side of the heart becomes dilated, and not unfrequently valvular incompetency ensues.

In the lead mines of Cumberland, Northumberland, and Durham, the dust inhaled probably is a more important element in the production of the bronchial affections of the miners; indeed, they very generally complain of suffering from the "stour" when working in the soft-shales. The atmosphere of some of these mines is, however, apparently quite as bad as in Cornwall, though the workings are comparatively shallow; and so the men are equally subject to asthma and prostration of strength, and dyspeptic symptoms. As, however, ladders are little used, the mines being entered by day levels, or machinery being provided for access and egress, the miners appear much less liable to suffer from heart disease.

While in Cornwall, I had the opportunity of examining the body of a man who died at the age of fifty-five, and had been employed in the mines since he was thirteen or fourteen years of age. His health began to fail at about the age of fifty, and he became incapable of work at fifty-two. The left lung was emphysematous at the edges, and of a deep blue colour. The right lung was firmly adherent to the parietes, consolidated throughout, and with irregular cavities at the apex, containing a brown coloured fluid, but without anything of the nature of tubercle in any part. The lung-tissue was not found, on chemical analysis, to contain any siliceous material. The bronchial glands were enlarged, very hard, and of a deep blue colour. There was caries of the third left rib, and an abscess had formed. One suprarenal body was atrophied, so as to be reduced to little else than cellular tissue, and the other was converted into a cyst containing dark grumous fluid.

It is quite possible that some effectual mechanical means may be introduced by which the inhalation of the gritty particles by the millstone-makers may be lessened or prevented; and I have before suggested that, if the stones were worked wet, it would probably very much prevent the dust being thrown off and inhaled. I believe, however, that the most effectual relief would be gained by not allowing young persons to be brought up to the trade; and by only employing men who have attained their full growth. I have also long thought that a similar rule, as regards the metalliferous miners, would go far to lessen the amount of sickness and invaliding among them. In some of the mines, as those of the London Lead Company in the North of England, boys are not allowed to work underground before the age of sixteen, and only for three or four months during winter between that age and eighteen to nineteen; and the evidence of the resident medical men was conclusive as to the young people, so gradually seasoned to the work, suffering much less than those who commence to go under ground at earlier ages.

I do not know that the condition of the lungs has been carefully investigated in the chest-affections of the northern lead-miners; and cannot say whether, in their case, the gritty particles are commonly found in the lungs; but it is most probable that such is the case, as the workings are stated to be often extremely dusty.

DISEASES INCIDENT TO THE MANUFACTURE OF POTTERY.*

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AT the solicitation of the worthy President of this Section, I have put together some brief observations on the principal diseases incident to the manufacture of pottery, as a contribution to the series of essays which he has so very wisely sought to lay before the members of the British Medical Association, illustrative of the maladies attributable to the chief manufacturing processes carried on in this country.

Having on several previous occasions written on the same subject, it will be difficult to avoid repetition in the observations now submitted, for the materials constituting the basis for observation remain the same, and are in themselves necessarily limited.

The observations upon which the remarks and conclusions in this paper are based are written notes of 815 cases of disease occurring among those engaged in the various processes of the manufacture of earthenware and china, who came under my notice as out-patients of the North Staffordshire Infirmary.

This infirmary is, as you may know, the great medical institution for North Staffordshire, but, by its locality in Stoke, is pre-eminently the medical institution of the Pottery towns, containing a population of 120,000 individuals, of whom a very considerable proportion—just

about one-sixth—are engaged in the pottery manufacture; consequently the infirmary affords, by its very large out-patient department, as well as by its in-patient accommodation—amounting to 180 beds, most ample opportunities for observing the diseases prevalent among the artisans of the neighbourhood.

So much for the field of observation afforded me. It is further necessary for you to know something of the processes of the manufacture in question, so as to apprehend in some degree the mode in which those processes prove detrimental to health.

As a rough classification, they are divisible into the clay and finishing departments. The clay department comprehends all those processes concerned in the preparation of the clay for use, and in the moulding of the clay into the various objects, ornamental and useful, which we all know under the terms "earthenware and china". The finishing department comprises all processes employed in giving the glazed surface to the ware, and in ornamenting the surface with colours and gold. The firing of the ware in the ovens and the placing of it in the special boxes, technically called "saggars", made of coarse clay, wherein it is submitted to the fire and protected from smoke and other injury, may be regarded as intermediate processes. So perhaps might the "dipping" of the ware—that is, the covering of it with the glaze—be deemed an intermediate process; whilst, again, the "sorting" of the ware after it is withdrawn from the oven may be represented as a supplementary operation, neither appertaining rightly to the clay nor to the finishing department. Now, without puzzling my hearers with details and technical words, I may state that the working in the clay and the "dipping" of the ware are the divisions of labour most inimical to health.

The so-called clay is obtained from Cornwall and Dorsetshire, and is very rich in silica, consisting largely of decomposed granite. And, besides clay, more or less ground flint is used, especially in the making of china. In the manipulation of the clay in the processes called "throwing", "pressing", and "turning", and, in a considerable measure, by reason of the heat in the workshops, more or less dust is thrown off and diffused through the atmosphere. Hence it happens that the operatives in the shops are exposed to the inhalation of dust, consisting of mineral matters, silica, and alumina.

Again, the "dipping" consists in immersing the ware for a second or two, by means of the hands of the workmen, in the glaze, a thick liquid compound containing a large proportion of lead blended with borax and other matters. In this proceeding, therefore, there is exposure to the absorption of lead through the skin; but my belief is, that the poison is chiefly introduced into the system through the lungs by inhalation of the dust; for the glazed dries upon the surface of the ware almost immediately, and you will find the clothes of the workers and all surrounding objects in the workshop dusted over with a white dust, which is the same as saying that the surrounding air is more or less charged with the dust from the poisonous glaze. Men are employed in this work of "dipping", but are assisted by women or lads, who take the ware, when dipped, from the hands of the dipper, remove any excess of glaze from the surface, and put it aside to finish drying. But, with this process, the mischievous contact with the lead-solution does not cease, for another class of workmen are next in order called upon to handle the ware covered by its film of glaze, and to "place" it, or carefully dispose it in the earthen vessels—the saggars—in which it is to be fired. Hence it is that placers suffer equally with dippers from lead-disease. There are yet other processes in which lead is used; viz., where it is mixed with colours and dusted on the surface in a dry state, the process of "ground-laying", and where it is mixed with colour in a moist state and laid on by pencils in the colouring of the ware known as majolica.

The finishing branches of the trade are those of printing, painting, gilding, and burnishing; but these in themselves offer no source of disease other than what is represented by sedentary labour and exposure to hot, and too frequently ill-ventilated and overcrowded workshops. I need, however, mention a subsidiary branch of labour known as scouring, carried on by women, and consisting in the cleaning of china after it is drawn from the oven from the flint dust with which it has been covered. This unhappily is a very health-destroying proceeding, by reason of the dust given off in it, and its copious inhalation.

After this bare outline of the processes of pottery manufacture, you will not be surprised to learn that lung-disease, caused by the inhalation of mineral dust, is exceedingly prevalent among potters, and very destructive of life, killing them off, indeed, at an early age. From statistics I have worked out, I find that, whereas among the males of the population not engaged in the making of pottery the proportion of sufferers with bronchitis equalled 18 per cent., that of potters was a shade higher than 36 per cent.; and that, with regard to phthisis, whilst the proportion among the former was 13 per cent., it rose among the latter to 20 per cent. Now, it is the male workers who are espe-

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cially exposed to the inhalation of dust from the clay in its manipulation, and we perhaps get a better apprehension of the effects of such inhalation from the statistics relatively to men and women engaged in the manufactories. For instance, we find that women engaged in fictile works furnished only 7.14 per cent. of the cases under notice, as against 36.57 per cent. of male potters so employed.

To turn now to the statistics of lead-disease among potters, male and female, I find that, among the 815 out-patients, as many as 68 suffered in one way and another from the baneful effects of the poison. In other words, one patient out of every twelve engaged in pottery manufacture suffered more or less severely from the poisonous effects in lead. This proportion is higher, indeed, than I should have stated had I been asked what it was; but the memoranda of the cases in my possession leave no doubt about the matter. The proportion is the more remarkable, inasmuch as the number of operatives brought into contact with lead constitute but a small percentage of the whole number of workers engaged in the pottery manufacture.

I must now say something about the disease induced among potters by the inhalation of dust. The special malady so induced is a chronic and incurable form of bronchitis, resembling in all its intrinsic features the bronchitis consequent on the inhalation of all mineral and of some organic dusts; resembling, that is, the "grinder's rot" of Sheffield, the miners' consumption of coal-getting districts, the consumption of dressers of stone, or that of the mother-of-pearl workers.

It is a form of bronchitis ever advancing from bad to worse while the workman continues at his calling. Pathologically, it is a fibrosis of the lung-tissue, consequent on the direct irritation of the gritty dust upon the mucous membrane of the smaller bronchi. Its minute features I have already described in a paper published in the *British and Foreign Medico-Chirurgical Review* for 1875, to which, in the absence of time to again depict them, I must on the present occasion refer my hearers. Its symptoms are distressing cough and severe dyspnoea, and, as frequent concomitants, heart-disease and dropsy. The marked dyspnoea causes it to be called potters' asthma, whilst the wasting accompanying it has given rise to the name potters' consumption. In fact, in many cases, the line of demarcation between this chronic bronchitis and tubercular consumption is difficult of recognition, and, in a large proportion of cases, tubercular disease is associated with it.

A few words with respect to lead-poisoning. This is witnessed in every variety of form and gravity, from mere general malaise and nerve-tremor and dyspepsia to more or less complete paralysis affecting one or more limbs, or even the whole body. Colic is the most frequent result, and is noted as the principal morbid feature in sixteen of the sixty-eight cases where lead was the morbid agent. Gastric and intestinal derangements, where colicky pain was not prominent, were found in fourteen instances. Paralysis of the hands and arms occurred in thirteen, hemiplegia and paraplegia severally in three, and paralysis of both upper and lower extremities in four cases. In not a few patients neuralgia was a leading symptom, affecting sometimes the aspects of rheumatism. Moreover, two of the sixty-eight patients were epileptic.

Usually I find colic to be the initiatory symptom of the lead-poisoning; but it is not by any means universally accompanied by constipation. It is also often intermittent between attacks of paralysis. The renal affection, with albuminuria, which some pathologists insist upon as a common resultant of lead-poisoning, has very seldom indeed fallen under my observation, although I have carefully looked for it. Affection of the sight, amounting to actual blindness in rare instances, is of common occurrence; and, among the women, menstrual disorder, miscarriages, and confinements with puny children, unable to survive, are events of considerable frequency, attributable to the operation of the same mineral poison.

A word, in conclusion, relative to the maladies prevailing among the workpeople, chiefly women, engaged in the "finishing" departments. These are such as are credited to working in hot, ill-ventilated, and too crowded shops, and in constrained and fixed positions, and also to sedentary work. The women suffer with delayed and disordered menstruation, especially with amenorrhoea and its concomitants anæmia and gastric disorders, and also with pulmonary consumption. Epilepsy is a very common malady among both men and women, and chorea even a more frequent one among the girls and children. Gout also prevails largely in the female population, making its appearance at or soon after puberty; but it is not unknown, though uncommon, among the males.

The time at my disposal is too short to give you other than a very rude outline of the subject I have taken in hand; but the matter presented to you may suffice to enable you to form some conception of the sanitary, or rather insanitary, conditions under which the pottery artisans labour, and of the maladies thereto attributable. As a matter of

course, I have said nothing about the hygienic or sanitary measures calculated to lessen or remove those unfavourable conditions, deeming this topic, even had time allowed me, beyond the scope of a paper read before this Section of Medicine.

ON THE OCCURRENCE OF PHTHISIS AMONG GRANITE-MASONS.*

By R. BEVERIDGE, M.D., Aberdeen,
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FROM the similarity in several points between the working of granite and other trades known to be unhealthy, I was led, some years ago, to inquire into the sanitary condition of the granite masons in this neighbourhood; but the results obtained were mainly negative. The repeated occurrence, however, of late years of phthisis among masons, as brought under my notice in hospital practice, induced me to look into the subject again, with the following result:—That the granite masons were formerly a very healthy body of men, little subject to phthisis; but that, of late years, although they are still fairly healthy, yet phthisis is much more prevalent among them than it was. The following figures will make this apparent. As I desire to compare the past fifteen years or thereabout with a period prior to 1850—before the Registration Act was in force—a reference to the Registrar's returns of deaths will not avail for my purpose; and I, therefore, take the admissions into hospital as the most reliable source of evidence for the purpose of comparison. These admissions do not, of course, give the total number of cases in town, but a comparison of the ratio of phthisis to other diseases among the masons admitted to hospital will give a very fair approximation to the prevalence or otherwise of that disease at different times. For a reason that will be apparent immediately, I select the ten years 1839 to 1848, inclusive, as representing the former condition of the trade, and, during that period, the ratio of phthisis to other diseases among the masons admitted was as 1 to 77½. The ten years succeeding to the period named must be held as exceptional among the working population of Aberdeen, for this reason. The financial crisis of 1847-48 fell with very great severity on Aberdeen, paralysing its industries to such an extent, that the working population shortly began to leave the town in considerable numbers, and continued to do so for several years. So long, in fact, did the depression continue, that the census of 1861 showed but a trifling increase over that of 1851: an increase not equal to the natural increment by excess of births over deaths. The ten years, therefore, 1849 to 1858, I leave out of account, as the condition of the working classes then was such as to make it unsafe to draw any conclusion as to their sanitary state. During the next decade, 1859 to 1868, the ratio of phthisis to other diseases among the masons admitted to hospital was as 1 to 26, or about three times the proportion already quoted. In the succeeding seven years, 1869-75, the same ratio is maintained, with this circumstance in addition, that the total number for these seven years is as large as for the previous ten. This naturally raises the question, Is this increase exceptional in this trade, or is it but the expression of a general increase dependent on the increase of the population, or a defective sanitary condition of the town at large? This question I answer from two sources: 1. The total hospital admissions of phthisis; 2. The Registrar's returns of deaths from phthisis. In stating these, I take an average of years; for it is obviously unfair in such a disease as phthisis, which varies to a certain extent, both in incidence and in mortality, according to the seasons, to take any single year as a guide. For the ten years 1859-68, the average annual admissions of phthisis cases was 73, and for the seven years 1869-75, the average was 70. Phthisis, therefore, throughout the town was, to say the least, not on the increase. The Registrar's returns of deaths from phthisis shows the same result. For the seven years of which 1861 was the centre, the average annual mortality from phthisis was 228, or one in every 323.7 of the population; while, in the seven years of which 1871 is the centre, the average was 229, or one in every 354.8 of the population. It appears, therefore, that, throughout the town generally, the total number of cases of phthisis is not on the increase, although the population is rapidly rising; or, in other words, that the proportion of phthisis to the population at large is on the decrease, while, among the granite-masons, it is on the increase. The same result may be brought out another way. If we compare the number of masons admitted labouring under phthisis with the total admissions into hospital of cases labouring under the same disease, the following result appears. From

* Read before the Medical Section at the Annual Meeting of the British Medical Association in Sheffield, August 1876.