

is removed. Therefore, we pay especial attention to the exclusion from schools of children who belong to infected families. Whooping-cough occupies much the same position. It is an interminable disease, tapering off at both ends into a condition not recognisable except by relation to the condition which supervenes or precedes. The child is on the whole vigorous, except in the youngest cases. I believe, therefore, that the benefit of treatment to the individual case is almost all that can be claimed for the hospital treatment of whooping-cough. In Glasgow, where pulmonary diseases are so rife and so fatal, it is a fearful scourge. In 1872, it caused a death-rate of 21 per 10,000 of the entire population. In 1874, scarlet fever produced a death-rate of 33 per 10,000, and measles, in 1871, of 18. Still, contrasting the ten years, 1861-70, with the ten years, 1871-80, we find in all these diseases substantial evidence of improvement—in the case of scarlet fever, a fall from a death-rate of 13 per 10,000 to one of 10; in measles, from 8 to 7; in whooping-cough, from 15 to 12½.

I wish, in conclusion, merely to point out that during the ten years to which I have appealed for the results of the policy and practice of Glasgow in the management of epidemic disease, both the policy and the practice were only being matured and developed; more especially, the policy did not reach its full proportions until the last years of the decade. I think, therefore, it is pretty safe to anticipate that whoever may sum up the results of the ten years which now lie immediately in the future of Glasgow will have some facts to put in evidence which will tell still more strongly and decidedly in favour of the policy and practice which I have ventured to bring before the Epidemiological Society of London.

CHAPTER V.

THE IMMEDIATE RESULTS OF DISPLACEMENTS FROM INSANITARY DWELLINGS.

THE OPERATIONS OF THE CITY IMPROVEMENT TRUST.

WE have already seen (p. 57) that the area originally scheduled under the Improvement Act extended to 88 acres, which were situated chiefly in the Central District of the City, but also in Gorbals and Calton. The inhabitants of these areas numbered over 51,000 persons, and between 1870-77 extensive clearances were effected. In May, 1874 and 1875, and again in 1877, an investigation was conducted regarding the rehousing of 2270 families, comprising 5870 persons, and the conditions before and after displacement compared with regard to size of house and number of occupants, rental, and sanitary conveniences.

The situation of both, with reference to the centre of displacement, is also shown, and in the corresponding enquiry of 1877 the analysis was extended to include the effect of displacement on the individual members of households with regard to place of employment.

Details of the first and second displacements were submitted to the Philosophical Society of Glasgow, and are now reproduced together with extracts from the third Report, which refers to the displacement of 1877.

As a general result, these enquiries showed that the crest of the outward wave of displacement was reached about three-quarters of a mile from the centre, and that the majority of the displaced families went into houses better adapted to their numerical requirements. The rents increased, but so also did the accommodation supplied.

In an address, as President of the Section of Public Medicine, at the annual meeting of the British Medical Association at Sheffield, 1876, the combined results of the first two displace-

ments were summarised, and occasion was then taken to consider the question of providing buildings for the dishoused— together with the hygienics of flatted tenements and model dwellings. This leads to a discussion of density in relation to health. The papers are here reproduced in the order just indicated.—(ED.)

(1) *On the Immediate results of the Operations of the Glasgow Improvement Trust at May, 1874, as Regards the Inhabitants Displaced, with Remarks on the question of Preventing the Recurrence of the Evils which the Trust seeks to Remedy.*¹

The results which the Glasgow City Improvement Trust desires to attain by its proceedings are clearly set forth in the Preamble of the Act, by which that Trust was constituted, in these terms:—

"Whereas various portions of the City of Glasgow are so built, and the buildings thereon are so densely inhabited as to be highly injurious to the moral and physical welfare of the inhabitants, and many of the thoroughfares are narrow, circuitous, and inconvenient, and it would be of public and local advantage if various houses and buildings were taken down, and those portions of the said City reconstituted, and new streets were constructed in and through various parts of said City," &c.

The first part of this preamble is that with which this paper is chiefly concerned. The Trust obtained power to turn out the inhabitants of certain buildings, with the intention of improving their "moral and physical welfare," in so far as it was injured by those buildings or houses. No one will expect a simple transference from one house to another to produce an effect which can be fully estimated, whether it be good or bad, at the very time of the transference. Moral and physical injury grows into the moral and physical constitution of the individual in the course of his life, and is cumulative in the constitution of successive generations of his descendants. A gutter-child from the Bridgegate is a very complicated production. More forces have contributed to the pitiable result than those which have operated within the short span of his own life, or even passed into his body from the parents who begot him. The evil which the Improvement Trust sets itself to remedy was worked in successive generations, and the good which it desires

¹ Read before the Sanitary Section of the Philosophical Society of Glasgow, 14th December, 1874.

to effect cannot be exhausted in a period short of the life of one generation, if not of several.

I make those prefatory remarks, and wish in the title of my paper to emphasize the adjective "immediate" in order to indicate the only part of the "results" of the proceedings of the Improvement Trust regarding which I intend to contribute a little precise information, and in order to prevent you from estimating the value and scope of my paper, either in excess or in defect of its real importance. What I mean by "immediate results" is nothing vague or speculative, nothing sensational or sentimental, but simply such exact facts as are capable of numerical statement—viz. the size, monthly rental, number of inmates per house, distance of the house from the centre of the city, and manner of the excrement disposal of the inhabitants, before the proceedings of the Improvement Trust at last May Term and after.

Since 1870 the Improvement Trust has, from time to time, demolished the houses of some 15,425 persons. At last May Term some 351 houses were pulled down. The districts operated upon were St. Andrew's Square, Calton, and Main Street, Gorbals. Although 351 families were thus expelled, I propose, partly from necessity and partly from choice, for the sake of purity of results, to confine my data, as to size, rent, and inmates, to 243 houses. The remaining 108 are accounted for thus:—In many cases we failed to trace the subsequent residences from not catching the families before they removed. In other cases, from the combination of dwelling-houses with shops, the rental and general character of the occupancy were such as to remove them from the category to which the great majority of the houses belonged; while in the case of a large new tenement in Great Hamilton Street, which was involved in the operations necessary for the formation of a new street, the houses were really of a superior kind, and would not have been interfered with but for this accident of position. A similar remark applies to some of the houses in St. Andrew's Square. Having excluded those houses, the remaining 243 are on the whole fair samples of the utterly insanitary house, and their 990 inhabitants, fair specimens of the miserable population whose "moral and physical welfare" are alleged in the Preamble of the Improvement Act to be injured by the houses which they inhabited.

The three areas operated upon present some differences, more particularly as to the rental of the houses demolished, which is highest in the Central District, lowest in the Southern District, and intermediate in the Eastern District. Still, the facts regarding these demolitions may best be considered in the aggregate.

1st. *Size of House.*—Before the operations, of the 243 families whose subsequent history has been traced, 118 lived in houses of one apartment, 96 in houses of two apartments, 23 in houses of three apartments, and 6 in houses of four apartments. After the operations those 243 families were housed as follows—viz. 96 in houses of one apartment, 116 in houses of two apartments, 16 in houses of three apartments, and 3 in houses of four apartments, this accounts for 231 families. The remaining 12 families were distributed thus:—5 to the suburbs, 2 to the country, 3 to lodgings, and 2 to Ireland. For the sake of comparison these whole numbers may be reduced to percentages, when we find that before the intervention of the Improvement Trust, 48½ per cent. of the families lived in houses of one apartment, after 39½ per cent.; that before 39½ per cent. of the families lived in houses of two apartments, after 48½ per cent.; that before 9½ per cent. lived in houses of three apartments, after 6½ per cent.; that before 2½ per cent. lived in houses of four apartments, after 1 per cent.; leaving 5 per cent. who after these operations settled in the suburbs, lodgings, or removed to the country districts of Scotland or to Ireland. The same facts may be stated in another way, thus:—Of 118 families living in houses of one apartment, when expelled by the Improvement Trust, 76 removed to houses of the same size, 39 to larger houses, 2 to lodgings, and 1 to the country in Scotland; of 96 families living in houses of two apartments, 66 removed to houses of the same size, 10 to larger houses, 17 to smaller houses, 1 to the country, and 2 to Ireland; of 23 families living in houses of three apartments, 4 removed to houses of the same size, 18 to smaller houses, and 1 to lodgings; of 6 families living in houses of four apartments all removed to smaller houses.

2nd. *Rental of House.*—The monthly rental was ascertained in each case, both of the house which was left and the house to be occupied. The average rental, according to the number of apartments, has been calculated in both cases. It is evident that some differences existed in the value of the property demolished in the different districts of the city. It seems to have been lowest in the Gorbals, and highest in St. Andrew's Square area; thus in Gorbals, the average monthly rental of one apartment in the property demolished was 6s. 3½d.; in Calton, 6s. 7½d.; and in St. Andrew's Square, 8s. 7½d. In Gorbals the average monthly rental of two apartments was 8s. 10½d.; in Calton, 10s. 1½d.; and in St. Andrew's Square, 10s. 3½d. Throwing all these districts together, and calculating the average rental paid for each size of house by the families ejected, in the houses abandoned, and in the houses into which they removed, we find it stands thus:—In

the old buildings, a house of one apartment cost on an average 6s. 7½d. per month; in the new, 7s. 11½d. per month. In the old buildings, a house of two apartments cost on an average 9s. 7½d. per month; in the new 11s. 6½d. In the old buildings, a house of three apartments cost 11s. 5½d. per month; in the new 18s. 1½d. In the old buildings, a house of four apartments cost 13s. 4½d. per month; in the new 17s. 2d. In all cases, therefore, the operations of the Improvement Trust brought an increased expenditure in the shape of rental to the families involved. Stated as a percentage upon their former rent, this increase amounted to 20 per cent. on the rental of a house of one apartment, to 20 per cent. on a house of two apartments, to 58 per cent. on a house of three apartments, and to 28 per cent. on a house of four apartments.

I must pause here to make a few remarks on these comparisons between the sizes and rental of the houses demolished, and the houses into which the families occupying them removed. The number of apartments in the houses demolished is for the most part an entirely delusive method of estimating the accommodation afforded, whether calculated according to the cubic space of those apartments, or as to the sufficiency of the structure; but especially as to the cubic space. To speak of three or four apartments in the old houses is generally a mere fiction, and a fiction of a very tragic kind. Thus, what could a house of one apartment be at 2s. 6d. or 3s. 6d. per month, or a house of two apartments at 5s. per month, or a house of three apartments at 5s. 10d. per month, or a house of four apartments at 7s. 10d. or 8s. 6d. per month? Yet these are all actual quotations of rents paid for such houses in the property lately demolished. It is therefore evident that a very great part of the contrast between the average rental of the old and new houses especially of those of three or four apartments, arises from the fictitious nature of the accommodation afforded by the old houses. The case of a tenant paying more rent in those circumstances is precisely that of one who ceases to buy a cheap but bad and adulterated article, and buys instead a more expensive but good and pure article.

3rd. *Number of Inmates in House.*—Overcrowding of individuals in the family is more serious than overcrowding of families on the soil; hence it is important to ascertain whether the number of inmates per house was greater before or after the operations as regards the families involved. This is all the more important owing to the great increase in house rent, which we have just seen was an immediate result of the change to the families displaced. I find, then, that in the old houses of one apartment the average number of inmates was 3.6, and in the new houses of one apartment 3.3; in the old

houses of two apartments the average number of inmates was 4.6; in the *new* houses of two apartments also 4.6; in the *old* houses of three apartments 4.3; in the *new* houses of three apartments 4.9; in the *old* houses of four apartments 3.6; and in the *new* houses of four apartments 6.8. Still further reducing the comparison to the number of inmates per apartment in the old and new houses, I find that in the *old* houses 990 individuals were accommodated in 403 apartments, giving an average of 2.4 inmates for each apartment, and that in the *new* houses 949 individuals were accommodated in 388 apartments, giving still the same average of 2.4 inmates for each apartment. Returning to my remark as to the fictitious nature of the old house accommodation, it is quite certain that the same number of inmates per house or apartment in the old and new houses really means an increased cubic space in the new houses—this is especially true of the houses of three and four apartments. In the old houses these apartments are merely nominal, in the new they are real.

4th. *Distance from the Centre of the City.*—The operations of the Improvement Trust at last May Term were confined to three areas—the Calton, St. Andrew's Square, and Gorbals. The Cross may be taken as the centre of the city, as almost equi-distant from all points of the circumference, and certainly as the nucleus round which the city has grown—the oldest part of it, and the most densely inhabited and most unhealthy. Taking the Cross, therefore, as the centre, I have determined the relative distance, before and after those operations of the Trust of the houses occupied by 263 families displaced, by marking their position on a map in relation to circles described, with a radius increasing by quarters of a mile in distance from this centre. *In their original habitations*, of these 263 families, 29 were within a quarter of a mile of the Cross, 162 within half a mile, and 72 within three-quarters of a mile. *In their new habitations*, 26 were within a quarter of a mile of the Cross, 79 within half a mile, 108 within three-quarters of a mile, 29 within one mile, 13 within one mile and a quarter, 3 within one mile and a half, and 5 beyond the municipal boundaries. Reducing these numbers to percentages of the whole number of families displaced, we get this comparative result: In their original habitations 11 per cent., in their new 10 per cent. were within a quarter of a mile of the Cross; in their original habitations 62 per cent., in their new 30 per cent. were within half a mile of the Cross; in their original 27 per cent., in their new habitations 41 per cent. were within three-quarters of a mile of the Cross; in their original, within one mile of the Cross, none; in their new habitations, 11 per cent.; in their original within a mile and a quarter of the Cross, none;

in their new habitations 5 per cent., in their original within one mile and a half of the Cross, none; in their new habitations, 1 per cent.; in their original, beyond the municipal bounds, none; in their new habitations, 2 per cent. The change may be summed up in the statement, that *before* these operations only 27 per cent. of the families displaced lived beyond half a mile from the Cross; but that *afterwards* in their new houses, no less than 60 per cent. found themselves beyond that distance. Or taking a wider circle as the limit, none of the families were over three-quarters of a mile from the centre of the city in their original homes, but now 19 per cent. are outside that circle.

5th. The only remaining point in the immediate change in the circumstances of the families evicted which can be exhibited in this form, is the *method of excrement disposal*. Including for this purpose also the total 263 families whose future residence was traced, I find that only 12 of these had water-closet accommodation originally, but 35 have such accommodation in their new houses—that is, whereas only $4\frac{1}{2}$ per cent. of the families whose houses were demolished sent their excreta into the sewers before the demolitions, nearly $13\frac{1}{2}$ per cent. did so afterwards.

This indicates a very decided tendency to increase the proportion of the total excreta of the population which is sent into the sewers and so to add to the pollution of the Clyde at a rate increasing beyond the mere increase of the population. As to the immediate effects of the change from privies and ashpits, as the method of excrement disposal, upon the families themselves, two things must be taken into consideration: *First*, That from the close occupation of the ground in the old localities, for the most part no site was to be had where a privy or midden could be placed so as not to be a nuisance, and even a source of injury to the health of the inhabitants. *Second*, That of the 35 families who found themselves supplied with water-closets after these operations, only 13 found them in their houses. The remaining 22 found them on the stair. The change from a midden reeking in a confined court, possibly right under your window, or at the foot of the stair, to a water-closet on a stair well ventilated and cleanly kept, must be admitted to be for the better.

On the whole, then, the result of the intervention of the Improvement Trust, as regards those families, has been at once to cause their redistribution into houses better suited to their requirements as to size, and situated much farther from the centre of the city, to compel them to incur some 20 per cent. more expenditure for rental on one and two apartment houses, and considerably more for houses above that size, and

in some cases to improve the method of their excrement disposal.¹

I have now placed before you all that seems to me to be involved in the title of my paper; but as a supplement, you will allow me to add a few general remarks on the condition necessary to ensure the success of the Improvement Act, and particularly on the prevention of the return of the evils it is intended to remove.

When a scientific surgeon has removed a tumour from the human body his first impulse is to submit it to microscopic examination, and to determine from the results of this examination what is its exact nature, and above all whether it has a tendency to recur. In like manner, no physician worthy of the name is satisfied with simply treating his patient, or even curing the disease. He also inquires into the origin of the disease, observes its habits and characteristics, and, if possible, gives such advice as will prevent its recurrence. The ailment of which the Improvement Trust desires to relieve us is a very serious one, and the cure of it very costly, and with this, as with our own personal diseases, prevention is not only better but cheaper than cure. I propose, therefore, to glance at the nature, history, and mode of prevention of the civic disease against which the operations of the Improvement Trust are directed.

The disease is overcrowding of various kinds—

1. Overcrowding of tenements on the soil, or over-building.
2. Overcrowding of dwelling-houses in the tenement, and internal defects of structure.
3. Overcrowding of inhabitants in the dwelling-house, or overcrowding proper.

Each of these three forms of overcrowding is an evil in itself, and may exist independently of the other; but, in fact, they are cognate, and are generally found together, each intensifying the evil effects of the other, and all together producing that state of chronic ill-health, with acute exacerbations, which is a feature of the life of Glasgow. Let us run rapidly over each form separately, touching on these three points,—the injury which each causes, especially to the “physical welfare” of the inhabitants, the natural history of each (which will guide us to the prevention of each), and lastly, how far we have succeeded in adopting the measures necessary for prevention.

¹ I wish to avoid stating mere impressions; but it is quite fair to add that the impressions conveyed to the minds of the large and intelligent sanitary staff, whose daily duties have brought the entire operations of the Trust under observation, as well as to my own, are in harmony with the facts stated concerning that section of the operations which was carried out at last May term.

1. OVERCROWDING OF TENEMENTS ON THE SOIL, OR OVER-BUILDING.

Every stone deposited on the surface of the earth displaces so much air, and therefore every tenement added to a city removes further from its inhabitants the great store of outer atmosphere from which alone the air vitiated by the functions of their lives, and the processes of manufacture, can be renewed. Hence there must be broad passages left for the entrance of air from the open country, and spaces preserved, which not only are reservoirs of fresh air, but the soil of which will provide playgrounds, places for rest or exercise, and sites for ash-pits, washing-houses, and other conveniences necessary for comfort and even for health. A study of extant maps of Glasgow throws considerable light on the natural history of this form of overcrowding in old Glasgow. The idea of the city was, central thoroughfares east and west, and north and south. End-on to the building-line of these streets we see long narrow strips, extending in what was the natural direction of the growth of a house placed endwise to the street—*backwards*, looking on the maps like sections of geological stratification, with cracks or flaws between. These were the closes or wynds—parallel intervals left between tenements simply for convenience of access, only wide enough to permit two persons to pass, or perhaps a barrow or a cart. Each proprietor was bent on covering every inch of his grounds with his building, and the only function exercised by the Dean of Guild Court was that expressed in the phrase, which is still in use, “to grant a lining,” that is, to see that if he *built up to*, he should not *build over* the line of his holding. What the result was in process of time has been graphically described by Sir James Watson, and so recently quoted by Bailie Morrison, that I need not dwell further on the picture. At the end of last century, in the first extensions of the city in the feuing of Tradeston, Hutchesontown, Laurieston, Cowcaddens, &c., a different principle was adopted, which gave a new direction to this form of overcrowding, although at the same time it increased the number of streets in proportion to the surface occupied. We may call this the hollow-block plan, appearing on the map as the outlines of squares or parallelograms. These were not happy designs for the free circulation of air, but year by year you find black squares planted in the middle of those hollow squares, and long lines budding out from the sides, or running parallel within a short distance of the sides. This was the new development of overcrowding or over-building. Just as a mason erects the solid shell of his wall and then fills up the

interval with packing, so the proprietor first built his block like a box, and then packed it with other houses, in many cases placed back to back. Hence those ominous black squares on the Post-Office Map of the present day. The operations of the Improvement Trust are almost entirely confined to the product of the older form of over-building, but they are scarcely less needed in the localities which have been spoiled by this more recent development.

The next question is, How far have we profited by the lessons of the past, and succeeded in preventing the continuance of this over-building? My answer is. Not so much as we ought to have profited and prevented it. When the Trust has finished its work, our streets will be the finest in the world. We are also getting squares and parks and other breathing spaces. We have got entirely rid of the old way of development of buildings parallel to each other, and vertical to the line of the street; but if you look at our Post-Office Map, you will find it studded year by year with more of these squares, like the block plan of boxes: and if you go and inspect those squares *in situ*, you find that boxes they are to all intents and purposes, containing stagnant air. If the process of over-building is developed to its next stage, by packing those boxes to any degree with buildings of any kind, whether intended for dwellings or not, then you reproduce to the full the old evils. I admit, of course, that there is no chance of this being done in the present day to the extent to which it has been done in the past; but I think I am quite safe in asserting that the principle that a building of any kind displaces vital air, and impedes its circulation, is not sufficiently acknowledged in the powers of the Dean of Guild Court for preventing over-building. It is barely worth consideration whether a tenement which darkens my windows and impedes the access of fresh air to my house is a warehouse, or a singing saloon, or a four-storied land of dwelling-houses. But apart altogether from the aggravation of packing those hollow blocks with further erections, I venture to suggest that they are in themselves faulty, and that some other principle of ground plan should be adopted which would permit a free current of air along the back as well as the front of every tenement.

2. OVERCROWDING OF DWELLING-HOUSES IN THE TENEMENT, WITH INTERNAL DEFECTS OF STRUCTURE.

The aggregation of dwellings in the tenement is an essential feature of the Scotch system of flats with common stairs, as contrasted with the English system of self-contained houses

with common courts. The attendant evils, to the mitigation of which special attention ought to be paid, are the vertical accumulation of houses by the imposition of successive flats, and the horizontal or lateral accumulation of houses in the flats, involving the removal of the house still farther from the air and light, which possibly are already greatly debarred by over-building; the vitiation of the air with animal excreta which inevitably follows, and the tangible dirt which is always associated with darkness. The Scotch system also necessitates a much greater degree of personal contact and communion than the English. The result of this in a tenement overcrowded with houses, and defective in internal structure to boot, is that the inhabitants actually breathe and swallow each other as well as come into bodily contact. The stairs and lobbies have that curious indescribable sour smell which can be perceived the moment you enter a close in the overbuilt part of our city. This co-operates with internal overcrowding in producing a low state of vitality and that constant irritation and defective discharge of the functions of the lungs which issues in bronchitis and consumption, and makes the city, so to speak, asthmatic. Then consider the circumstances of poor children in such tenements. Raised above the street level to such a height, and separated from such scant and dangerous room for play and exercise as those streets and courts afford, by dark lobbies and steep dark stairs, what can the poor things do? The playground of most of the children of Glasgow below five years of age is the lobby and the stairhead. It is a sorry thing to hear their voices, and to feel them, for often you cannot see them, running about or sitting in groups in such places. No wonder that they are deformed with rickets and prematurely aged; and as to the mortality which prevails among them, the marvel is that so large a proportion of them ever reach adult years. As for stamping out epidemic diseases, such as scarlet fever, measles, and whooping-cough, in such circumstances, it is impossible; and it is only by the rigid enforcement of hospital treatment that their parents and the adults who live in these localities can be saved from decimation with typhus—that scourge of overcrowding and dirt.

This, then, is a broad and hurried sketch of the evils to which the system of flats, especially when accompanied with undue vertical extension and overcrowding of dwelling-houses, in the flats, tends. What can we do, and what have we done to reduce them to a minimum? The chief structural defects are in our *common stairs* and our *lobbies*.

The common stair of a Scotch flatted tenement is the analogue of the English court, not only as the means of access to the houses, but especially in old buildings, in respect that it

contains the common jaw-box—the representative of the English gully-hole—and the common water-tap for the supply of water; and in modern buildings in respect that it contains the common water-closet, the representative of the privy or trough water-closet which stands at the head of the English court. Yet with all this similarity of function, the English court is at the worst a box open above to the free air, while the Scotch common stair is *at best* a longer, narrower box, fully open only at the lower end, with or without certain mockeries of ventilators at the upper end, and with windows at intervals, which may admit light, but are never opened, and serve no useful purpose for ventilation until by a providential accident, or a merciful exhibition of malice, the panes of glass are smashed. In their *worst* form it is hard to say what the Scotch common stair is, but a dark, noisome tunnel buried in the centre of the tenement, and impervious both to light and air, excepting the fetid air which is continuous and undiluted from the house along the lobbies and down to the close, from which you start on your perilous and tedious ascent.

Now, I confess to you, I do not think we have made much progress in recent times in the structure of our common stairs. In the oldest houses the best form probably was the turnpike standing outside the main wall, like a huge round chimney stalk, the worst was the same turnpike running up through the heart of the tenement; but there were also good broad stairs with roomy landings, having windows in the main wall, and so making ventilation from the outer air possible. The more recent introduction of the hanging stair, in place of the turnpike in the centre of the tenement, ensures a passage of air right up to the roof, instead of only along the length of the stair. This with ventilation at the top is an improvement, but it still falls very far short of what ought to be.

Rather than dwell on those architectural details, of the terminology of which I know little, I shall endeavour to give my notion of the principles which it is the business of the architect to carry out in the structure of a common stair.

1. It should touch the open air at every flat or landing between the flats. I have been told that this is impossible in corner tenements, and I know it is seldom done in such situations; but it is just there that the greatest need of ventilation exists, because of the number of dwelling-houses having access to the stair in a corner tenement. I do not believe in impossibilities of this kind, and there is no doubt this condition would be complied with even there, if made compulsory.

2. A common stair should not only touch the open air, but the air should have free access independent of the control of any tenant. Fresh air is as essential as fresh water, and should

be brought to each individual door. The individual house-holders may please themselves on the matter of admitting the fresh air further, but it should not be possible by closing a window to deprive all the neighbours of this necessary of life. In Mr. Carrick's model houses in Drygate, and in a tenement in the Northern District, there is a free space in the main wall at each landing, protected by a railing, while in Dr. Hill's property, recently erected on Garngad Hill, the common stair is a turnpike outside the main wall, and the air blows freely across each landing by an equally perfect arrangement of structure.

3. Such a thing as a common stair which requires to be lighted artificially in the day time should not exist, and, of course, would not exist if the previous conditions were fulfilled.

4. The last defect in our common stairs to which I shall allude is the universal want of proper ventilation at the top of the staircase. This is a most important matter when there are windows and water-closets on the stair—these windows, as already remarked, when a harmony of opinion among a dozen house-wives has to be obtained before they are allowed to remain open, being good for nothing as an access for air. There should always be some equivalence between the area of apertures admitting fresh air and those giving egress to foul air. Yet, as a rule, the top of those stairs is hermetically sealed with a glazed skylight, and perhaps there is a hole entering beneath the roof, or an aperture in the skylight about six inches square, or even less.

So much for common stairs. Let us now turn to the lobbies which give access to the stair, and ought to lead the fresh air to the very doors of the dwellings.

If we inquire into the natural history of the lobbies of the buildings within the area of the operations of the Improvement Trust—those T lobbies and L lobbies, and infinite long lobbies, of which you have heard so much—we find that the immense majority of them have risen in this way, by throwing open the front door of a large house and letting each several apartment to a separate tenant, a process technically known as "subdividing" or "making down" a house. You will remember to what use for rhetorical effect Dr. Guthrie puts this practice in his sermon, *The City: its Sins and Sorrows*, when he compares the lower parts of Edinburgh to a submerged forest: "In their economical, educational, moral, and religious aspect, certain parts of this city bear palpable evidence of a corresponding subsidence. Not a single house, nor a block of houses, but whole streets, once from end to end the homes of decency and industry, and wealth, and rank, and piety, have been engulfed. A flood of ignorance and misery and sin now breaks and roars

above the top of their highest tenements." This is the poetry of facts; but we have at present to deal with the effect of such a change on what was once the lobby of a private house, but what is now the lobby by which access is obtained to six, eight, or more distinct houses occupied by as many families. It is hardly necessary for me to enter into details. Let any one of you imagine what would be the state of matters if your own private residences were suddenly to suffer such a change: then bethink yourselves of the condition of a common stair in the Saltmarket, which gave access in olden times to four or five houses, of, say, six apartments, but which now accommodates from four-and-twenty to thirty families. If any of you wish to see easily recognisable illustrations of a more modern kind, you will find them in St. Andrew's Square.

Although the immense majority of those lobbies were, as I have said, originated in this way, a few were primarily planned as we find them; begotten, let us suppose, in the minds of young architects under the evil influence of the examples furnished by the made-down houses.

Now arises the question, Have we profited by the lessons which experience ought to teach us in reference to this practice of "sub-dividing" or "making down" houses? I am sorry to say not in the least. The plan of a house is the elaboration of an idea, the consistency and general correctness of which, in a sanitary point of view, rests upon the fitness of the design to the mode of occupancy. Disturb this relation in any way, and you land at once in a condition which was never anticipated or provided for by the architect. If a man takes a house which was originally designed as a segment or fraction of a house, he is somewhat like one who buys one article of what was to him who possessed the whole a complete suit, and fancies that he is fully clothed. Yet to this day there is no check on this sub-division of houses, and the City Assessor will tell you that year by year, where formerly he had but one tenant in his roll, he finds that there are several. There have been no structural alterations, no authority has been asked from the Dean of Guild Court, no one is consulted in the public interest. A landlord finds that a demand for one or two apartment houses has arisen in the locality where he had three or six apartment houses that will not let. Like his predecessors in the area of the Improvement Trust, he merely throws open the front door and makes down his three or six apartment houses to meet the demand. This is in effect the erection of a new tenement, and a considerable proportion of our smaller-sized houses are produced in this way. If at the end of a lobby running in a straight line from the landing you have two houses of three apartments, and these are made down into single apartment

houses, you have at once a **T** lobby of the worst description. If you have two front doors on a landing, opening into houses of four to six apartments, and these are made down, you will probably have two **L** lobbies. No matter with what intelligence and care the original plan may have been drawn, and however healthy and unobjectionable the houses may have been, no sooner is the mode of occupancy altered than the whole plan becomes disorganised.

In the present state of the law this process cannot be prevented, and can be remedied only *after the fact* by the certificate of the Medical Officer, that there are in such a tenement lobbies defective in light and ventilation, so as to be a nuisance and injurious to health. This ends in a reference by the Sheriff to an architect or an architect and a doctor, and perhaps in a tedious legal process, which may or may not lead to the remedy of an evil which ought never to have been allowed to come into existence. Obviously there ought to be no alteration in the mode of occupancy of a tenement until authority has been obtained from the Dean of Guild Court. The result of such an enactment would be that the alterations requisite to ensure the necessary light and ventilation would be enforced before the change, and before any injury was done to public health. We see daily how far proprietors can look before them in the erection of houses on the street level, which may ultimately be more profitable if let as shops. Any hardship involved in such a rule as I have mentioned would probably be obviated by a similar provision in the drafting of the original plans. However this may be, I have no doubt that your more modern tenements of working and middle-class houses, built on the box plan, will, if subjected to this process of making down, become in a few years little better than the rookeries which you are now demolishing, and which were produced by the same process.¹

As in the case of the common stair, the principal points to be remembered in the construction of a lobby are these:—

1. It ought to lead fresh air to the very doors of the dwellings to which it gives access. The ventilation should be such that no stagnation can be possible, making the air of the lobby and of all the houses opening into it continuous and common. A tenant ought not to be able to send his aerial sewage into his neighbour's house along the lobby any more than to cut off the fresh air by keeping a stair window shut. In the case of long lobbies with many small apartments, or in the case of lobbies with angles and tortuosities, nothing but through-and-

¹The abuse in English houses, corresponding to that of "making-down" in Scotch flats, is "sub-letting," which would require to be regulated by special legislation.

through ventilation from the stair at one end to the open air in the main wall at the other will be effective. Yet it is not uncommon to find the lobby door in a house which has been made down still in use and shut at night, producing inside a condition something like that of the Black Hole of Calcutta.

2. Darkness in a lobby is most objectionable—it nearly always means dirt, and can never be consistent with ventilation.

3. OVERCROWDING OF THE INHABITANTS IN THE DWELLING-HOUSE, OR OVERCROWDING PROPER.

The last of the evils with which the Improvement Trust contends is *overcrowding of the inhabitants* in the house, or overcrowding proper.

Overcrowding of the house has no direct relation to the structure of the tenement, and consequently any effect which the operations of the Trust may have upon it is not so direct as in the case of over-building and overcrowding of houses in tenements. I believe that in and of itself the overcrowding of houses is worse in its moral and physical effects than either of the other forms of overcrowding to which I have alluded. No tenement of flatted houses, however well planned and however surrounded by free space, can be over-populated without becoming a hotbed of disease and (especially if lodgers are the extra inhabitants) immorality. As to the history of this vice of our cities (for it is, in fact, a vice inherent in a great part of our population, not a necessity of structure or even of circumstances), I believe it came to us with the Irish, or at least attained its fullest development with their advent. There can be no doubt that it is the Irish and Scoto-Irish who are at this moment the most obstinate overcrowders. There is very little of it amongst the Lowland Scotch. That worst form of overcrowding—the introduction of lodgers within the family circle—is almost confined to the Irish.

As to the prevention of overcrowding, I believe that it is a vice which will, probably, never be eradicated from a large mass of our population. I mean that, suppose you had every family in a duly proportioned house to-morrow, if you simply let them alone for six months, you would find them living like pigs again. It is a vice closely related to intemperance, both as a cause and as an effect. In 1865, in his Report to the Privy Council on the "Housing of the Poor in Towns," Dr. Hunter said—"From one point of view crowding in Glasgow means the diversion of income from rent to supply whisky." This still holds true of those habitual over-crowders; but I am afraid it must be said that many of our respectable Scotch

artisans have a great deal to learn in the distribution of their outlay between house, food, and dress. They fancy every shilling which can be pinched off the rent is a clear saving, while on food and dress they spend freely, if not extravagantly.

Glasgow was the first city to grapple with this evil in the Police Act of 1862, which gives power to measure the cubic contents of any house consisting of "not more than three apartments," and if the cubic contents are found to be under 2,000 feet, to affix a ticket on the door on which the cubic space and the number of inmates proportioned thereto is stated. All such houses may thereafter be visited at night, and a fine may be imposed for an excess of inmates or overcrowding. These were extraordinary powers; but no one who knows anything of the habits of the people affected by them (who are not the working classes as we see them pouring from our ship-building yards and engine works, in short, not the artisan, but the unskilled labourer and the grade lower still, our criminal classes) can have any doubt of their necessity; nor, I am glad to say, can any one who knew Glasgow as it was then and knows what it is now, have any doubt as to their efficacy and usefulness. Still, if you relaxed your repressive efforts, the old state of matters would return in a few weeks. The transference of those people from the Bridgegate to new tenements, let us say, in Nuneaton Street or Hopehill Road, will not at once divest them of their habits, though possibly by keeping them forcibly during one generation in circumstances of decency and health, new habits may grow up and become stable in their descendants. But we must not be restrained by any squeamishness about ticketing new property, and so giving it an ill name, if we find overcrowding has been transferred with the old tenants of our demolished houses. If a landlord finds that such process deteriorates the value of his property, then he must prevent the overcrowding, otherwise ticketed it must be.

Only two remarks occur to me with reference to the enforcement of the law against overcrowding, which, of course, rests with the magistrates.

1. I think no mercy ought to be extended to overcrowding which is caused by the introduction of lodgers into the family, cases which are subjected to heavier penalties when the house has been scheduled as "let in lodgings." There can be nothing more abominable and vicious in its results than this habit of taking strangers, generally young unmarried men, into a house which is already straitened to accommodate its legitimate occupants. Admonitions will not remedy such cases—only fines, which will make the violation of the law a losing game, will put them down.

2. In cases where the overcrowding arises from a family having grown beyond the dimensions of the house, or where only the members proper to the family are found in it, I think there is room for the exercise of a discretion based upon a broad consideration of the entire circumstances of the family, which would be paternal if not exactly judicial. These circumstances are the income of the family, and whether there is any vicious source of outlay, such as intemperance. Where you find a husband or a wife expending in drink what should go to the additional rent of a larger house, it would be not only just but kind to compel them to go to a larger house, and so perhaps convert an evil into a good. Also where members of the family are working as well as the parents, a large sum of money is frequently coming in, while the inmates are living in a way which is not only injurious to health but indecent. Again, it is not uncommon to have daughters bringing husbands into a crowded house, and sons bringing wives, a violation of all decorum, at best a false economy, and very often associated with improvidence, if not intemperance.

In all cases even of family overcrowding, a dirty house should be visited with a penalty. Dirt intensifies the dangers of overcrowding, and is an indication of the social degeneration to which it tends. By the introduction of such considerations as those, the legislation against overcrowding might be made a powerful lever for the elevation of the population to a higher ideal of the domestic life and to habits of self-denial, for the purpose of maintaining that ideal.

In conclusion, the operations of the Improvement Trust must in themselves be productive of good, inasmuch as they expel, from circumstances than which none worse could be found or imagined, a body of morally debased and physically deteriorated inhabitants, and make straight and spacious thoroughfares, in place of cramped and inconvenient wynds and closes. But, as in war, a body of troops may be well equipped and act effectively and successfully against the enemy, and yet the ultimate success of their arms may depend upon the co-operation of other bodies of troops who ought to be moving towards the same point at the same time, so the operations of the Improvement Trust against the "moral and physical" evils alluded to in the preamble of the Act, depend for their thorough success on support from other parts of the field. My statistics show, I think, that the Trust is doing its part well, and that the *immediate* results are good; but we must see to it, that we are not building up with one hand houses which may, for want of sufficient restrictive and regulative power, become as bad in process of time as those which we are pulling down with the other. We must also continue to look to the habits in the

new localities of the people who have been expelled from the old, and by a constant pressure compel them to distribute themselves, and endeavour to divert from intemperance and improvidence towards house-rent a larger proportion of their earnings.

I am no alarmist; but no one can comprehend the importance of this matter of house construction to the future of Glasgow, unless by placing clearly before his mind two facts:—(1) The enormous number of dwelling-houses being erected from year to year—since 1866 no less than 26,794; and (2) above all, the small size of those houses. Actually, of those 26,794 built since 1866, 25 per cent. were houses of one apartment, and 50 per cent. houses of two apartments, leaving only 25 per cent. for all sizes above two apartments, and of that 18 per cent. were houses of three apartments. One cannot be too anxious or exacting concerning the ventilation and general arrangements of such clusters of small houses. Mr. Chadwick has said somewhere that towns might be built by contract guaranteed to produce an average death-rate, according to the honesty and completeness of the sanitary provisions. I do not believe this statement without qualifications; but I doubt very much, if specifications were issued for a town of 26,000 houses, to be erected in hollow blocks containing 200 a piece or thereby, piled up in four flats and a "sunk" entering from a court behind, with inside staircases at the corner tenements, the size of house over all to average 25 per cent. one apartment, 50 per cent. two apartments, 18 per cent. three apartments, and the remainder in larger sizes, whether any contractor would be found willing to guarantee, on such conditions, an average death-rate below 25 per 1000 per annum, and even that only with the proviso that not one of these houses should ever be "made down."

(2) "*Further Information*" regarding the Displacements at Whitsunday, 1875.¹

GENTLEMEN,—It is due to myself to explain that I am here to-night, more at the urgent solicitation of the President of this Section, than in accordance with my own desire. Circumstances render it almost impossible for me to produce anything sufficiently new or matured to deserve attention; and I merely propose to lay before you some facts regarding the immediate results of the operations of the Improvement Trust on the inhabitants displaced by their operations at the May term of 1875, similar to those which I formerly gave you

¹Portion of the Opening Address as Vice-President of the Sanitary Section of the Philosophical Society of Glasgow. From *The Glasgow Medical Journal*, April, 1876.

regarding their operations at the May term of 1874. The information contained in my previous paper was transmitted by the Glasgow authorities, along with other documents, to the Secretary of State for the Home Department, and was, with similar information furnished by the City of Edinburgh and the Burgh of Liverpool, printed and presented to Parliament, for their guidance in the discussion and enactment of the Artizans' Dwellings Bill. It is therefore important to check previous conclusions by further facts.

At the May term of 1874, there were only 351 families displaced; and of these, for various reasons, only 243, embracing a population of 990 persons, were available for the purposes of my inquiry. At the May term of 1875, no less than 818 families were displaced, of whom 655 are available, embracing a population of 2720 persons. Of the balance of 163 families or houses, the large majority—viz., 145—are necessarily excluded, because we were unable to trace them to their new residences. People of that class are very suspicious, and I have no doubt, in many cases, intentionally obscured their retreat; while others had removed before the officers called. Of the others, eight lived in premises connected with shops, while six lived in a new property on the "Bell-o'-the-Brae," and the remainder were common lodging-houses, these being circumstances which removed those holdings, in point of rental, &c., from the category to which the 655, retained for the purposes of this inquiry, almost all belonged. That this large residue, so purified of sources of error, really represents the class of house with which the Artizans' Dwellings Acts was intended to enable Corporations to deal, will be at once apparent from the fact that no less than 84 per cent. were ticketed either as houses of not more than three apartments, and under 2000 feet of cubic space, under the Glasgow Police Act, or as houses let in lodgings, under the Public Health Act; and that, therefore, 84 per cent. of the inhabitants lived under the strict surveillance which houses so ticketed entail on their inmates. Being, therefore, so strictly of the proper class of house and inhabitant, the much larger numbers dealt with on the present occasion (655 families as compared with 243) give my conclusions a much broader basis. I am happy to say they are, on the whole, quite the same as were derived from the narrower basis; and as such inquiries are extremely laborious and troublesome, this paper, in connection with the last, may safely be taken as placing beyond question the nature of the *immediate* results of the operations of the Improvement Trust upon the inhabitants displaced. As to the *ultimate* results upon the health of the community, time is a necessary condition of their development. In the Parliamentary paper to which reference has just been

made, Dr. Littlejohn says in reference to this wider and more complex question, "As Medical Officer of Health I would not trust to any statistics that were not based on an experience of at least ten years," an opinion in which I entirely concur. But if I were asked whether we in Glasgow have gone about the renovation of our city in the way most likely to derive the maximum return of good results, I should distinctly say, No. One of the first principles in the development of any scheme of improvement, under any Act, local or general, should be to see that the building regulations are such as will give material expression to the accumulated lessons of the past. A thoroughly devised Building Act is a necessary complement of an Improvement Act; and to work out an Improvement Act, conceived in the light of the most advanced sanitary intelligence, while the reconstruction stimulated thereby is regulated by a Building Act, it may be, half a century behind in its conceptions of the demands of public health, is to do only half a good work, and lose a golden opportunity, which will soon be thought of with regret.

The area of the operations of last May term was chiefly the Gorbals and the High Street. Only a few houses were demolished in the Eastern district. There are some differences in the facts regarding those areas singly, especially in the quality of the property, which was decidedly worse in the Gorbals than in the High Street area. In point of construction and design, it may be said that many of these old houses fronting the High Street, if simply restored to their former mode of occupancy, as single instead of multiple holdings, would put the houses of a similar class erected now-a-days to shame. But the tenements in Gorbals were much less substantial to begin with, and much more wasted and worthless. However, we shall throw all the facts regarding these demolitions together, and consider them in the aggregate, following the same order as in my former paper.

1. *Size of House.*—Before the operations, of the 655 houses, the families occupying which were subsequently traced to their new abodes, 360 were houses of 1 apartment; 234 of 2 apartments; 39 of 3 apartments; 21 of 4 apartments; and 1 of 5 apartments. After the operations, those 655 families were found to be occupying 273 houses of 1 apartment; 267 of 2 apartments; 48 of 3 apartments; 11 of 4 apartments; and 1 of 6 apartments; leaving 55, of whom 25 had gone into lodgings; 9 had removed to various parts of the country; and 16 had emigrated—gone to Ireland, or otherwise disposed themselves forth of the city. Reducing these figures to percentages, so as to facilitate comparison, we find *before* the operations of the Improvement Trust, 55 per cent. of those families living in

houses of 1 apartment, and *after* 42 per cent.; *before*, 36 per cent. living in houses of 2 apartments, and *after*, 41 per cent.; *before*, 6 per cent. living in houses of 3 apartments, and *after*, 7 per cent.; *before*, 3 per cent. living in houses larger than 3 apartments, *after*, 2 per cent.; leaving a balance of 8 per cent. who betook themselves to lodgings, to the suburbs, to the country, &c., &c. By taking the families as we originally find them in each class of house apart, and tracing them thence to their new abodes, and noting the condition as to size, we get a more minute and interesting aspect of the same facts. Thus, of the 360 families in houses of 1 apartment, we find 220 still in houses of 1 apartment, while 99 are in larger houses, 23 in lodgings, 8 in the country, 1 in the suburbs, and 9 otherwise disposed of—emigrated, gone to Ireland, in the poorhouse, and in one or two cases in prison. So of the 234 families in houses of 2 apartments, we find 151 still in houses of 2 apartments; while 24 occupy larger houses, and 51 have taken smaller; 2 having gone into lodgings, 1 removed to the suburbs, and 5 otherwise disposed of themselves. Of the 39 families in houses of 3 apartments, we find 11 still in houses of 3 apartments; 8 in larger houses, 15 in smaller, 1 in the country, 3 in the suburbs, and 1 in premises connected with a shop. Of the remaining 22 families in houses larger than 3 apartments we find 3 still in houses of equal size, 1 in a larger house, 17 in a smaller, and 1 in premises connected with a shop. It will be observed that the occupants of 25 houses ceased to become householders and went into lodgings. This is about 4 per cent. of the families displaced, and embraces 71 individuals; giving a proportion of less than 3 per house, and indicating that they were for the most part old persons, widows, or persons without families. Of the 25 families who went into lodgings, 21 belong to the Gorbals area, being $6\frac{1}{2}$ per cent. of the families displaced, a very clear indication of the propriety of the erection of a model lodging-house in that district, which I believe the Improvement Trust are about to do. Indeed, while the Trust has very properly refrained from entering upon general building enterprises, I think they might very wisely extend their model lodging-house accommodation. They pay well, and they meet a clamant necessity. At the census of 1871, it was found that 23 per cent. of all the families in Glasgow kept lodgers, but it is only when we discover among what class of householders the practice most prevails, that the important relation of this fact to health and morality will appear. Of the families who lived in houses of 1 apartment 14 per cent. kept lodgers; of those who lived in houses of 2 apartments, 27 per cent. kept lodgers; of those who lived in houses of 3 apartments, 32 per cent. kept lodgers. Unfortunately, while the reception of lodgers brings

the house within the scheduling powers of the Public Health Act, the authorities have no power to forbid their reception, so long as no overcrowding takes place. So it is even with common lodging-houses. The authorities have a very limited power over their structure and plan, and I am frequently required to determine the number of beds to be licensed for such premises, when I should prefer to say that these premises are totally unsuited for such a purpose. The common lodging-house is the hotel of the great floating body of persons in search of employment, and the boarding-house of the labouring man and woman without family ties. Such persons are an evil in the private household, and to make special provision of a proper kind in suitable buildings it must be done on a large scale, and requires capital. Many of our large lodging-houses are unobjectionable in their construction and management, and nothing is more agreeable than to find a few flats of made-down, and therefore dismal, unhealthy houses, the majority let in lodgings, falling into the hands of an enterprising man, cleared of their artificial partitions and filled with rows of clean beds. But still, as a rule, common lodging-houses are not structurally adapted for the purpose, and I should like to see provided, either by the Improvement Trust or by private enterprise, preferably by the former, many commodious houses, not in obscure corners, but on prominent sites, near such populous centres as the Cross, Bridgeton Cross, Gorbals, Anderston, Cowcaddens, where the people have been in the habit of congregating and of obtaining lodgings. If this were done, and indeed in any case, the authorities ought to have the power not merely of regulating the use of premises as lodging-houses, but of deciding whether such premises are fit to be so used. In this way many of the smaller class of common lodging-houses which are totally unfit for the purpose, in the hands of people of no means, and often of no character, harbourages of thieves and prostitutes, would be abolished, and a large class of the community would be brought under discipline and live in circumstances healthier for themselves, and therefore less dangerous to the public health. This is particularly illustrated by the experience of model and even common lodging-houses as to infectious disease. I do not remember ever hearing of a case in the Trust establishments; and in a well-regulated lodging-house, if a case does occur, the disease never spreads, and yet the inmates are, in the condition which to them unfortunately, however unnatural, is a state of nature, "food for fever." But as I have said, common lodging-houses are not all what they ought to be, and may become dépôts of fever, and distribute it for weeks, unless absolutely shut up and the most extreme measures adopted which the law permits.

2. *Rental of House.*—The average monthly rental of the houses demolished in the Gorbals was much lower than in the Central district, a remark which was made also in my former Central district, a remark which was made also in my former paper. It was for a 1-apartment house, in Gorbals, 6s. 9d. per month; in the Central, 7s. 1 $\frac{1}{2}$ d.; for a 2-apartment house, in Gorbals, 9s. 10 $\frac{1}{4}$ d.; in the Central district, 10s. 6 $\frac{1}{2}$ d. The families displaced in Gorbals also got houses at a lower rental than those displaced in the Central, the addition being almost proportional on the original rent. It is better, however, as in considering the size of house, to throw all the districts together, when we obtain the following result:—Those families who in the *old* buildings occupied a house of 1 apartment, at an average monthly rental of 6s. 10 $\frac{1}{2}$ d., paid in the *new*, for the same size of a house, 8s. 0 $\frac{3}{4}$ d., an increase of 17 per cent. on their former rental. Those families who, in the *old* buildings, occupied a house of 2 apartments, at an average monthly rental of 12s. 3 $\frac{1}{2}$ d., 10s. 1 $\frac{3}{4}$ d., paid in the *new*, for the same size of house, 12s. 3 $\frac{1}{2}$ d., 10s. 1 $\frac{3}{4}$ d., an increase of 21 per cent. on their former rental. Those families who, in the *old* buildings, occupied a house of 3 apartments, at an average monthly rental of 16s. 2 $\frac{1}{2}$ d., paid in the *new*, for the same size of house, 18s. 10 $\frac{1}{4}$ d., an increase of 16 $\frac{1}{2}$ per cent. on their former rental. Similarly, a house of 4 apartments, in the *old* buildings, cost 19s. 9 $\frac{1}{2}$ d. per month, and in the *new*, 30s. 7 $\frac{1}{2}$ d., an increase which necessitates the repetition of the remark made last year, that whereas a house of 4 apartments in the *old* buildings was a sham, in the *new* it is a reality, and, therefore, must be paid for, as substantial goods must always be, with a substantial price. Indeed, the remark may be extended, though with less emphasis, to the whole of this increased outlay for rental, which was probably that aspect of the enforced change which would bulk largest in the minds of those persons. In the main, there can be no doubt they had a better article for the money, better accommodation, and more conveniences, which cannot be estimated statistically.

3. *Number of Inmates in House.*—One of the advantages which may underlie a change from one house to another of the same size, but at an increased rent, is additional house-room or space. Although I have the cubic contents of most of the old houses, I have not of the new, but the proportion of the inmates to the house is, if not as good commercially, better sanitarily, as an indication of the circumstances of the inmates as to accommodation. The *old* houses of 1 apartment had an average of 3.4 inmates, the *new* of 3.3 inmates; the *old* houses of 2 apartments had an average of 4.7 inmates, the *new* of 4.6 inmates; the *old* houses of 3 apartments had an average of 6 inmates, the *new* of 6.2 inmates; the *old* houses of 4 apartments had an average of 6.3 inmates, the *new* of 4 inmates.

On the whole, therefore, in the houses of smaller size at any-rate, the tendency has been to re-assort the families displaced into houses proportionally larger than those they were compelled to leave. The broadest expression of this fact is obtained by taking the average, not per house, but per apartment in all the houses, when we find that in the *old* houses there were 1034 apartments to 2720 inmates, while in the *new* houses there were 1001 apartments to 2509 inmates, giving 2.5 inhabitants for each apartment in place of 2.6. All these comparisons go on the presumption that the same inhabitants will go into the new house as left the old, and that no attempt will be made to turn increased accommodation to account by taking in lodgers and overcrowding. Unfortunately the tendency is too certainly in the opposite direction, and having left houses of which 84 per cent. were ticketed, and measures taken to keep down this tendency, if these people find themselves in their new residences suddenly relieved from this restraint, their last condition will soon be worse than their first. I may say, however, that the Committee of Health have given me full powers to require ticketing of houses, wherever the habits of the people or the prevalence of disease indicate the necessity and the law will permit it to be done.

4. *Method of Excrement Disposal.*—Another item of advantage which may be covered by change, even with increased rental, is greater convenience and less nuisance in the method of excrement disposal. This also may be indicated in a rough way statistically. For this part of my inquiry I have the facts as to this branch of social convenience concerning 556 families, embracing 2334 souls. Before the demolitions at last May term, only 7 per cent. of these families used water-closets; whereas 14 per cent. do so now. To the large remainder who still use public privies and ash-pits, there is this undoubted improvement that, on the whole, these conveniences are better constructed, and especially better situated, so as to be less a source of nuisance and injury than in the confined spaces available in the old parts of the town. Of the water-closets themselves—in the *old* houses 36 were *in* the houses, and only 4 on the stair; whereas in the *new* houses—43 are *in* the houses, and 35 on the stair, where they ought always to be in houses of this class. The result of my former inquiry was to show that 13 $\frac{1}{2}$ per cent. of the families displaced were, by the change, provided with water-closets, in place of only 4 $\frac{1}{2}$ per cent. So that we have, as an undoubted and immediate effect of the reconstruction of the city, an increased pollution of the river considerably beyond what the natural increase of our population would produce. I apprehend also that from this progressive withdrawal of the excrement of the population from

the possibility of utilisation, the total refuse of the city—with which our Cleansing Department has to deal—will become less and less valuable, and therefore more difficult to get rid of. At present our manurial refuse is employed as a means of disposing of our non-manurial refuse. Under cover of the former, we strew the fields, for miles around, with our rubbish, the farmer being rewarded for the trouble of gathering up our broken bottles, earthenware, boots, and other miscellaneous contents of our ash pits, from his land, by the intermixed manurial elements which the rain washes into it from these foreign bodies. This will become less and less possible as the proportion of our excretions lost in the sewers increases; and we shall be compelled to study the economics of our ash pits in a scientific way, which we have not yet done.

5. *Distance from the Centre of the City.*—There is no doubt the farther from the heart of the city we have our homes the better. We may have to go down into the city to earn our bread, but the place where we sleep and where we rear our families should be as near the outer verge as possible. We shall find that in this respect also an immediate result for good has been effected by the Improvement Trust, and one also which admits of partial statistical expression. I have again taken the Cross as the centre of the city, and have determined the distance therefrom of 626 families before and after last May term, the addresses of the remaining 29 not being sufficiently definite to admit of the distance being ascertained. *Before* last May term, 165 of these families lived within a quarter of a mile of the Cross, 294 within half a mile, and 167 within three-quarters of a mile; *after* last May term, those families found themselves distributed thus over the city:—102 within a quarter of a mile of the Cross, 190 within half a mile, 198 within three-quarters of a mile, 49 within one mile, and 32 within one and a half miles. Of the remaining 55, there were 5 who lived in the suburbs, 25 in lodgings, and 25 elsewhere remote from the city. If we reduce these figures to percentages, the change will be more evident. *Before* the term, 26 per cent. of those families lived within a quarter of a mile of the Cross, *after* it only 16 per cent.; *before* the term 47 per cent. lived within half a mile, *after* it only 30 per cent.; *before* the term, 27 per cent. lived within three-quarters of a mile, *after* it 32 per cent.; and this is the crest of the wave of dispersion, which gradually falls to 8 per cent. within one mile of the Cross, 5 per cent. within one and a half miles, and scarcely 1 per cent. flowed over into the suburbs. Speaking still more generally, those operations found all the families affected living within three-quarters of a mile of the Cross, and left 14 per cent. at various stages beyond that limit; within that limit also dis-

persing them outwards. My former inquiry showed that while all the families then displaced lived within three-quarters of a mile of the Cross, in their original dwellings, 19 per cent. were spread beyond that limit, only 2 per cent. actually overflowing the municipal boundaries. We are, therefore, able to form a very clear idea of the nature of the internal movements which such operations produce in our population. The effect resembles, in external form, when we confine our attention solely to the families directly involved, a wave gathering up to a crest, and then breaking and flowing out in a diminishing stream; but if we look deeper, and consider all the units of the population in whose midst this disturbance is set up, we shall find a process of displacement and substitution, whose influence is only expended when the very outer confines are reached, not merely of what is artificially termed Glasgow, but of that great community of which Glasgow is the vital centre. The class of people of whom I have been speaking cling tenaciously to their old haunts. It is wonderful how they manage to seize the nearest available corner. It is this desire, and the competition which it begets for houses of small size in the heart of the city, which stimulates the process of making down houses, on which I animadverted so strongly in my former paper. Those people go into cast-off houses just as they wear cast-off clothes, and the trade in the former commodity is as brisk and profitable in the centre of the city, or rather in the centres of the city, as the trade in the latter. A landlord finds he can double his rental by making down a house of 3, 5, 7 apartments into as many, or almost as many, houses as there are apartments, and I can best show you with what result by the most recent instance which has come under my notice, in close proximity to the area of the Improvement Trust's operations in Gorbals. This is a plan of two 6-apartment houses, comfortable, healthy dwellings, as originally designed and long occupied, but now sub-divided and let as four single-apartment houses and four double. The lobby of the private house is now the dark tunnel through which those people make their way to the stair, the common *cul-de-sac* into which the foul air from all those houses passes and where it stagnates. This change has been carried out in three flats, so that at once in place of 6 houses on this stair we have 24. I am anxious to throw another stone at this system. We are about to get those lobbies extended to the outer wall, so as to give a through draft, and shall most likely require to effect the change by a process before the Sheriff. But why should this making down be allowed without reference to the Dean of Guild or other Court governing the erection of new buildings? No reason whatever can be given for the continuance of the practice.

You will now understand how it is that although only 1 per cent. or 2 per cent. of the families actually disturbed reaches the outskirts and suburbs, still the effect on the units of our population is much wider, and its nature and tendency is to send our artizans and skilled workmen and respectable middle class outwards year by year, and increasingly, over our artificial boundaries. The space which has been cleared of those masses of unskilled workpeople will never be occupied by the same class again. A large area is consigned to railway purposes. Where buildings are being erected, they are either warehouses or shops, with dwelling-houses above, suitable for those employed about those places of business and trade. The occupation of those houses will cause a slight return current from the outskirts which will facilitate the passage outward of the lower class, and dilute the death-rate of the inner districts. This is a source of fallacy to which we shall soon be exposed. It may even come about that the death-rate in the High Street and closes, and in Bridgegate and Wynds, or Gorbals, will be lower than in districts which at present are much healthier, but we must distinguish between the district and the people, for whom we shall have to look elsewhere. In short, our general, and not our local, death-rate will be the only safe guide to the aggregate result of all those complicated internal movements.

(3) *Report upon the Result of the Displacements by the Improvement Trust at Whitsunday, 1877.*

Before proceeding to take up the new material I would remind the Trust that on two previous occasions I have submitted similar reports, viz., on the operations of the May terms, 1874 and 1875. In those reports ample information of a precise kind was given upon the relative rental, size of house in proportion to size of family, distance from the Cross, &c., of the families displaced, before and after displacement. The only new element in the present report is the endeavour to trace the effect of compulsory change of residence not merely upon the family, but upon the individual members of the family, especially as to the place of their employment.

I have also endeavoured to classify the occupations of the population by way of throwing light upon their social status.

The areas in which the May operations took place were in the Central, Southern, and Eastern Districts of the City. They involve 560 dwelling-houses, occupied by 2100 persons.

1. SOCIAL STATUS.

The social status of the persons who inhabit the houses removed by the Improvement Trust, so far as shown by their occupation, has never been stated. The fact that 247 or 12 per cent. of those 2100 persons were lodgers throws some light on the question. The following is a classification according to employment, the dependants including all the married women who had no employment except domestic work, with their children :—

1. Labourers and Employees of the Labouring Grade (Males), -	419	539 Dependents.
2. Factory Workers and other Employees of the same Grade (Females), - - - -	252	67
3. Tradesmen, - - - -	219	264
4. Skilled Labourers, - - - -	31	30
5. Miscellaneous Occupations, - -	71	91
No information obtained, - -	109	8
	1101	999
Grand Total, - -	2100	

The large preponderance of the low-waged, unskilled labouring class in the population is noteworthy. Among the Males of the Labouring Grade, 222 are designated Labourers, and 82 Hawkers.

The Females of this Grade include 108 Millworkers, and 53 Sewers. Among the Tradesmen, the most numerous class is Shoemakers, 61; the next being Moulders, 16; Tailors, 14; and Cabinet-makers, 14. A large number of these shoemakers would better be designated cobblers, being employed almost wholly in repairs and restorations for the Old Clothes Market. Altogether, I think this statement confirms the opinion that the inhabitants of those quarters are not the artizan or working class in the highest sense of the words.

They do not include our Tradesmen, our Craftsmen, but merely our unskilled workers, the hewers of wood and drawers of water, who work into the hands of our Craftsmen; together with the large nomadic and sedimentary class, who are the lees of the higher social grades. There are only 11 Masons, 9 Engineers, 5 Blacksmiths, 2 Shipwrights, and so with the other high-waged trades. The first two classes enumerated above comprise 64 per cent. of the entire population whose designation was obtained.

2. DISTANCE OF RESIDENCE FROM PLACE OF WORK.

For the reasons referred to at the outset, it was impossible to trace many of those displaced families to their new residence, and for the same reasons in the case of many individuals even of those families which were traced, their place of employment could not be discovered. Still, it is possible to state the comparative distance of 777 adults from their work, and of 189 children from school. A distinction must obviously be drawn between the inconvenience of increased distance from school and from work. A change of school can be effected readily. Of the 777 adults, 384 were housed equally near their work, 159 nearer, and 235 further off, i.e., 50 per cent. were equally near their work, 20 per cent. nearer, and 30 per cent. further off. This is a tolerably rigid statement of the actual result, but those who are said to have found houses further off were, as a rule, no great distance further off. Of the 189 children attending school, 70 were in their new residences equally near their school, 50 were nearer, and 69 were further off from it, i.e., 37 per cent. were equally near, 26 per cent. were nearer, and 37 per cent. were further off.

3. CHANGE IN RENTAL AND SIZE OF HOUSE TO THOSE INHABITING SMALL-SIZED HOUSES—VIZ. 1, 2, AND 3 APARTMENTS.

The families inhabiting 324 houses of 1, 2, and 3 apartments, comprising 1368 individuals, were traced to their new residences with the following result:—

Those families originally inhabiting 188 houses of 1 apartment, numbering 715 inmates, 44 per cent. removed to larger houses. The average number of inmates in the houses of 1 apartment which they left was 3.8 persons, and in the houses of 1 apartment to which they removed 3.47 persons. The average rental of the old 1 apartment houses was £4 5s. 2d. per annum, and of the new, £5 3s. 2d.—an increase of 21 per cent.

Those families originally inhabiting 119 houses of 2 apartments numbering 566 inmates, 12 per cent. removed to larger houses and 26 per cent. to smaller.

The average number of inmates in the houses of 2 apartments which they left was 4.75 persons, and in the houses of 2 apartments to which they removed 4.66 persons. The average rental of the old 2 apartment houses was £6 4s. 1d. per annum, and of the new, £7 15s. 6d.—an increase of 25 per cent.

Those families originally inhabiting 17 houses of 3 apartments, numbering 87 inmates, 6 per cent. removed to larger

houses, and 47 per cent. to smaller. The average number of inmates in the 3 apartment houses which they left was 5 persons, and in the houses of 3 apartments to which they removed 5.2 persons. The average rental of the old 3 apartment houses was £8 16s. 9d. per annum, and of the new, £11 7s. 7d.—an increase of 28 $\frac{3}{4}$ per cent.

Including all the families displaced, 81 per cent. paid a larger rent for their houses, 15 per cent. a smaller, and 4 per cent. the same rent. Against this is to be set the fact that 30 per cent. removed to larger houses.

The general result as to rental is practically the same as that established by the inquiries of 1874 and 1875. The property which is being removed by the Improvement Trust is the poorest house accommodation in the market, poorest because of age, disrepair, and defect of the essentials of health and comfort. Therefore it is the cheapest, and unless it be possible to build new houses of the same size and of the best quality, and yet to let at the same rent, there is nothing in this increase of rental imposed upon those families which is not the everyday experience of people who abandon the use of the inferior adulterated for the superior genuine article. They have to pay more, but they find it cheaper in the end.

I think it is also evident from the statistics as to the effect of those removals upon distance from work that, in Glasgow at any rate, however it may be in a city so gigantic as London, no hardship is inflicted in this direction. Indeed, it is obvious, looking to the relative distance of home and work even before the compulsory change, that many considerations must enter into the choice of a place of residence which cannot be estimated, and that certainly convenience to work is not the strongest. It would be well if it were, for then large numbers of our working class would live in the open suburbs who work there and persistently sleep in the very heart of the city.

On the whole, therefore, I doubt the wisdom of that clause of the "Artizans' Dwellings Act" which requires that provision shall be made for the displaced population "in suitable dwellings, which, unless there are any special reasons to the contrary, shall be situate within the limits of the same area or in the vicinity thereof, and shall also provide for proper sanitary arrangements." As to situation, except possibly in cities like London, there is no hardship in the change of locality. Indeed it is to be encouraged by facilitating tram-car and workmen's trains. As to the practicability of erecting houses on or near the area scheduled which can be let *at the same rental* as the houses demolished, it seems to me an absurd expectation. Of course, if alms-houses are to be built, or houses which so far partake of that character as to be restricted to the rental

formerly prevalent a new principle is introduced, and a bad one. But, after all, will the people be thus artificially controlled in their choice of residence? I think not. Before the scheduled area can be reconstructed it must be cleared and the inhabitants dispersed. When the reconstruction is completed, the people who will occupy the new houses will not belong to the class displaced, but to the class above them, into whose cast-off houses the displaced class will go. This is exactly what takes place in Glasgow. The change induced by the operations of the Trust is not local but general—a moving upwards and outwards—affecting all classes ultimately.

(4) *An Address delivered at the Opening of the Section of Public Medicine at the Annual Meeting of the British Medical Association, Sheffield, August, 1876.*

THE GLASGOW IMPROVEMENT TRUST.

That portion of the city of Glasgow which was included in the powers of the Improvement Act of 1866 embraced about 83 acres, on which a population of 51,300 persons lived in upwards of 10,000 houses, using that word not in the structural sense attached to it in England, but in the social sense customary in Scotland, meaning that fraction of a building rented and occupied by one family. Although the Act was passed in 1866, the demolition of houses was not commenced to any important extent until 1870, the intervening years being devoted to the acquisition of the properties involved in the scheme. When such operations are carried out, the advantages anticipated are of two kinds—1, immediate; and 2 remote. In terms of the Act, the extent of the demolition and displacement at any one time is defined by Section 28. Within six months no number of inhabitants exceeding 500 can be displaced without a certificate from the Sheriff of the County, granted on evidence, that accommodation exists or shall be provided for the inhabitants displaced. In Scotland the times of year when houses are let are May and November. The May term has been preferred for the greater part of the evictions and demolitions, being the summer, when least hardship is likely to arise. On two occasions, viz., in May, 1874, and May, 1875, a minute test of the *immediate* results upon the people displaced has been instituted. The investigation extended to 1169 families, containing 3710 persons. The houses were fair samples, situated in the oldest parts of the city, of the whole property to be dealt with, and their inhabitants were of that class of our urban

population which is the source of so much trouble and anxiety to authorities of all kinds. I shall not trouble you with more than a general statement of results, merely adding this assurance, that they are not guesses or approximations, but based on accurate statistics. When a householder is summarily ejected from his house, and the house demolished, the necessary immediate results are manifested in changes as regards the size of his house, its rental, the re-adjustment of the number of inmates per house, the position of the house, relative to the centre of the city, and the facilities afforded for the disposal of the excreta of the inmates.

Taking up those points in succession, the following are the immediate results of our action.

As to *size of house*, it would have been better had it been possible to state the cubic contents rather than the number of apartments; for, in reference to the comparative size as well as comparative rental, the words house and apartment, without further explanation, mean very different things as applied to the dwellings demolished and those into which the inmates removed. But, while 84 per cent. of the old houses were ticketed under the Glasgow Police Act, *i.e.*, their cubic contents were marked on the doors, with a statement of the corresponding number of inmates allowed, the majority of the new houses were not so ticketed, and consequently a sufficiently laborious inquiry would have been made still more so by the necessity of measuring those houses for the sake of comparison. After all, however, the result would have been merely to express in figures what, you may accept my assurance, is the fact, that the dwellings which those people were compelled to leave were, on the whole, so bad that it was impossible for them to find their equal or their like; and you may take it that the words house or apartment mean something more as applied to the new dwellings than to the old, more in the way of space, comfort, and convenience. You must keep this before your mind in interpreting the meaning of the following bare figures, and estimating the facts to which they give most meagre expression. We found 478 families occupying dwellings of only one apartment. Of these 296 removed to dwellings of the same size, and 138 to larger, while 25 gave up householding and took to lodgings, 1 removed to the suburbs, 9 to the country, and 9 are otherwise accounted for by emigration, imprisonment, the poorhouse, &c. We found 330 families occupying dwellings of two apartments. Of these 217 removed to dwellings of the same size, 34 to larger, and 68 to smaller; while 2 went into lodgings, 1 removed to the suburbs, and 1 to the country, leaving 7 to be otherwise accounted for. We found 62 families occupying dwellings of three apartments. Of these, 15 removed

to houses of the same size, 8 to larger, and 33 to smaller; while 1 went to lodgings, 3 removed to the suburbs, and 1 to the country, leaving 1 to be otherwise accounted for. The remaining 28 families occupied dwellings larger than three apartments; and of these 3 removed to houses of the same size, 1 to a larger, and 23 to smaller, leaving 1 to be otherwise accounted for. The general result is that only 13 per cent. of the families displaced by our operations removed to smaller houses, even if we estimate the comparative size on the rough basis of the number of apartments; while 20 per cent. removed to larger.

In a sanitary aspect the meaning of the size of a house depends upon the relation between the *number of the family* and the capacity of the house. Applying this test also, the results are satisfactory. Both in May, 1874, and May, 1875, it was found that the average number of inmates in the houses of one apartment into which those families assorted themselves was decidedly less than in those which they had left; that in houses of two apartments, also, the average number was less, though not so decidedly; while in houses of three apartments and upwards the numbers were considerably greater. All this is just as it should be. The operations left the families displaced living in houses better adapted to their numerical requirements than those in which it found them.

This fact is all the more important and gratifying when we turn to the matter of *rental*, and observe that of all the changes forced upon those people, that of increased expenditure for house-rent was the most decided, and very probably to themselves the greatest and most obtrusive. For every class of house there was an increase of rent, amounting to 20 per cent. on the old rental of a one-apartment dwelling in 1874, and 17 per cent. in 1875; to 20 per cent. on the old rental of a two-apartment dwelling in 1874, and 21 per cent. in 1875. The purely fictitious nature of the accommodation provided in these wretched dilapidated properties is made glaringly manifest by the comparative rental of the houses above two apartments. To say that a dwelling of three or four apartments could only be got in the new localities at an increase of 50 to 58 per cent. over the rental of the same size dwelling in the old localities, is to misrepresent the case, and do an injustice to the honest landlord quite as great as would the quotation of the prices of the merchant of adulterated goods against those of the fair dealer. The same remark applies to the smaller houses, though not to the same extent. What would a house of one apartment be at 2s. 6d. or 3s. 6d. per month, or a house of two apartments at 5s. per month, or a house of three apartments at 5s. 10d. per month, or one of four apartments at

7s. 10d. or 8s. 6d. per month? Yet these are all quotations of rents actually paid. A house means something more than a hole. The burrow of a Bosjeman is not a house. But are there people in our large towns who can contribute no more monthly towards the provision of a dwelling place than such sums as these? If there be, then, for the public safety and for the sake of our civilisation, philanthropy or taxation must provide for such; but my experience does not lead me to believe in their existence, except as the product of vice and improvidence. I invariably observe that in such hovels you do not find those who are poor from necessity of circumstance, but those who live by unlawful callings or who divert from their families and their houses every possible penny, in order to spend it in self-indulgence. In 1865, in his Report to the Privy Council on the Housing of the Poor in Towns, Dr. Hunter said: "From one point of view, crowding in Glasgow means the diversion of income from rent to supply whisky." The same remark, I have no doubt, applies to the same class in all large towns.

Another item in the changed circumstances of those people which admits of numerical statement is the method of *excrement disposal*. In 1874 we found that only 4½ per cent. of the families displaced had water-closets, the remainder using ash-pits and privies. In their new abodes, 13½ per cent. were supplied with those conveniences. In 1875 the proportion was increased from 7 per cent. to 14 per cent. by the compulsory change. Here, again, we must recall your minds to the improved conditions which cannot be expressed by bald figures. The ash-pits and privies of the new localities are much more inoffensive and innocuous than in the old, where, from want of space, they were close to the dwelling-houses, often at the bottom of enclosures, which were simply pits or tanks, in which the foul effluvia stagnated, and surrounded by windows through which they passed freely into the houses. In the new localities, also, in 1874, 63 per cent., and in 1875, 45 per cent. of the water-closets were situated, not in the houses, but on the common stair, indeed, but for this, I should hesitate to enumerate among the advantages of the change the fact that houses of this class were provided with water-closets. It is scarcely possible to find a position in a house of four or five apartments where a water-closet will not be a dangerous nuisance; and it is simply abominable to introduce such a thing into a house of three apartments or less. Apart from those objections on the ground of space and structure, there is this other of wider application, that a certain amount of culture and intelligence is necessary for the proper management of those social conveniences; and, wherever a water-closet

is common property, as a rule it is abused; it is essentially suited only for the use of one family living in a self-contained house. In Glasgow, unfortunately, where we have proved that our Improvement Trust operations are increasing the proportion of our excretions which passes into the sewers, we have not seen the last of the nuisance. We are increasing the pollution of the Clyde beyond the increase proportioned to the growth of our population; but, after all, in relation to public health, it is a question of degree. On the one hand, we have the filthy ashpit or privy in our confined courts and yards; and, on the other, the filthy river flowing through a long open space, and exposed freely to the open air. Still, it is not a case of "How happy should we be with either," but how gladly would we part with both.

The last of the immediate and numerically measurable results of our demolitions is their effect in accomplishing the *dispersion of our population* more equally over the area of the city. We shall discuss the matter of density and its relations to health immediately; but meanwhile we shall assume that the expulsion of masses of the community from the centre outwards is at once to effect an improvement in their general hygienic position. We must go down into the city to earn our bread, but the nearer to the outer verge we can sleep and rear our families, the better in the aggregate.

The Cross may be taken as the centre of the city of Glasgow, being almost equi-distant from all points of the municipal boundary, and also the nucleus round which the city has grown—the oldest, most densely inhabited, and most unhealthy part of it. The general result of our investigations in 1874 was that before our operations only 27 per cent. of the families displaced lived beyond half a mile from the Cross, but that afterwards no less than 60 per cent. were dispersed to various stages beyond that distance, two per cent. flowing over into the suburbs. In 1875 we found that, as in the former year before being distributed, only 27 per cent. lived outside a circle at half a mile radius from the Cross, but that afterwards 54 per cent. had settled down outside that circle, 1 per cent. having gone to the suburbs. In each year the crest of the wave of dispersion was at the three-quarter mile circle from the Cross. If we confine our attention solely to the families primarily displaced, the internal movement resembles that of a wave gathering up to a crest, then breaking and flowing outwards in a diminishing stream; but if we have regard to all the units of the population in whose midst this commotion takes place, we shall discover a process of displacement and substitution whose only limits are the very outer confines not merely of that which is artificially termed Glasgow, but of that great community of

which Glasgow is the vital centre. Those people go into cast-off houses just as they wear cast-off clothes, and the demand is met by "making down" houses, converting one large into a cluster of small, a process to which I shall not allude further than to say that it is rapidly reproducing the evils to get rid of which we are expending so much money.

Such are all the facts capable of statistical expression which I can adduce concerning the sanitary results of the Glasgow Improvement Act. They are, you will observe, facts concerning the very people whom the operations of the Act immediately affect, and they are the immediate effects upon those people. As to the ulterior effects upon the health of those people, and upon the health of the general community, I am not yet able to speak. A necessary condition of all effects upon health is time. On general principles, we believe that all the changes to which I have given numerical expression are of a nature to benefit the citizens involved in those changes; but for the manifestation of those benefits, until they also admit of statistical expression, time for their development is absolutely essential. It seems to me that they have begun to show themselves, but it would be premature to appeal to figures in proof of our belief.

I may, however, allude shortly to other procedures under the Improvement Act which have been adopted in the direction of the amelioration of the unhealthy conditions of city life. The first of these is the provision of *common lodging-houses*. In the course of our investigations we found that between 3 and 4 per cent. of the families displaced went into lodgings. The keeping of lodgers is quite a feature of small householding in Glasgow, and a very unpleasant one it is, both in its social and its sanitary aspects. At the census of 1871, it was found that 23 per cent. of all the families kept lodgers, and the practice prevails among those who must necessarily sacrifice both decency and health in the exercise of it. Even of families living in one apartment, 14 per cent. had lodgers, and of those in two apartments, 27 per cent. As three-fourths precisely of all the dwellings in the town are of that size, you will understand what an important element in the community in every aspect is the unattached lodging population. To my mind the introduction of lodgers into the family circle of those small houses is to be regretted and discouraged. In a one-apartment house it is simply abominable to contemplate; and in all cases the close personal contact and the want of privacy either of the general or family functions which must prevail are made doubly injurious, morally, by the introduction of strangers, besides the physical injury of overcrowding. Of this lodgers are the frequent cause, being crammed into houses which, without

them, would afford tolerably decent and wholesome accommodation to the natural inmates. Hence, as the Registrar-General for Scotland pointed out in his Report on the Census, "the larger house for the operative, built with a view of effecting the better separation of the sexes, is in reality found to have no such effect; but, on the other hand, holds out an inducement to him to crowd his family to a greater extent than when he occupies a house of one or two rooms" (vol. i. p. 35).

In destroying those fictitious houses, let at nominal rents, which I have described, the Improvement Trust were adding to that vagrant class of people who occupy common lodging-houses, and for them only did they of themselves provide accommodation in the shape of large lodging-houses, with day rooms, lavatories, and every convenience, where each has a separate bed, and the use of a cooking range and utensils, at the charge of $3\frac{1}{2}$ d. per night. They are each under a superintendent, and are kept in admirable order. They are self-supporting, and return 5 per cent. on the capital expended. From this we may have some idea how lucrative the lodging-houses provided by private enterprise must be.

PROVISION OF DWELLINGS FOR THE PEOPLE DISPLACED.

Now we come to the most important branch of all improvement schemes, the reconstruction, the *provision of dwellings for the people displaced*, and their supervision, so as to check the upgrowth of like errors of plan and occupation. In a memorandum addressed to Mr. Secretary Cross, and contained in the papers presented to Parliament before the introduction of the Artizans' Dwellings Bill, the sub-convener of our Trust (Bailie Morrison) says—"We do not build houses, as a sufficient number of these are erected by private enterprise to meet all the wants, and no case of real hardship is known. . . . We are opposed to competing with private enterprise, as such a course checks building. Neither do we consider it prudent to become philanthropic landlords, to let houses below the actual rents to any class, as this has a decided tendency to pauperize and destroy that feeling of independence in our working-class population to which they are already too prone." I do not question the propriety of this decision, to leave the demands of a public necessity to the action of the ordinary law of supply on commercial principles; but it ought to be an essential condition of such a decision on the part of a local authority carrying out such operations, that they must have the power of impressing upon the new building of the present all the sanitary lessons of the past; that, in short, they should have a

liberally constructed Building Act. This we unfortunately do not possess in Glasgow, as is sufficiently manifested by a resolution of the Committee of Health of date 18th January, 1875, to this effect: "The attention of the Committee having been directed to the evil effects resulting from the occupation of buildings of a certain construction, now being erected in different districts of the city, particularly tenements of dwelling-houses erected on what is known as the hollow-square system, the Committee remitted to a sub-committee of their number, along with the medical officer and master of works, as a special committee to examine these buildings relatively to the width of the adjoining streets, and open spaces inside of these squares, and to report what steps should be adopted by the Board in reference thereto."

I shall not occupy your time with any details of the defects in the powers of the local authority over new buildings, noted and reported by this committee. It is enough to state that they were numerous and most important, and that their labours resulted in the appointment of a deputation, which waited upon the Home Secretary and Lord Advocate, and strongly represented to the Government the necessity of statutory provision for the enforcement of a uniform system of building regulations in the cities and large towns of Scotland, and beyond the boundaries thereof, within a certain defined radius from the centres of such cities and towns, according to their population and area. The important lesson which I wish to impress upon your minds is this, that to enter upon any large scheme of demolition of the dense unhealthy areas of large towns, without first looking narrowly into the existing building regulations, is to adopt a course which necessitates extensive reconstruction and erection of new buildings, without a sufficient guarantee that they shall not, in any degree, reproduce the evils of the old, and, indeed, shall be in all respects the best that the most advanced sanitary requirements can demand. Let the example of Glasgow, therefore, be a warning to other communities. A full quarter of our total inhabited houses has been erected since 1866, when our Improvement Act was passed; and of that quarter, 93 per cent. were dwellings of one, two, or three apartments. Yet while we have enforced all the powers we possess of regulating those new buildings, and while they are undoubtedly improvements upon the old, we confess that we have let slip a golden opportunity of erecting a model city.

The operations to which I refer have enhanced enormously the value of property in the city, and of land suited for building purposes in its neighbourhood. The tendency of both is always upwards in the vicinity of towns; but the artificial stimulus of

those extensive central clearances, and the outward pressure caused thereby have, in Glasgow, added to house property and land all at once a marketable value which in ordinary circumstances would have been the slow increment of years. In this way the great problem which presents itself at the very outset of any attempt to provide working-class houses on commercial principles has been rendered still more difficult of solution. I mean the value of land, the primary cost of sites for buildings, and the difficulty of so planning our buildings as to secure a sufficient return upon capital and yet not overbuild and overcrowd the soil. It seems to me that the question of the health of towns has now passed into the hands of the architect, the engineer, and the capitalist. Speaking, for the moment, in a representative sense, I do not feel called upon to be architect, and economist, and hygienist all in one. In the latter capacity I am prepared to lay down general principles, and to criticise and approve; and unless it be that architects cannot draw plans which will satisfy both the hygienist and the capitalist, I see no reason why I should be asked to do more. If you go out into the clear for your building ground, there is no doubt my demands will be more easily satisfied; but you must persuade the people to go thither; you must get manufacturers to transfer their factories, foundries, and workshops to the outskirts, where they would, in these days of private telegraphs and railways, be nearer the town counting-house than they were half a century ago: and you must facilitate the means of bodily transit between the town and the country.

If you desire to make a trial of the dearer city soil, then you will find my requirements more stringent, and my conditions more difficult to combine with profit. However the task of providing healthy houses is to be accomplished, I believe our knowledge of the conditions of health is sufficiently advanced, and our conviction of their practicability sufficiently clear, to warrant the Legislature to take the same position as in the case of trade nuisances, and say—These are our conditions, and you must comply with them. It was never intended that cities must either cease to grow or become huge sarcophagi, because architects and engineers could not satisfy the hygienist on the one hand and the capitalist on the other.

In addition to the area of which they became proprietors in the course of their operations, the Improvement Trust also purchased two small estates on the outskirts of the city, which they disposed of in the ordinary way for the erection of working-class houses. In drawing the building plans they availed themselves to some extent of their position, as superiors to set aside free spaces, to control the arrangement of the building blocks, and otherwise to illustrate the power which the

original holder of the land possesses of giving a healthy constitution, so to speak, to the new quarters of towns.

THE FLATTED TENEMENT IN MODEL DWELLING-HOUSES.

It is somewhat remarkable that, in the endeavour to work out this problem of house accommodation and high-priced land, you, in the south, are turning with favour to the flattened system of tenements, on which we in the north look with misgiving. It requires no great consideration or exercise of ingenuity to discover that the simplest way to solve the problem of dear lands is to build upwards into the air. Still you will readily understand that the public of Glasgow paying a yearly tax to disperse densities averaging 800 to the acre, convinced that they were building houses too tall, and packing them too closely together in districts which did not carry above a fourth of that number, and only just recovering from the alarm of a death-rate of 66 under the smothering blanket of the previous winter's fog, were startled in the spring of 1875, when news was brought to them from London, that people were being exhibited there, living in tall tenements like steeples, seven flats high, and 1600 to the acre. You may fancy with what eagerness and anxiety the officials and members of the Corporation seized the first chance of being in the metropolis to go and see this wondrous sight. I must add that when the Chairman of our Health Committee, our Master of Works, Dr. Gairdner, late Medical Officer of Health, and myself, looked upon these erections in Farringdon Road, we recognised too much of the features of the High Street and Saltmarket, to take readily to the belief that we saw before us a solution of the question of house accommodation for urban communities. Still, a rash inference or a misleading statement, uttered with authority, often gives much trouble to persons who are striving for a principle; and from the amount of attention which the above statement has attracted in Glasgow, it seems worth while to look narrowly into it. I wish also to add, that while reference is made to one set of model dwellings alone, I have various others in London, such as the Peabody, Corporation, Waterlow, &c., in my mind also, to which in different degrees the same criticisms apply, as in the case of the buildings specially quoted.

In February, 1875, Mr. Charles Gatliff, Secretary to the Metropolitan Association for Improving the Dwellings of the Industrial Classes, read a paper before the Statistical Society of London "On Improved Dwellings and their Beneficial Effect on Health and Morals, with Suggestions for their Extension." It is an extremely able, exhaustive, fair, and, on the whole,

accurate statement of the facts as regards the dwellings of the Metropolitan Association, to which the flatted tenements in Farringdon Road belong. I am anxious that no adverse criticism which I may make shall be taken as depreciatory of Mr. Gatliff's services in compiling such a paper. The Association was incorporated by Royal Charter in 1845, the dividend being thereby limited to 5 per cent. as the maximum. It has provided accommodation for 4150 persons in flatted tenements in London, and for 1150 in cottages in the suburbs, to which gardens are attached.

The tenements are built in blocks from five to seven flats in height, standing vertical to the street. The cottages range in size from two to six rooms, and in rent from 5s. to 7s. 6d. per week. The dwellings in flats range in size from two to four rooms, and in rent from 4s. to 9s. 6d. per week. The average density of the inhabitants of those dwellings is 1140 to the acre. At one part of the paper the mortality is said during the last eight years not to have exceeded 14 per 1000; and I have seen this quoted repeatedly, although it is an error, as we find from Table IV. that it has ranged from 15 to 18 per 1000. The birth-rate was 36 per 1000. The death-rate of all London in the same time averaged 24, and the birth-rate was $34\frac{1}{2}$. The financial results are, that for 1875, the maximum dividend of 5 per cent. was paid, and for the five previous years $4\frac{1}{2}$. Mr. Gatliff puts forward, as the leading advantages of the metropolitan dwellings, decreased mortality and disease; less area occupied and greater number of persons provided for, notwithstanding large space for recreation and ventilation; the facilities for the detection and suppression of crime.

There are various minor criticisms which occur to me upon this paper, which I may rapidly mention before proceeding to the main question of principle involved. The average death-rate of those model dwellings in eight years is 16 per 1000, calculated from Mr. Gatliff's data; but you will observe these are derived from all the buildings, urban and suburban, making twelve widely scattered groups of persons. It is eminently unsatisfactory to test such a system of building as the flatted tenement, by including with its statistics those of self-contained cottages with gardens, which everyone admits must be a sanitary Arcadia. After all, we have no assurance that all the deaths fairly referable to those tenements are included. In the discussion at the Statistical Society a member "begged to submit that the death-rate was entirely fallacious, inasmuch as a considerable number of the inmates of these model lodging-houses died in the hospital." I put this by letter to Mr. Gatliff, and find that this has not been inquired into; but he argues that his tenants are less likely to go to hospital than

those of inferior property in London, and that therefore his death-rate, if not absolutely correct, is sufficiently so for comparative purposes. It is a pity that, in a paper on which so much labour has been spent, a flaw so serious should exist. Isolated blocks of buildings, standing in districts widely separated, cannot be compared with districts, unless this matter of hospital deaths has been settled. The district generally contains a hospital and a workhouse; and the block of building, whether it retains all its cases of sickness or parts with a few to an institution, has an obvious unfair advantage. This is altogether apart from fundamental objections to such a test of mortality or comparison in any respect subsequently to be taken. Another circumstance to be discounted from the value of Mr. Gatliff's death-rates is the process of selection of the population from which they are derived. In his own words, "the inmates of these model houses always undergo a twofold process of selection; that is to say, the inmates first select the model lodging-houses as harmonizing with their own decent tastes, and are then chosen from a larger list of applicants, according to the discretion of the managers of these institutions." In short, the inmates as well as the houses are models; and from this assorted population we are asked to make inferences applicable to the mass of a city population, or rather to the residuum who are cast aside in this process of selection, and in whose ranks we shall find the very people who are the source of our perplexity, and for whom we are most anxious to provide. They have not the senses requisite for the discovery of the comforts of such dwellings, but the possession of which leads the skilled workman, the clerk, and the warehouseman towards the exotic circumstances of the model dwelling-houses, where, in the words of a valuable Report of the London Charity Organisation Society, "philanthropic" agency supplies one of the chief necessities of life—viz. lodging—below its market value. Mr. Gatliff gives the occupations of his tenants. I find among the tenants of the flatted tenements only 5 per cent. designated as "labourers," and $2\frac{1}{2}$ per cent. as "charwomen"; the remainder are tradesmen and other persons who under any circumstances, at any rate, in Glasgow, would have provided themselves, without the aid of an association, with the best article in the way of house accommodation to be had, at its full market value. There is yet another circumstance in the way of discount to be mentioned, and that is the supervision and discipline to which this model population is constantly subjected. Again, to quote Mr. Gatliff, "at each of these establishments a superintendent resides to collect rents, supervise, and make himself generally useful; and there is a labourer to execute repairs, also residing on the premises. These men,

in performing their duties, become acquainted with the tenants, their occupations and pursuits, and soon detect drunkards, brawlers, prostitutes, receivers of stolen goods, or other bad characters, who occasionally resort to improved dwellings to evade suspicion." I only ask you to consider what influence on the health as well as the morals of almost any sort of property would be exercised if the landlords set themselves to eliminate "all drunkards, brawlers, prostitutes, receivers of stolen goods, or other bad characters."

But the point to which I wish most particularly to direct your attention is the imperfect and fallacious ideas of density which pervade Mr. Gatliff's paper and underlie his inferences; for example, in such a passage as this: When we consider the diminished rates of mortality and disease which accrue to the tenants in them, notwithstanding that the average population is at least four times more to the acre than in the most densely populated parts of the metropolis, we have an irresistible argument in favour of the increase and extension of this class of buildings. In Westminster, which is the most densely populated part of the metropolis, the population is only 235 persons to the acre; whereas in the dwellings provided by the Metropolitan Association, including in the areas the large court-yards and gardens attached, the average is 1140 to the acre; and yet the rates of mortality and disease are at the low figures just stated." In a foot-note it is added, "In one instance (that of the Farringdon Road Buildings) the population is 1625 to the acre."

THE DOCTRINE OF DENSITY IN RELATION TO HEALTH.

It will be necessary for us to endeavour to form some clear conception of the doctrine of density in relation to mortality. It is not necessary now-a-days to prove that there is such a relation. From the date of the publication of the first of Dr. Farr's annual "Letters to the Registrar-General" appended to the Report for 1838, the fact has received yearly accession of proof and illustration. In the fifth Report, on the basis of four years, Dr. Farr showed that the relation was so exact that it could be formulated thus. The mortality of two places is as the sixth root of their densities; and the mortality, calculated from this formula for certain districts during those years, is shown to be identical with the actual mortality. This rule, however, has not been found to apply to the decennial statistics of 1841-50, 1851-60, and 1861-70; but in each period the law prevails, that "there is a constant increase of mortality running parallel with the increase of density." The fact of density may be expressed in various ways; as persons to a certain unit

of superficial area, *e.g.*, square miles or acres; or as so many units of superficial area to a person; or both modes of expression may be combined in the proximity, which is as the square root of the density. But this is a mere matter of terminology. What we wish to ascertain is this: What is the essence of this relation between density and death-rate? What is the fact in Nature involved therein? and what is the broadest expression we can give to it? It seems to me to be the numerical expression of the fact that there are limits to the self-purifying powers of Nature; that the laws of Nature, to which we trust for the purification of earth and air and water from the contaminations of animal life, are effective under certain conditions, with which aggregation interferes when it exceeds a certain proportion to the area occupied. The oxygenating powers of the ground-air are overmastered; the ground-water becomes impregnated with unreduced organic matter; the rivers are loaded with impurities; the cycle of interchange and co-operation of the animal and vegetable kingdoms is interrupted; the action of the law of diffusion in the atmosphere, and the influence of light and heat in promoting chemical change and mechanical mixture and dispersion, are crippled. These propositions are, theoretically, simple expressions of fact; but in various ways, when we come practically to illustrate their meaning, they become involved with so many modifying variables, that it is only by supposing simple cases, and introducing synthetically these variables, we can, as it were, build up before our minds the conditions under which we find populations living, and show through them all the operation of one law. This is the secret of the failure of Farr's law, that the mortality of two places is as the sixth root of their densities. We can modify the influence of density by certain sanitary expedients. Let us imagine a community or a series of districts with a density unchanged for a decade; the population stereotyped in their occupations, character, proportion of ages and sexes, &c.; but advancing in their understanding by those laws of Nature which govern the action of density. By drainage they will lower the level of the ground-water, increase the proportion of ground air, and so increase the power of the earth to cope with impurities. By sewerage they will convey to a distance their local filth, and so diminish the impurity with which the soil has to deal. They can make themselves entirely free of all local influences of the ground-water by leading into their midst a domestic water supply from a distant source. Air they cannot directly bring from a distance, but it will be purified to some extent by the same means which promote purity of earth and water, and still more by restoring as far as possible those conditions under which pneumatic laws obtain

the freest scope, by removing mechanical obstructions to diffusion, to the access of light and the free play of winds, and by calling in the aid of vegetation. Suppose all this done, and we have a series of districts with their density unchanged but with their mortality diminished. If all the districts have made equal sanitary progress, the same relation of density and mortality will be apparent; but if they have advanced unequally, then this relation will be entirely overthrown. A case of the very opposite of this may be imagined, in which a series of districts may be stagnant as regards every condition of their existence saving their density. They may spread themselves out to the density of rural districts, or rather in that direction; and the more nearly they approach that degree of tenuity of population, the more will their death-rate approach the rural standard. Yet another case may be supposed, in which while the density and the general sanitary expedients are the same, the character of the population, their occupations, proportion of ages and sexes, &c., are revolutionized, and individual effort in the combat of circumstances is introduced. In that case we should again have a lower death-rate, apparently inconsistent with this great law of density, but in fact proving this, that the same degree of aggregation is more destructive of one class of people than of another; that the habits of some people sooner than those of others break the laws on the observance of which a certain degree of health may be had—laws which become more exacting with every increase of density.

It will be apparent from these synthetic illustrations that, in studying the influence of density as we find it, we must remember the infinitely variable combination of circumstances in and through which it acts, and prepare to meet inconsistencies, which will disappear only after a careful analysis of these circumstances. But of this we may rest assured, that, whenever two communities are absolutely comparable in all respects save of the density or proximity to their vital units, the more dense will be the more unhealthy, above that, as yet, undetermined limit at which the element of density becomes measurable as a factor; and if two communities be of like density, but differ in health, then we shall find in the one circumstances which intensify the morbid influences of density, or in the other circumstances which compensate and neutralize them. Here, then, we are introduced to the practical aspect of the doctrine of density. Concentration of vital units is one of the features of civilization, and an essential condition of its highest development. The point to be determined in this concentration is, that where the maximum of common advantage is reached, and where deterioration and morbid influences begin to exceed; and that nation will reach the highest level

and, what is still more important, longest maintain its place there, which succeeds in discovering and preserving the maximum of concentration consistent with the minimum of deterioration.

We can now return to the Metropolitan Association. In the passage which I quoted Mr. Gatliff contrasts the density and mortality of Westminster with what he calls the density and mortality of his dwellings. In the former we have 235 persons per acre, and a mortality of 23 per 1000 (the average of the decade 1851-60, for Westminster registration district); in the latter we have 1140 per acre, and a mortality of 16 per 1000—nay, we have even 1600 per acre in one building, and yet, see what material advantages remain. The question of whether 16 is or is not the mortality is of little moment. We have at present to ask, is this a logical comparison? And I have to answer that it is not. An essential condition of the notion of density, and an element which enters into its very definition as a law, is not the rate, but the area over which the rate prevails; and that area must be a continuous area, not formed of patches only brought together upon paper for statistical purposes. But Mr. Gatliff takes bits of land dotted all over the metropolis, with the flattened tenements thereon, and his cottages in the country, with their gardens; adds together their area and population, finds that the proportion is 1140 to the acre, calls it their density, and then contrasts this with the density of between two and three hundred continuous acres in Westminster, and, by implication, with all that we know of the relation of density and death-rate, as illustrated in three decades of the Registrar-General's Returns, derived from square miles of country, urban and rural. Could anything be more fallacious? The fact is, the density of those buildings and cottages is simply that of the district in which they stand, if taken individually; and, if collectively, that of the metropolis as a whole, viz., 45 per acre. If you have 800 people living on half an acre of ground in the middle of Hyde Park, that does not mean that they are living at a density of 1600 per acre; they are living upon the bounty of the surrounding acres. If such a block of buildings were transported into the midst of a semi-asphyxiated city, such as Glasgow, where every patch of soil has already been utilised, and the general stock of air is poor, the death-rate would soon adjust itself to the actual density. In short, we may be sure that, while the seven-flatted tenement carrying 1600 per acre of the area of its own site, may be a satisfactory solution of the difficulty of ground rent and cheap house accommodation, between the architect and the individual capitalist who holds the ground or builds the tenements, it would be ruinous for the health of the community

if applied to a large area, and intolerable unless the Government or the local authority provided lungs in the shape of free space, on the bounty of which the tenants would live.

A few minutes ago I referred to Glasgow as a "semi-asphyxiated city," and I used the term with deliberation, as I believe that it is on the quality of the air that density of population most certainly tells. The influences on earth and water may be combated and diminished with comparative ease; but it is to a great degree inevitable that, except in so far as purity of air and water lessen the impurity of the air, density must carry with it aerial contamination. In cities we have a conjunction of circumstances, all which co-operate to throw an excess of impurity into the air, and also of circumstances which obstruct and impair the natural arrangements for the reduction of those impurities. Just let me give a few details of my own city relative to this matter. What is called Glasgow, and for municipal and statistical purposes is embraced under the name, occupies an area of 6033 acres, of which, we may say, 1000 are unbuilt upon, but available for building; while 282 are devoted to public parks, and 137 are graveyards, of which 120 are still in daily use. On the remaining 4614 acres there were congregated, in 1875, 534,560 human beings, of whom three-fourths lived in dwellings of one and two apartments; 8200 horses in 2300 stalls; 1770 cows in 300 cow-houses; 1370 pigs in 140 piggeries. Each of these collections of animals has its attached heap of manure or refuse; the human animals having 7000 ashpits, or ashpits and privies with pans, the superficial area of which, at a moderate computation, will be $4\frac{1}{2}$ acres, and probably a third of this area is covered with a mixture of night-soil and ashes or night-soil alone. The emanations of this area are more injurious than if it were really continuous, as these ashpits and privies are all situated in confined courts, or inside those hollow blocks in which the Glasgow tenements are always built. Add to this the products of combustion of coal, poured out from hundreds of factory chimneys and thousands of domestic vents, and of some sixteen hundred million cubic feet of gas which is consumed, besides three million cubic feet which leaks into the soil. Then look at the hindrances thrown in the way of nature by our block-buildings, which are so many boxes of stagnant air; by our back buildings standing inside those boxes, by our narrow streets and tall tenements; and at the subversion of the cycle of nature by the abolition of vegetation, partly through our avarice of the soil, which will not leave a yard to its natural uses if possible; partly through the impurity of our atmosphere, which kills all trees, and in some places even grass, so that the influence of Glasgow is like that of a flight of locusts, it leaves not a green thing behind.

Can it be a matter of surprise that bronchitis, consumption, and other diseases of the lungs constitute, year by year, from 31 to 38 per cent. of our entire mortality? The same fatal prevalence of pulmonary disease attends all urban communities, more or less; and when the sources of mortality are compared with the density of large areas over decades, it is found that they show characteristics consistent with, and proportioned to, density. Sometimes this tendency to asphyxia in our large cities is brought out in an appalling manner by passing physical changes, which temporarily intensify all those obstacles to the purifying efforts of nature which we have enumerated. Such are the effects of combined cold and fog, of the influence of which an illustration was furnished in London in December, 1873, when the death-rate was pushed up to 38, and the cattle in the Christmas Show at the Agricultural Hall died in great numbers, manifestly choked. But more shocking was our own case, in December, 1874, when, during a ten days' continuous fog, ending on the 31st of that month, the death-rate of Glasgow reached the unprecedented point of 69 per 1000 in the week ending January 2nd—this rate being calculated from the date of death, and not merely from that of registration, which at such a season may be unduly deferred. And what were the causes of those deaths? Of the total 700 no fewer than 372 were pulmonary; only 107 were zymotic, and the remaining 221 were from other general causes. Hence, simply by drawing the curtain of the fog over a city during a time of intense frost, it is possible, under those circumstances of constantly impaired aeration of its organic effluvia, to well-nigh stifle it, and cause a mortality to which zymotic disease contributes comparatively nothing; and which, indeed, it seldom occasions under such degrees of prevalence of pestilence as are known in modern times in the temperate zone.

EFFECTS OF DENSITY ON THE COMPOSITION OF THE AIR.

We are thus led up to the consideration of an exact measurement of density as a factor in relation to health. The simple numerical statement is subject to so many modifications by association with varying conditions in the other circumstances of the vital units, that it is very desirable to obtain some compendious exact expression of the meaning of density in each case. This would probably be afforded by analysis of the air. So far as density of population is a factor of disease, it must have a corresponding density of air, and thus the chemist could detect, where, under given circumstances, we pass from a degree of density consistent with health in those circumstances to one productive of disease. This idea was floating in

the mind of Dr. Farr in 1843; but he says, at that date, "chemists have hitherto failed to detect any excess of carbonic acid in cities," a statement which, though not historically correct, inasmuch as the younger De Saussure had, in 1827, clearly established a difference between the air of Geneva and of the fields outside that town, is indicative of the position of chemical analysis as practically applicable to the solution of the hygienic relations of the air. I need not remind you that, through the laborious investigations of Dr. Angus Smith, the most important of which were expended upon the air of the neighbouring city of Manchester, the outlines of the chemical climatology of cities have been clearly drawn, and the chief difficulties of method have been overcome. When we recollect the special provision made by the laws of diffusion of gases for the dispersion of carbonic acid, we can estimate the importance of the establishment of the presence in excess of that gas in the atmosphere of cities. It prepares us to expect the presence also of foreign ingredients in the shape of solid particles of animal life and other matter, which, unaided by pneumatic laws, depend for their dispersion upon mechanical transport by the fluid medium in which they are suspended. It is to this atmospheric dust, and the products of that portion which is organic, that modern pathology leads us to attach most importance, and also that modern chemical processes have made most advance in their power of estimating. The mechanical obstacles to the effective operation of the laws of diffusion which accompany density of population, tend to the accumulation in the lowest atmospheric strata in which we live of a microscopic sediment, which is both mechanically injurious to life and productive of chemical deterioration in the quality of the vital air.

I have long thought that the most important aid which chemical science could furnish to public health would consist in the systematic publication of analytic reports on the quality of the air we breathe, similar to those which are habitually furnished of the water we drink. It is not so very long ago since we became familiarized with the fact that water differs in its intimate composition to a degree beyond the powers of our finest senses to detect; and the greatest possible advance in our exact knowledge of the conditions of health would follow a like familiarity with the fact that chemical analysis can weigh and measure degrees of difference in air which are totally inappreciable by unaided sense. Angus Smith says—"It was a great day for the world when air was found to be something material, and to be capable of weighing down the scales of a balance"; but what he says in the previous sentence—"when we are children air is nothing"—is nevertheless true of the ordinary

thoughts and conceptions of air current in the minds of the general public, whose intelligence is really the measure of sanitary progress.

It is not what Angus Smith teaches, but what our mayors and aldermen, provosts and magistrates believe, and have some rough practical apprehension of, that will sustain and give effect to a medical officer's denunciation of overflowing middens, building in hollow squares, narrow streets, unconsumed smoke, and other details which contribute to the great sum of aerial deterioration.

A short while ago, at my suggestion, the Health Committee of Glasgow resolved to give some assistance in the analysis of the air, in the healthy and unhealthy parts of the town, to Mr. Dixon, a gentleman who placed his personal services at our disposal without fee or reward. He has expended much time, ingenuity, and skill in devising an apparatus for the collection of the impurities of a large quantity of air in a short space of time. Even if it were prudent, at this stage, to enter upon any description of his arrangements, or account of his analytic processes, I should only spoil an interesting subject through lack of chemical knowledge. Mr. Dixon will probably be in a position to make some provisional communication on the subject at the meeting of the British Association in Glasgow in September next. The quality of their air is well worth the attention of all large towns. The chemist seems now quite able to cope with all the most important foreign ingredients, as well as with the minute variations in the proportion of its normal constituents. What he requires is such aid as public funds alone can provide. We may shortly expect some interesting and valuable results from the city of Paris, which, in April last, resolved to devote an annual sum of 12,000 francs for meteorological observations in various districts of the city. They are to be carried out under M. Marie-Davy, director of the Observatory of Montsouris, on the outskirts of Paris, and, besides the ordinary facts of meteorology, are to include atmospheric electricity and the comparative composition of the air. Before receiving this commission from the municipality of Paris, M. Marie-Davy had been gradually introducing air-analysis into the routine work of the observatory, both directly by automatic continuous air-washings, and indirectly, by the analysis of the rain-water. The special design of those investigations was to contribute to the scientific knowledge of agriculture; but now, in their extension to numerous stations in Paris, they cannot but yield results of importance to a scientific knowledge of hygiene. Since 1865, indeed, ozone estimations have been continuously made at twenty different stations in that city, of the results of which M. Marie-Davy

gives a diagrammatic summary in the monthly report of his observatory for May last. From this it appears that, while ozone abounds towards the periphery and in the open parts of Paris, it is present only as a trace in the denser central quarters. The fact of the recognizable presence of ozone, even in the populous parts, is something to boast of. The contents of the Montsouris monthly reports are very interesting. Much attention is being given to the photographic delineation of the microscopic particles of the atmosphere, as well as to the products of culture experiments with the living organic portion: and it looks like progress in the right direction to find a systematic table of "Matters contained in the air and rain" of each month, showing opposite each day, for the period of the day and the night, the proportion in 100 cubic *metres* of air, of ozone, carbonic acid, ammonia, nitric acid, and organic matter, and per litre of rain-water, of ammonia, nitric acid, saline residue, and organic matter. Similar systematic information, collected at different points in the same city, will soon supply a solid structure of fact regarding its comparative hygienic conditions. The next step in the use of air-analysis will be as evidence in the enforcement of sanitary work, in matters of ventilation, defective structure, and nuisance removal, which at present are decided on the evidence of the senses or of experts, authorities which may differ. We have only to imagine that, to prove the impurity of the water of a well sunk in the neighbourhood of a cess-pit, we were deprived of the assistance of chemistry, to understand how great is the want of this assistance in the parallel case of air in alleged pollution from whatever cause.

Now, gentlemen, I have taken you over a considerable range of subjects, beginning with the endeavours of the authorities of Glasgow to improve the condition of their poorer citizens, passing through a discussion of the doctrine of density in relation to health, and ending with a reference to the important information to be anticipated from systematic air-analysis in crowded districts, as a key to the real truth in nature expressed by this doctrine of density. Laws of wide action may be lost sight of by the very scope of their influence; and if I have succeeded in convincing you that, however we may modify the effects of density upon health, they still exist, and are measurable in comparable circumstances, then the design of my remarks has been attained.

CHAPTER VI.

THE SOCIOLOGICAL ASPECTS OF SANITATION.

THE following pamphlets are here included :

1. The House.
2. The House in relation to Public Health.
3. Life in One Room.
4. Ticketed Houses.
5. Uninhabitable Houses.
6. Common Lodging-houses.
7. Sociological Aspects of Sanitation.
8. Sanitation and Social Economics.
9. Public Health and Social Problems.
10. The Children of the City : what can we do for them?

These papers, although delivered at separate times, and before different audiences, form, in reality, a continuous study of the defects of the social organism which militate against the health of the individual, and the well-being of the community.

At the time of their issue they stood almost alone in the wealth of detail which they supplied to legislator and social reformer alike, and scarcely anywhere else—within the limits of a single community at least—have the difficulties which beset the life of the poor in cities been the subject of so much patient inquiry and sympathetic description.

They begin with a simple dissertation on house structure and environment in relation to the requirements of healthy living, but the subject expands in the author's treatment of it, until the house becomes the index to the character of its occupant, and the ticketed house, the uninhabitable house, the house of one room, reflect not only grades in social condition, but degrees of moral abasement. In the paper on "Sanitation and Social Economics" in particular, the vital and social features of the worst of the old City Districts (Bridgegate and Wynds) are followed with a remorseless appeal to facts, which reveals, with an almost Zolaesque vividness, the hopeless abyss into