"Every combustible particle of it, that is, two-thirds of the whole, is efficient in producing heat, which heat may be further utilised and distributed down to its lowest unit above the mean surrounding temperature, in warming and in ventilation The products of combustion, instead of poisoning the air and darkening the sky, give nourishment and vigour to vegetation, and having by it been in turn partially transformed, are evolved in the oxygen of respiration, to give fresh life and vigour to man."—*Iron.*

According to the *Scientific American*, the Canadian way of measuring a tree is said to be as certain as it is grotesque. You walk from the tree, looking at it from time to time between your knees. When you are able to see the top of a tree in this way, your distance from the root of the tree equals its height.