induce an Individual to change a long-fixed habit or practice is a very difficult matter, unless it can be shown to be decidedly to his interest and advantage. To change the habit or practice of the inhabitants of a great city can only be undertaken by enthusiasts, who must be gifted with exhaustless patience and perseverance, for at the best they cannot hope to see anything but a very gradual change. But there is hope for London: the abatement of its smoke has begun. To estimate the proportion of the smoke of London due to domestic fires is impossible. It is certainly very large and greatly in excess of that produced by factories, etc. On a still day even a few cottages will fill a country valley with smoke. I once saw with astonishment; and I often see from a hillside overlooking the lower part of a town the great amount of smoke from a few hundreds of small houses. In fact, if domestic smoke could be abolished, that from factories would be found to be less than is commonly supposed, and would cause little trouble. Gaseous firing, the gas-engine, and the dynamo are latent agents for the diminution of factory smoke.
gaseous fuel, at a low price, could be substituted for the bituminous coal now used so largely, the trouble would be ended. The Improvement that has taken place during the last twenty years, much more in the later than in the earlier ten years, is due to the substitution of gas for coal by the general adoption of gas cooking stoves by all classes, and particularly the wage-earners. The smoke from cooking is an old source of trouble, for the other day I found these quaint lines:

Observe how the chimneys
Do smoke all about;
The cooks are providing
For dinner no doubt.

From Poor Robin's Almanack (1803).

The following figures will show how this source of smoke is being diminished. I have been obligingly furnished by my friends, Mr. Watson, the General Manager of the Gas Light Company, and Mr. Stanley Jones, Engineer of the Commercial Gas Company, with the number of cooking stoves, etc., so far as is known to them. I only give the statistics for the three Metropolitan companies, but all the suburban companies are working on the same lines. Within the last ten or twelve years, by the introduction of the penny-in-the-slot meter, almost the whole of the wage-earning classes of London have been supplied with gas, whereas previously not one in a hundred used gas, for which there were two reasons, the cost of fitting up their houses and the periodic collection of the gas accounts. The gas companies now fit up the houses and tenements, providing meter, cooking stove, pipes, fitting, and burners: all, including the gas, being paid for by the pennies put into the meter.
These figures are an under-statement, being only those known to the
gas companies as stoves let on hire or sold to consumers; but some
consumers have purchased stoves of the makers. It will therefore be safe
to say that of the 834,000 consumers supplied with gas by these three
companies, about 70 per cent., or 584,000 use gas stoves for cooking.
The only reason why it is not 100 per cent. in the case of the slot-meter
consumers is that in a certain number of their habitations a cooker cannot
be fixed, sometimes because there is no place for it and in other cases
because the landlords will not permit it. One of the greatest and best of
the philanthropic trusts for a long time refused permission to fix a stove
in their buildings, and now that objection has been overcome it is found
that in a large proportion of their tenements there is no place for the gas
cooker, they having provided good ordinary ranges to burn solid fuel.

From the King's palace to the cottage or the small tenement of the
workman, from the small room occupied by a single man or woman to the
largest business and other establishments where hundreds are fed daily,
gas is used for cooking. The demand for gas cookers is still maintained,
the three companies supplying not less than 700 to 800 a week; and if
the other companies in the immediate suburbs are included, the new
cookers fixed in all London must average about 1,000 a week. Substitute
coal for all this gas and what would be the condition of London?

But this result has been obtained by slow degrees. The first intro-
ducers of gas stoves were the late Mr. Sharp, of the Southampton Gas
Company, I think in the forties, and shortly afterwards the late Mr.
Goddard, of Ipswich, the father of the Member of Parliament for
that borough. Prior to 1850 the cooking in my father's house was done
by gas, but only by very slow degrees did it become general. For about
thirty years, and in some places longer, the gas companies left the intro-
duction of cooking stoves to the makers and to the consumers, who had to
purchase them outright, with the result that comparatively few came into
use. It is to the system of letting on hire at a quarterly rental to ordinary
consumers and to the supply of stoves with the slot meters that the
present position is due. I am afraid I cannot say that the question of
smoke abatement has had anything whatever to do with it. The gas
companies simply desired to increase their business, and the consumers
found it advantageous to use gas for cooking; the necessary facilities
were given and that is all. It will be no departure from truth to say that
not a single gas cooking stove has been fixed with the object of preventing
smoke; in fact, that worthy object has never been considered by the
parties, but, hey, presto!' it has, so far as cooking is concerned, been accomplished.

There remains a more difficult task for the advocates of smoke abatement, on which, if they are to succeed, they must concentrate their attention. The domestic fire used for heating is the problem. It needs extreme care, suitable appliances and expert knowledge to burn bituminous coal in a steam boiler or factory furnace generally, without smoke. It is vain to expect such a combination in the case of the domestic fire, though it may be improved. The main hope, therefore, lies either in smokeless solid fuel or gaseous fuel of some kind. The only solid smokeless fuels at present available are anthracite and coke. The former is not burnt in the ordinary domestic grate, and although the latter can be so burnt it has not been extensively adopted, except in small houses, and not by any means generally. Coke, no doubt, is best when used in close stoves, and is very effective, and the same may be said of anthracite. Abroad, close stoves are common, but England will have none of them for the heating of sitting-rooms.

We have been too long used to the cheerful open fire (which, in addition to its cheerfulness, serves another most useful purpose, as a ventilator) to give it up without good reason. Constructed as our houses usually are, we have to depend for ventilation on the chimney. I have had a number of experiments made in eight rooms, which show that in ordinary dwelling-houses the chimney, when the fire is burning, will take away about five times the cubical contents of the room in an hour, in some cases slightly less, and in others considerably more, the range being from 7,400 cubic feet an hour in a cottage bedroom (cubic contents about 1,000 feet and a chimney 10 feet high) to 17,200 in that of an ordinary dwelling-house, in a sitting-room of 2,104 cubic feet contents. In this case the chimney is 45 feet high above the fireplace. The lowest ratio in the eight experiments was five times, and the highest about ten times the quantity of air equal to the cubical contents of the room in an hour, that is where a fire, in some cases a gas fire, was burning. In one room of the cottage where there was no fire there was no measurable draught up the chimney. The air in a room with the window shut is not so fresh in the summer as in the winter, owing to the absence of the fire to create a draught up the chimney. The great importance of a good draught up the chimney is therefore clear, and is a justification for the open fire against the closed stoves. Gas fires are often so placed as to partially block up the chimney and thus check the flow of air, which is
probably the reason why complaints are sometimes made against them. This, however, can be, and is, in many cases, avoided. The chief objection to gas for heating is that it is more costly than coal when the fire is required throughout the day. Therefore the inhabitants of our towns will not adopt gas generally, even to please the Smoke Abatement Society. Give them heating as efficient, as convenient, and as cheap as the coal fire, and they will in time (for the householder is very conservative) adopt gas generally. As to convenience and cleanliness in the house, gas has a great advantage over coal, which is one point in its favour. And for efficiency and ventilation it can hold its ground, but its price is the crucial point. It is, however, used more extensively than is generally supposed. The exact number of gas fires in use can only be estimated, because in the majority of cases they are purchased by the consumers. The South Metropolitan Company have 19,765 on hire, but this is no measure of the total. A canvass has been made in a number of streets, mostly of private houses, with the result that 38 per cent. of the ordinary consumers have gas fires in their houses, with an average of two fires to each house.

The following is the list of the places canvassed:

<table>
<thead>
<tr>
<th>Place</th>
<th>Number of Houses Canvassed</th>
<th>Number of Gas Fires</th>
<th>Number of Incandescent Burners</th>
<th>Number of Consumers using Cooking Stoves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Con.</td>
<td>F.</td>
<td>Con.</td>
<td></td>
</tr>
<tr>
<td>Kennington Park Road</td>
<td>93</td>
<td>27</td>
<td>45</td>
<td>77</td>
</tr>
<tr>
<td>Narbonne Avenue, S.W.</td>
<td>100</td>
<td>37</td>
<td>46</td>
<td>86</td>
</tr>
<tr>
<td>Burnt Ash Hill, S.E.</td>
<td>78</td>
<td>52</td>
<td>124</td>
<td>82</td>
</tr>
<tr>
<td>Stockwell Park Road</td>
<td>68</td>
<td>23</td>
<td>57</td>
<td>48</td>
</tr>
<tr>
<td>Camberwell Grove</td>
<td>63</td>
<td>24</td>
<td>42</td>
<td>53</td>
</tr>
<tr>
<td>Wickham Road, Brockley</td>
<td>52</td>
<td>38</td>
<td>100</td>
<td>38</td>
</tr>
<tr>
<td>Louisville Road, Upper Tooting</td>
<td>123</td>
<td>41</td>
<td>88</td>
<td>115</td>
</tr>
<tr>
<td>Norwood Road</td>
<td>98</td>
<td>39</td>
<td>71</td>
<td>83</td>
</tr>
<tr>
<td>New Cross Road</td>
<td>90</td>
<td>14</td>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>Wrottesley Road, Plumstead</td>
<td>72</td>
<td>27</td>
<td>43</td>
<td>62</td>
</tr>
<tr>
<td>Maryon Road, Woolwich</td>
<td>88</td>
<td>25</td>
<td>42</td>
<td>74</td>
</tr>
<tr>
<td>Lee Road</td>
<td>74</td>
<td>30</td>
<td>91</td>
<td>48</td>
</tr>
<tr>
<td>Trinity Street, Southwark</td>
<td>33</td>
<td>6</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>397</td>
<td>379</td>
<td>770</td>
<td>829</td>
</tr>
</tbody>
</table>

The great desideratum for smoke abatement is cheap gaseous fuel. Fortunately illuminating gas, thanks to the Welsbach mantle, is no longer necessary, heating power being the only requirement. To use gas with a
luminous flame burner is now nothing less than unjustifiable extravagance. As shown in the above table over 80 per cent. of the consumers use the mantle, and in a short time it is hoped that it will be as difficult in England as it is in Germany to find a flat flame burner in use.

This being the position, there is no real obstacle to the supply of one quality of gas for all purposes. Prior to the introduction of the mantle it was held that if fuel gas were wanted it would have to be supplied in separate mains, and this would have been impracticable. There is not room in the roadways for another complete set of large gas mains. Now, however, an eight-candle gas would answer all purposes. An entirely non-luminous gas would do but that there are passages and cellars and other out-of-the-way places where a small light is necessary, and this can be better obtained by an ordinary burner than by the use of a mantle.

There are, however, two difficulties in the way. In London the County Council have put every possible obstacle in the way of all the gas companies' efforts to obtain Parliamentary sanction to reduce illuminating power, and in the meantime the production of cheap gas suitable for all purposes is delayed. This struggle began in 1900 and is still going on; a notable advance having recently been made in the shape of a just method of testing gas. For nearly forty years have the companies been subjected to a system of testing that entailed enormous expense and constant worrying anxiety, with no advantage to the public. This great waste of the money of the consumers and ratepayers is due to the mistaken idea of the London County Council that every proposal of the gas companies must be at variance with the public interest. The gas companies have no monopoly now, but are subject to fierce competition. If they do not supply the article the consumers want they lose business. The restrictions imposed by Parliament (when they had an absolute monopoly and gas was the only practicable artificial light, the choice being between ordinary tallow candles, or oil at from 5s. to 7s. a gallon) are now not only useless but mischievous, because they stand in the way of the production of cheap gaseous fuel, which I believe to be the great desideratum for the prevention of smoke.

The second difficulty is that we have not yet found the gaseous fuel suitable for the purpose, which can only come by slow degrees. We want freedom to work in that direction. The just method of testing mentioned above, to come into force in the New Year, will give us a certain measure of freedom to start towards the goal of a cheap fuel gas.

It is in these means that, in my opinion, lies the best hope of success in the abolition of smoke. It can come only by providing the public with
means to supply their needs for heat and light that will suit them better than those at present available. The domestic fire is the point to attack, and this will not be given up for sentimental reasons. No householder will give up his coal fire simply to prevent a smoky atmosphere, but if an efficient and cheap substitute can be found then a gradual change will be made. Legislation to control the householder in this matter is futile, and I hope The Royal Sanitary Institute and the Smoke Abatement Society will not follow the Socialists in the belief that everything can be done by Acts of Parliament. As much freedom as possible is what we want if we are to progress; but put not trust in legislation, which means restriction. The boy who said that pins had saved many lives explained that it was by people not swallowing them, and in like manner Parliament does a great deal of good by not passing many of the Acts introduced every Session, and as many of those now on the Statute Book are productive of harm, Parliament might be much worse employed than in repealing those that are unnecessary and mischievous.