Title of Thesis

"Circumstances affecting Health in a Manufacturing District"

April. 1885

Circumstances affecting Health in a Manufacturing District

Smoke, Smell, Noise

Thesis

by

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April 1885.

Victory Gordon on Circumstances
affecting health in a Manufacturing
district. —
A fair thesis - giving an
account of the Linoleum
Works at Kirkcaldy
Like many articles in similar
journals it perhaps rather overstates
the bad effects
It may be regarded as S

Smoke, Smell, Noise

— " —

In almost all localities, but more especially in the neighbourhood of large Manufacturing Centres, we only require to glance the Eye around us to discover at once fertile Sources of disease. Probably it will never be known how far the death rate has been influenced by such causes. Civilisation has made such rapid strides, that it has succeeded in overturning the Equilibrium of Nature, and it meantime seems to be one of the unavoidable penalties of Civilisation, that we should live under unwholesome Conditions of life. Nevertheless, it is truly our essential and chief part of our duty, as Cultivators of the noble Science of Medicine, to prevent, as well as to cure disease. Yet, how frequently are Sources of disease in a district overlooked and neglected, and how much in this degree have

the health and Comfort of a Community been found to Corresponds!

In Communities there exists the principle of an overcoming security, in respect of fancier immunity from disease, and so long as an uninterrupted Calm is enjoyed, the idea of a possible Coming Storm seldom obtrudes itself

There is a strong feeling abroad, that legislative enactments are Capable of doing service in the preservation of health and the Suppression of disease. This may be the Case, but the rule seems to be, that Acts of Parliament, when put into execution, turn out in the end to be, at best, merely permissive. Be this as it may, it Cannot be denied that, by Legislative enactments and their advocacy by the Press, Sanitarians are now being listened to by the Public, and their teaching is at last beginning to Convince the Nation that "There is no virtue like necessity"

Under the most favourable circumstances, Sanitary reform is uphill work. But in a manufacturing district, it must be very gradual in its development to be safe in its course. It must be founded on actual knowledge, and must be taught to, and understood by the masses in a systematic, definite and comprehensive manner. They must especially be taught, that the art of preserving health cannot be interfered with by questions of a social kind. They must be taught that disease appears through a well defined series of causes — causes, in many instances, of easy avoidable and removable. But in many instances also obscure. It is only by tracing out and suggesting means for the removal of these causes, that the Sanitarians of our day can add their quota to the advances made in the knowledge and appreciation of Sanitary matters during generations

past — advances which, especially during late years, have made such rapid strides, that even we, of this century, are entitled to picture to ourselves the time when men shall live in perfection of sanitary splendour — the grand days of universal health and happiness sung of by Virgil; the days of perfect legislation taught by the illustrious Solon; or such times as Plato pictured, when the taught that, by careful management and purity of life physicians and drugs were alike unnecessary, nay rather, that the very existence of such in a community was only a proof of the vice of the people.

The regulation of Public Health must not be looked upon as of modern origin. When we look back into early history, we find this a subject of legislation. The Mosaic Code of Laws — the most ancient on record — contains minute directions for the cleanliness of the person, the purification

of the Camp and dwelling, the proper selection of food, and the isolation of infectious disorders &c.

But it is admitted, that not-withstanding our own time, has the Science of preserving health through art, been worthy the Name of Science. It has however been slow in its progress, for, from the beginning of this Town, Knowledge & Wisdom have had to wage war with Ignorance and superstition in all its forms.

Smoke

Though the Smoke Nuisance is now only receiving the attention it deserves, it has been a subject of ancient legislation - We find it has a history extending back nearly Six hundred years.

The injurious effects to health and property arising from the use of Coal as a fuel, were experienced as far back as the Year 1306, when the King - Edward I - effectually checked the noxious vapours and Smoke arising from Coal, by prohibiting its

further use. In the reign of Queen Elizabeth, it was again made a question of Legislation. From this period down to 1819 Scientific men, at intervals of about 50 years, protested against the Smoke nuisance and its evil effects on life and property. In 1819 it once more became a subject of Parliamentary discussion. Instead, however, of prohibiting the use of Coal, a Select Committee of the House was appointed to "inquire whether means could be devised, so as to render Smoke less prejudicial to public health & Comfort"

This Committee reported, that the Nuisance Complained of "might at least be diminished if not altogether removed"

In 1843 another Select Committee was appointed to inquire "into the means and Expediency of preventing the Nuisance of Smoke arising from fires or Furnaces". They recommended "that a Bill should be brought into

Parliament to prohibit the production of Smoke from furnaces and Steam-engines". From 1843 to 1845 such Eminent Scientists as Faraday, Sir Lyon Playfair and Sir Henry de la Beche reported that "the Continued Emission of Smoke is an unnecessary consequence of the Combustion of fuel, and that, as an abstract Statement, it can be dispensed with"

Truly Sanitary reforms as to Smoke Nuisance, has been slow in its development, but, it has also been steps in its Course.

Our Scientific and Technical Knowledge has advanced pari passu. Public interest has at length been enlisted and awakened to the cognition of the Evil, and to desirability of some reforms; the prevention of Smoke is recognised as a matter, not only of public importance, but one of material interest; so that, sooner or later, this nuisance must be swept away by the breath of public opinion.

We wait now for some Systematic prosecution on the part of the Government, to carry the Scientific investigations which have been so fitfully carried on, during the past Six hundred years, and which, since 1845 have been pursued so industriously and successfully.

Although Smoke, Smell and Noise, are Nuisances and injurious to Health, within the meaning of the Public Health Act, yet the Law as at present administered, seems fitting inadequate to express the Sanitary Evils it is intended to destroy.

Local Authorities, as a rule, are indolent or remiss in regard to the great hygienic laws which ought to govern every well cared for district. They are too much under the influence of the Manufacturers, who create these Nuisances, to take the unpopular course of prosecuting; and though the inhabitants of an affected locality are permitted to institute legal proceedings,

few of them are really independent enough of the trades in the district in which they live, to adopt such a course. The result is, that nuisances of the kind referred to, are allowed to exist for a lengthened period.

With the powers that be, there is often the feeling that legal proceedings against the authors of such nuisances would be an undue interference with the liberty of the subject, or the rights of property and vested interests. This stalking-horse of the liberty of the subject has been brought forward to the front, in every evil, danger or abuse the law has ever sought to put an end to. It is a well known fact however, that the very foundations of society and liberty, as distinct from the license to injure others, is the relinquishment of many individual rights for the common weal. The force of this, is indeed fully exemplified by the many re-

strictions

-Stuctions under which man is placed, both as regards the Construction of his walls and his Sewers, and in respect of infectious diseases occurring in his household, as well as those matters, which do less affect his neighbours than himself.

So long as the health or life of one individual alone is concerned - as in diseases which are neither infectious nor Contagious - each one may claim some large discretionary right to determine whether either the one or the other be worth preserving, and to repose in the State or others, the power of deciding. So, though a man can hardly be prevented from poisoning himself by an excessive production of Smoke, if he chooses to allow his chimneys & smoke downwards into his own apartments, he can have no right, either legally or morally, to poison the atmosphere inhaled by those who have the misfortune

to her in close proximity to them,
endangering their health & life,
and interfering thus with the interests
of the Community.

Probably, as our technical and
Scientific knowledge advances along-
side of our industrial progress,
Self interest will do more to check
these evils than any Compulsory
legislation can effect.

Already some manufacturers are
beginning to realise the force of Scientific
Conclusions; and, acting upon knowledge
thus gained, conduct their several trades
without any or but little production of
Smoke, with great profit to themselves
and Comfort to their neighbours.

It is authentically reported that
"the whole of Messrs Minton's great pottery
& porcelain works are being Con-
ducted practically without Smoke, and
with a saving in fuel and Labour
amounting together to about 40
per Cent: a careful account of about
5000 firings, under the new system

Shewing a saving of about 20 000 tons of Coals of the value of upwards of £10 000, and in addition to this, there is a saving in wages, and a better production of work.

Again the same report says that Messrs Hanbury, Brewer, who conducted the operation of their business smokelessly, save by that means in the cost of Coal £2666 annually. This surely points to an immense loss of heating material. The question arises What does become of it? This we shall see by & by.

Coal is often a very complex substance; but putting aside its accidental and adventitious ingredients, Carbon, Hydrogen, Nitrogen & Oxygen may be regarded as its ordinary and essential Constituents; indeed for all practical purposes it may be regarded as composed exclusively of Carbon & Hydrogen.

The Combustible Constituents of Coal, in passing through the furnace and flues of a boiler, are converted into:-

1. Steam — highly rarified, invisible and incombustible

2. Carbonic Acid — invisible + incombustible

3. Carbonic Oxide — invisible but combustible

4. Smoke — visible, partly combustible + partly incombustible -

Whenever, during combustion, portions of the constituent elements of Coal gas — Carbon + Hydrogen — fail to combine with the oxygen of Oxygen to convert them into Steam and Carbonic Acid, Smoke is formed.

Oxygen forms one fifth of the volume of air. It will therefore require five volumes of air to produce One volume of Oxygen. But Coal gas requires two volumes of Oxygen as its Saturating Equivalent; therefore, for the same purpose ten volumes of air are necessary to provide these two volumes of Oxygen. Should therefore, sufficient air be introduced (viz ten times the Saturating Equivalent of the Coal gas consumed) then the Hydrogen takes up its Equivalent of

Oxygen to form Steam, and the Carbon to equivalent of oxygen to form Carbonic acid - In this case, perfect Combustion would ensue, and no Smoke formed. These Substances would constitute moisture and incombustible gases and vapours and would therefore escape from the Chimney-top and blend with the atmosphere without being perceived; and, which is of more importance, without its being deleterious. But it unfortunately happens that, from the manner in which Coal is burnt to Combustion is far from being perfect, and that besides the above mentioned products, inflammable gases and vapours, together with large quantities of very finely divided Carbon, constituting black or brown Smoke, are emitted forth from the Chimney Shafts, not only Contaminating the air, but also occasioning loss of fuel. For, should the Saturatory supply of air be deficient to meet the demand during Com-

bustion

of Coal, the hydrogen, possessing a greater affinity for oxygen than Carbon in the gaseous state does, would take up the oxygen and separate itself from the Carbon; and the Carbon, loosing its gaseous character, would return to its natural and elementary state of a black, pulverulent and finely divided body — the amount of which would be, of course, in proportion to the air supplied

Carbon, however, may pass off in an objectionable form otherwise than as soot. It may escape and does escape daily as Carbonic oxide. The inference from this statement must therefore be, that Combustion without smoke does not indicate perfect Combustion. But it does not follow however, that because there is no smoke, no Carbon can therefore be escaping. It is only when Carbon passes off in the form of Carbonic dioxide, that perfect Combustion has taken place.

Carbon in the shape of Carbonic oxide

is lost in the following manner:- The air, on entering the furnace, is at once seized upon by the glowing fuel, absorbing its oxygen and forming Carbonic Acid, thus generating much heat. This Carbonic Acid, now at a very high temperature, has to pass upwards through a body of incandescent Carbonaceous matter, and in doing so, takes up an additional portion of the Carbon and becomes Carbonic Oxide.

In this manner not only is heat lost, but also the portion of Carbon taken up during the conversion of Carbonic Acid into Carbonic Oxide. Hence, instead of one portion of Carbon (CO_2) escaping, two portions (CO) escape. And, therefore, it has done but half the duty it was capable of as a fuel, as compared with the more highly oxidized condition of Carbonic Acid. Thus proving that the loss of duty on the part of Coal, taken as a whole, might easily

be upwards of 40 per cent, as demonstrated by Mr. D. K. Clark.

Smoke moreover, is as readily produced by a supply of air larger than is requisite for perfect Combustion as it is by a deficiency of air. In the latter, Oxygen is deficient for Completely Saturating Equivalents. In the former a lowering of temperature results, and as a sequence of this, the non-union of the various Constituents with Oxygen. Smoke would thus be formed.

The same thing is observed during and shortly after feeding a briskly-burning fire. By this operation the temperature is lowered by the Coal absorbing the heat of the furnace during the process of its own Volatalization. The Carbon, (as in the case of Excessive supply of air), escapes half burnt. This, of Course, means imperfect Combustion + therefore Smoke.

The Combustible gases and Vapours

generated by the action of heat on Coal, in order to perfect Combustion, must be mixed with air, so that by virtue of a due supply of Oxygen, they may be made to burn with flame, and become entirely converted into incombustible and transparent invisible Vapours and Gases, instead of being, as they now are, only partially burned, their Carbon being precipitated and escaping together with the other imperfectly Consumed matter into the air. This can only be accomplished by (1) a high temperature with air within the furnace (2) Adequate time for the operation.

Such a contrivance, experiment has proved, would save 40 per Cent in fuel and Labour, not to mention damage to property - Caused by Smoke. The 40 per Cent saving is accounted for thus:- (1) less Coal used (2) less labour in handling (3) Cost of Cartage therefor less (4) by

the imperfect Combustion of Coal the Carbon escapes & its heating value is thereby lost (5°) loss of greater heating value (than that of Carbon) of the Combustible gases in black Smoke, and (6) loss of Sensible heat which escapes unutilised, from the defective method of Conducting Combustion.

"It is urged by modern authorities that the Combustion of Smoke is not economical, because the excess of air which it is necessary to introduce through the fire to effect the Combustion of Smoke, has to be heated, and the heat so applied, more than balances that produced by the Combustion of the Smoke.

As regards actual body Smoke, the Solid Carbon in which does not exceed 1 per Cent of the amount in the fuel burnt, this view may be correct, but the Completion of the Combustion of invisible Carbon present in the gaseous products

as Carbonic Oxide or Hydrocarbons is certainly remunerative".

Nitrogen during Combustion, seems to serve no earthly purpose. It escapes uncombined, and to assist its escape, it must absorb heat. Thus it would appear that Nitrogen is, if anything, a heat absorber - But it also helps to Contaminate the air, for a portion of it Combines with the existing hydrogen and forms Ammonia.

In thus considering the interests of the manufacturer, those of the Community are steadily kept in view. The injury to health from the puff of Smoke belching from factory Chimney cannot easily be estimated in words. We have so accustomed to it all our days that we are almost apt to say that Smoke, bounded only by the Vault of Heaven, is innocuous to health. We may, perhaps, be unable to say that we ever experienced any direct inconvenience from the Smoke of factories; and we have

So much of vital organs and the evil effects of any injury to them, that we are in danger of disregarding as unimportant all minor deviations. Yet from these often spring the beginnings of severe maladies.

It is true that, during life, the body as a whole and the several structures which compose it, possess such a power of resistance, that exposure to noxious agents of various kinds does not produce any sudden and striking mischief, neither does it always or usually result in the manifestation of disease. It does not follow that because pain or discomfort is not always experienced in a vitiated atmosphere, no harm has been done. The effects may be slowly and imperceptibly cumulative, but they are none the less injurious, may rather on that account, may act as potent and widespread predisposing causes of disease.

Producing disturbance of the System, a vitiated air sooner or later undermines

health and Strength.

Carbon in forever an impalpable form, Emanations of every kind and name beyond the reach of reckoning from Manufactories, and the infinitely varied products of Natural or artificial changes therewith connected, pass into the air, on the one hand; whence, in spite of the exquisite arrangement in the pulmonary membrane, as well as for the filtration of air, they find their way into the tissues, where they become permanent lodgers; or, on the other hand, they amalgamate with the water, (which in vapor with unnatural substances has developed such an affinity for noxious matter,) & thus get into the System through the Stomach.

for their ejection,

A Saturated atmosphere condenses on the cloud of dust constantly floating about in the air — each particle of which forms a nucleus on which the vapors of the saturated atmosphere condense, and a fog is thus formed.

But- There are Hill and River fogs,
and There are Town fogs. The former
are dispelled by heat - the heat of
the noonday sun; or, should they
invade your room, by the heat
of the fire in that room. The
latter - Town fog - will not make
itself invisible however warmly
it may be heated, but- chooses
rather to- Constitute a room-fog,
& settle slowly, & soil and destroy
the furniture. When the atmosphere
is moist or nearly saturated, we have
fog; So also when the atmosphere
is moist and saturated with vapour
in a manufacturing Town, we have
the Smoke falling all round like
a finely powdered shower of black
dust.

The Smoke particles being apparently
good radiators are soon cooled and
form nuclei on which the vapour
condenses. The Smoke particles thus
become loaded with moisture, which
prevents them rising, and by sinking

into our Streets and gardens and this murky thickness is an atmosphere already repulsive to the olfactory nerve.

In a manufacturing district however, where the trades are so various as in the locality I hold in view, we are independent, so to speak, of the naturally saturated condition of the atmosphere to render the Smoke particles dense, and thus cause them to fall; for as will afterwards be shewn in this paper, Steams and gases of various kinds are conducted by all Manufacturers into their respective Chimney shafts, sufficient of themselves, to render the Smoke particles not only dense but the atmosphere poisonous. This will be referred to under the obnoxious Smell of this Thesis.

As the fact founded on Experiment, in connection with Smoke is, that air efficient for supporting healthy life must be rendered active by the presence of Ozone. The permanent

absence of Ozone from the air of a locality may therefore, be regarded as a proof that the air is adulterated air, and thus reduced in active power to purify the atmosphere and neutralize its poisons as they are generated. Experiment has proved that Ozone is rapidly destroyed by smoke and other impurities which are ever present in manufacturing districts. This is only another proof of the injurious effects of smoke, and it will no longer do for us therefore, to poison the air we breathe, under the pleasing impression that its purifying properties are inexhaustible.

If it were possible to totally prevent the evolution of Carbon in a finely divided state by perfect combustion, we have still Sulphurous Acid, Carbonic Acid & Carbonic Oxide to deal with. These gases remain in the air as plentiful as ever in spite of perfect combustion of Coal.

the Combustion of 1000 tons of Coal
with out into the air 15 tons of
Sulphur as Sulphurous Acid. Coal
in Glasgow gives off annually 3000
tons of Sulphuric Acid; and in London
the 5000,000 tons annually consumed
give off 75000 tons Sulphurous
Acid.

Dr Frankland says that "vast
aggregate quantities of Coal-tar and
paraffin oil are daily distilled into
the Atmosphere from our Manufactories,
which, Condensing upon, or attaching
themselves to, the watery Spherules of
fog or cloud, must of necessity
Coat the latter with an oily film,
which would retard the Evaporation
of the water and the consequent
Saturation of the interstitial air" and
"that the presence of liquid hydro Carbons
in a diffused Condition - resulting
from Imperfect Combustion - would
tend to Explain the frequency, per-
sistency and irritating character of
the fogs which affect our large

town, inasmuch as some of the products of destructive distillation of Coals are very irritating to the respiratory organs"

Thus it would appear, that we burn our Coal, not only at a terrific loss, but convert it into a dangerous bronchial irritant.

Dense Volumes of Smoke, constantly overhanging, act also as interceptors of Sunlight — our most potent purifying Agent of air.

Last and perhaps not least, this perpetual showering of Smut or soot in the vicinity of Factories, naturally precludes <u>Ventilation</u>. Now any circumstance that interferes with Ventilation, must certainly deteriorate health and Strength.

It may be concluded then that Smoke, by the irritating particles suspended in it, is hurtful to the respiratory organs; that the Tone of the general health is thus impaired; that the sightless and busy air

of Spirits, which Contribute so much to the Power and Gladness of Life, are thereby diminished; and that in thus Enfeebling the Vital Powers, it is a Source of danger, by rendering the body less able to resist attacks of disease. And as body Mind and Spirit are indissolubly united, the Nervous System must likewise become depressed; and thus the moral as well as the physical health is injuriously affected by this Smoke-laden Atmosphere.

Smoke alone is a Nuisance within the meaning of the Public Health Act, and injurious to health. Alone it is bad enough, but Co-Existent with Smell and Noise the Case becomes simply intolerable and should be abolished

Smell // As Smoke precludes Ventilation, it is deeply injurious to health. For the same reason, if for no other, Smell is a Nuisance and injurious to health. But there are other reasons

that determine the prejudicial effects of Smell.

In a district where the manufacture of Linoleum is the leading industry Smell is even more marked as well as more offensive than Smoke.

As Smoke, we have been used all our days, and our progress in towards Smoke as its increasing progress in relation to us, has been so insidious, that we do not, in any striking way, feel its baneful influence on health. Not so with Smell - especially such an offensive Smell as emanates from the manufacture of Linoleum.

In the manufacture of Linoleum various fases and Vapours appear to arise from substances used during the various stages of the operation

These Stages are:-

I The boiling of Linseed oil
II The Oxidation of that oil
III The preparation of the Cement and backing Composition
IV The laying on of the backing Composition

The gaseous Emanations given off by these processes are all more or less offensive and injurious to health.

I Boiling of the Linseed oil.

The fumes evolved from the boiling of Linseed oil which principally affect the senses are:-

(1) Acrolein, which is a vapour irritating to the Eyes and Nose and mucous membrane generally.

(2) Linoleic Acid which is an oily vapour but slightly soluble in water and leaving a strongly acid reaction.

These fumes escape - in fact are conducted - into the Chimney stalk and descend with the Smoke to the detriment and annoyance of the surrounding district, near and at a distance

Should the Atmosphere be heavy, the gaseous Emanations proceeding from the Chimney Stalk will descend at no great distance from the point where they are produced and

must thus be decidedly disagreable & offensive. Even under ordinary atmospheric Conditions, when they may be carried to a greater distance, and although they may be so well diluted with air as to render them inoffensive to the Senses, yet the air thus diluted, is by no means pure air.

So potent are the fumes driven off from boiling oil containing, as they do, Acetic and other acids, that it is not advisable to lead them into the boiler flue, as they speedily corrode the boiler plates. In the boiling house the fumes quickly corrode Zinc fittings. A mixture of these vapours with air in certain proportions is explosive.

This state of affairs should be obviated by the fumes being either absorbed or burnt. In burning however, we would have the usual products of Combustion, which have already been shewn to be injurious

to health, but in such a case as this, comparatively harmless as it would be odourless.

It must be left to others to say how this condition is to be remedied.

II The Oxidation of the oil.

It is chiefly these vapours from the oxidizing buildings that give rise to the nuisance complained of in the neighbourhood of Linoleum works.

During the process of Oxidation of the oil the fumes of Acrolein are so irritating as to render access difficult until they have been removed. Efficient means of ventilation must be provided. Attempts have been made to pass them through a fire; but the great bulk of air which has to be treated with them, and in a short space of time has rendered these endeavours fruitless. As in the preceding process of Oil boiling, the only remedy which has met with some partial success, is that of passing

-thews up a high stuff into the atmosphere. Thus in the immediate neighbourhood many things be deteriorated (according to condition of atmosphere) but certainly at the expense of those living at a greater distance.

The vapours given off by the oil during oxidation, have been found to injuriously affect not only textile fabrics, but also wood, iron + mortar.

During oxidation, the boiled oil gains 11 per cent in weight. The amount of oxygen absorbed therefore, must be large, and indicates the necessity of a plentiful supply of air in the oxidizing buildings.

I grant that this vapour more particularly to operatives in such buildings. Nevertheless the fact is worth notice on account of its bearings.

III The preparation of the Cement

This consists in mixing and heating the boiled oil with a certain proportion

of Resin and Kauri Gum, in a pot with a Steam jacket, for a few minutes, and pouring out the mixture into a trough upon the floor. During this Operation, an acrid irritating gas is evolved and having a powerful irritating action on the mucous membrane.

This pungent vapour consists of Acrolein which is, in this case, drawn into the Chimney Stalk, and thence into the air before the pungent gases have been absorbed (Chemically)

II Laying on of the Backing Composition.

This process gives off a decidedly sickly oily Smell, but has not any pungency in its character and may therefore be covered pretty fully by the foregoing paragraphs.

It may be said that these noxious vapours are readily diffused in the air as they are emitted from the Chimney; but it is contended

that this diluting action of the
Air is not rapid enough to obviate
the injurious effects of these noxious
gases, before they have made their
mark on the Neighbourhood.

Such Emanations are sometimes
carried a great distance before
they become so diluted as to
be inoffensive to the senses on the
one hand, or finally descend and
settle, on the other. For example,
Shale works, Six miles distant,
fill houses in this district - Should
the wind blow from that quarter -
with their abominable Smells. Not
only so, but I have frequently ob-
served the Edges of a large Lake,
in the out-skirts of this Town, bound
by a dirty oily-like film - The result
of the volatile Elements generated
by these Shale works. This is
an important fact and bearing
heavily on the diluting Power
of Air in the case of noxious
Emanations.

the Steam alone, be it little or much — irrespective of the atmosphere in a state of Saturation — which passes up the Chimney shaft with these oily Vapours, is sufficient to bring them down more readily than if they were alone.

Smell, whether offensive or the opposite, indicates atmospheric impurity, for gaseous Emanations and pure air are not, and cannot be Coexistent.

The Oxygen of the air is taken up by the odorous matter, whereby the air is thus rendered impure.

There can be no doubt but that one of the principal objects for which the sense of Smell is given us, is, to detect atmospheric impurities. All odours however may not be positively or directly deleterious to health, nor may all poisonous gases be odorous.

The nature of odorous Emanations is so little known that it is scarcely possible to give a definite account of the mode in which they produce Sensory impressions, which

in turn are transposed to the inner Code of Consciousness where they are perceived and gauged.

From the fact- that most odorous substances are volatile, or vice versâ, it may be presumed that they consist of particles of extreme minuteness dissolved in the air.

Before the odorous matter can be immediately applied to, or affect the Olfactory Nerve, they must be dissolved in the Mucus of the mucous membrane of the Nasal Cavity. Should there, -the membrane of the Olfactory Region be in an unhealthy Condition, Smell is impaired or altogether lost. The membrane may, for Example, be too dry, as in the first Stage of Catarrh, or there may be an inordinate Secretion of fluid from its surface, as in the second Stage of Catarrh, and thus prevent the necessary penetration of the Stimulating odours to the nervous filaments.

During a general holiday, or on

Sundays The Works are not in operation. Why is it that Sensation of these odours Continue after the impression of the odorous matter has ceased? Possibly because some of the odorous matter still remains in the mucus of the Nostrils.

Probably an Excessive Stimulation of the Nerves produces an Excessive Stimulation of function and a morbid flushing of the Olfactory Centre — local hyperaemia. Thus by the Continuous action of Smell, a Chronic morbid Condition of Nerve Centre must result — in fact disease.

The irritating pungent nature of the gases and vapours, already referred to, seem to affect the mucous membrane of the Olfactory region — especially in the case of those employed in the manufacture of Linoleum — pretty much after the fashion of Catarrh. Their sense of Smell becomes first impaired and then gradually lost. This

Seems Specially the case with the workmen who live on the premises, for I have heard them solemnly declare upon the Skriptures, that they never experienced any odour proceeding from their work. It has become, to be spoken, their native air. This may be so, but do they on that account breathe pure air? & does it come to pass that adulterated air is as healthful as pure air? And is it the case that because I am unconscious of breathing an impure air I am proof against its influence?

I am quite aware that odours are pleasant or offensive in a peculiar sense only. This is especially true of the lower Animals; but it is also frequently observed amongst men. Many odours thought agreeable, are to some intolerable; and the sensations derived from the same odorous substances are differently described by different persons.

As with the Eye, in case of certain colours, so with the nose, in the case of certain odours — with some it is insensible. Different men to possess different degrees of perceptive powers with regard to smell.

Cases of a bronchial character, in the vicinity of these works, have been very frequently under my care, and I have observed that when the wind blew from the direction of the patients house against the factory the patient was comparatively better. In that case we were able to open windows or door & ventilate; whereas, when these the patients suffered, and for want of fresh air, in some instances, died. This was especially observed in the case of Children. It was found that as soon as door or windows was opened for ventilation the room filled with this sickening smell, and the little one became overpowered. Its digestion was upset and for

some time it was unable to assimilate food. This, I was assured a few days ago, by a Colleague, was also his experience.

For some time past I have had under my care a patient living near one of these factories, suffering night and day from smell, loss of appetite, nausea & sickness. I sent her away from the deleterious nuisance for a period of his work. During that time she was well and in perfect health, but on her return home the old symptoms also returned. She was sent to the Country a second time, though on this occasion, the symptoms were of so serious a nature that I was apprehensive of the probable necessity of haunting, along with another Medical man, certificates for her removal to a place where she could live suitably to her.

Removal for a time from the nuisance had, however, the desired effect.

Such places really become the centres of disease not by necessity, as is commonly supposed, because the inhabitants are conscious of a "smell" but because the air they breathe is reduced in active power and poisons are being generated around them to which they are constantly exposed and upon which they fall a prey.

Deterioration of property in the neighbourhood of Linoleum Works marches apace; but the bearing of this on health, concerns only the few proprietors around, and may therefore but involve the question of the influence of mind on matter — an important factor nevertheless — and can only be included under moral responsibility rather than legal jurisdiction

Noise

Noise, like smoke is generated by every factory and workshop in this district. We hear noises of every degree of intensity.

Some are loud and acute, others grinding and irritating as in the Lincolnsmm works; Some are constant and regular, others irregular and interrupted; Some begin at certain hours and cease at certain hours; others begin at hours irregularly and cease as irregularly, thus giving rise to a sense of painful suspectancy on the one hand, or subjects the centre of audition to a series of successive shocks on the other. Each class may be fairly assumed to act as irritants to the nervous System.

Blackstone, gave as his definition of a Nuisance "Anything which worketh hurt, inconvenience or damage". Bell in his "Principles" says "Whatever is noxious or unsafe, or renders life uncomfortable to the public generally or to the neighbourhood; whatever is intolerably offensive to individuals in their dwelling houses or inconsistent with

the comfort of life whether by Stench, as the boiling of Whale blubber — by Noise, as a Smithy in an upper floor is a Nuisance".

As the nutrient and Structural development of muscle is determined by Exercise, so also is the nutrient and constructive development of the nerve centres which govern the various senses, determined by Exercise. Every impression made on the auditory nerve is transmitted to the centre of audition whether that centre take cognisance of the communication or not. And as the growth and development of a plant is determined through and by the soil in which it is planted, and as its growth and development may therefore be interrupted or prevented by & through the soil; so with the nervous system. The Centres of Captivity are determined, as to their nutrient and constructive develop-

ment

by their several accessories for food or for evil. Thus whether abnormal noises are perceived or not by the inner consciousness they irritate and disturb. Function is abnormally stimulated, giving rise to local hyperaemia - a condition which interferes with the normal nutrition & development of the Nerve Centre. Thus a continuation of such a condition generates a morbid state of structure which sooner or later passes into disease.

Loud and acute noises, such as those produced by the Steam-trumpets or Steam whistles, so largely used as Signals for summoning work people to their duties, shock and worry the Nervous System.

Grinding noises again, such as are produced by the action of Bevel wheels one upon another irritate and worry.

Such noises as are regular and constant, are perhaps more tolerable

tolerable than any other noise, but they never have a more prejudicial effect on the nervous system; for in a comparatively short time, by their continuous disturbance, an abnormal condition is substituted for the normal — and thereby a morbid growth. This condition now becomes a habit — an abnormal thought established in the nerve centre. So much so, that when the noise ceases, or the person afflicted removes from the noise, he feels as unhappy for a time without the noise as he formerly did on account of it. In such a case known then is only a condition of mental distress and unaccompanied by the nerve destroying agent.

It is well known fact that an accustomed to an eight-day clock ticking loudly in his room, readily goes to sleep in spite of the sound emitted, and that the moment the clock stops ticking, he wakens

wakens up. The reason of this is that the Stimulant whereby this morbid nutritive process has been maintained & the fetich of rhythm, has been removed, thus disturbing sleep — that sleep induced under abnormal conditions

As exercise (normal) is necessary to the healthy condition of nerve centres, so a Stimulant — that same Stimulant which has been the origo mali — is necessary for the maintainance of the habit and rhythm generated by morbid nutritive processes.

The same is true of the child accustomed to be hushed to sleep by the monotonous hum or plaintive song of its nurse. Long after it has fallen asleep the child will awake as soon as the music stops. This is a habit — and a morbid condition (rhythmical) of the nerve centre to boot. In

the Medical Journal some time ago I read of a case of proper by the attendant of a Pullman Car, Traveller every alternate night from London to Glasgow, and the next from Glasgow to London, sleeping during the day, when in Glasgow, in the Car, and when in London at his home. When at home, his sleep was broken & restless, owing, he explained, to the absence of noise to which he was accustomed.

Noises interrupted and irregular differ in their action on the Nerves, from those repeated at regular intervals, inasmuch as they do not create the dangerous rhythmical shocks already referred to. Yet they subject the nerve to successive shocks and in this manner interrupt nutrition. In addition to this the State of Expectancy set up in the brain by their irregular character is as painful as it is injurious. For

hear thus the two fold baneful effects of Noise acting in quick succession - the one arising in the inner consciousness duly producing local hyperaemia, and the other from without, interrupting normal nutrition.

Thus then Noise is beyond doubt an exciting factor in the production and determination of disease - Many organic disease - for by interrupting Nutrition it destroys Structure, & by destroying Structure it produces organic disease.

Noise is a most annoying form of Nerve irritation and a loathsome form of Vexation; a serious source of inconvenience, loss of rest and loss of health & money; and seriously prejudices the Satisfactory progress of the Sick. Notwithstanding all this, it is a form of annoyance & danger to health and life, which it is difficult to move the Law to Condemn as a Nuisance & Legal offence.

Note. In connection with the manufacture of Linoleum, one might refer to the clouds of Cork dust floating in the air to the detriment of health, but this may safely be classed with the already threadbare subject of "An Atmosphere loaded with mechanical impurities in certain Trades & Occupations" e.g. the organic dust or fluff in flax mills of which also we hear less now than enough. Seeing that much has been written of such air impurities since the time of the Italian physician Ramazzini - who first directed attention to the matter - the Subject may with much comfort to all concerned with this paper, be left off, without further discussion —