

process of crystallisation, and so give rise to the effect noticed above, but the figures recorded by Tammann are striking and suggestive.

In this hurried review of a large field it may seem that I have presented rather our ignorance than our knowledge, my intention having been to show how much remains to be done before we can understand the chemical relations of solids as we do those of liquids and gases. One department of research is, however, more advanced than might have been supposed from my brief references to it. That is the study of the internal changes in metallic alloys as revealed by the microscope and by thermal and electrical methods. Metallography has made wonderful progress since the days of Sorby, and it would repay students of physical chemistry to give some attention to its main results, even though they may not intend to make a special study of the subject. Nowhere are the benefits of the doctrine of phases of Willard Gibbs to be more clearly traced, whilst the recognition of every change of phase by microscopical examination, making use of a tech-

nique which has been brought to a high state of perfection, gives concrete reality to the study by direct verification of its conclusions.

To understand more thoroughly the mechanism of these changes in alloys and to extend its application to salts, minerals, and rocks, we need a fuller knowledge of the relation between crystal structure and chemical behaviour. Research on the mechanical side is discovering the direction of planes of slip in the atomic space lattice under stress, and it remains to determine the corresponding planes of greatest and least chemical activity towards a given reagent. Next follows the still unsolved query as to the nature of the inter-crystalline boundary, and the solution of these two problems will make it possible to define exactly the chemical character of a given aggregate of crystals. The results will be of extreme interest for the study of metallurgy, of mineralogy, and of petrology, besides filling a serious gap in chemistry, serious because of the extent to which solids compose the world around us, and of the part which they play in our daily life.

The Meaning of Wages.¹

By Miss LYNDA GRIER.

IT is as little within my intention as it is within my power to put forward a theory of wages. My business is one of analysis, not of construction, of re-statement, not of creation. My purpose is twofold: first, to discuss certain aspects of wages, and then to review from those aspects certain payments made to or on behalf of employees.

Let us then consider three aspects of wages, each important in its way. First, there is the distributive or competitive aspect, from which wages are regarded as a factor determining where labour shall go, who shall command it, in what manner labour of certain types and given efficiency shall be employed. Competition between employers seeking the best workers is expressed in the wage they offer, and competition between workers seeking the best employer is expressed in the wage they accept. This competition tends to bring the wages of workers of equal efficiency to equality and to ensure that the wages of workers of unequal efficiency shall be unequal.

Taken alone, this idea of wages treats of the supply of labour as being fixed independently of the wage, and of the wage as powerful only in directing the available supply. It is therefore a short-period consideration, dealing with market price rather than normal value; as in all short-period considerations, stress is laid on the quantitative side, on the notion of value falling with an increase in the supply of labour and rising with a limitation of supply.

Secondly, there is the idea of wage payment which treats of work and wages as completely interdependent, since the product of each worker constitutes his payment. The product of each worker, represented by his wage, makes an effective demand for the produce of other workers. His addition to wealth is his claim upon it. Numbers are important only if with alteration in numbers there are consequent alterations in

productive power per head, or if the proportions between the different types of labour required be ill-adjusted.

Finally, we may take the aspect of wage payments which is concerned with their effect on work and on the supply of workers, the wage being regarded as something that maintains the worker.

These three aspects of wages are not antagonistic. It is clear from the outset that there is no contradiction between the first two, between that from which they are regarded as a distributive force and that from which they are regarded as the actual product of the wage-earner. The idea that the worker produces so much wealth and that his work is paid in proportion to the wealth he produces is, indeed, associated with the idea that the demand for and supply of such labour as he has to offer determines its value. Wages so determined are known as "fair" or "normal": fair in that they are equal to those of other workers of similar capacity, normal in that they are the wages that tend to be paid under conditions of free competition.

Each worker on this reckoning tends to get what his work is worth. It may be worth little. This admission does not apply only to bad workers. It certainly does apply to them, whether the badness of their work be due to bad character, bad health, or bad mental equipment. But the question is one not only of efficiency but also of the type of ability and of the number of other workers possessed of that particular type. Work which is not entirely unskilled may be ill-paid if the numbers competent to do it are great. This is, perhaps, especially the case with women's work.

For the most part, earnings are low in occupations that offer no special attractions and are filled by workers who, thanks to heredity, or sex, or environment, have little chance of entering others. The able man or woman has not only the fun of being clever, but also the advantage of high earnings through belonging to a grade in which the numbers are relatively small.

¹ From the presidential address delivered at Southampton on August 28 before Section F (Economic Science and Statistics) of the British Association.

It is, perhaps, unfortunate that wages which reflect the value of the work done should be known as fair wages. It has already been stated that they are known as fair because they are equal, if mobility is perfect and competition free, to those of other workers of equal capacity and doing work offering equal attractions. It is the equality that has led to the epithet "fair." But it is a not very convincing fairness to the man receiving a low wage whose work is worth little through no fault of his own. For when the demand price sufficient to absorb all the workers in a given grade is small or, in more technical language, when the marginal net productivity of such workers is low, when the workers in that grade are neither bad nor careless, other members of the community gain by cheap goods as the workers lose in low pay.

Plenty is generally an advantage to the community. We rejoice if land is plentiful in proportion to the population and rents are low. We should like capital to be plentiful and cheap, competing for employment at a low rate of interest. We are aware also that the owner of a limited supply of a commodity that becomes plentiful loses wealth as the consumer gains it. It is one of the anomalies of economic measurement that when a country becomes richer through an increased supply of certain goods, wealth as represented by those goods may be calculated as being less than before, because of the lowering of this exchange value.

The owner of anything other than labour may be compensated, or more than compensated, by the greater amount he possesses. Not so the worker. Each worker is lord only of his own labour. Recognition of this leads to limitation of output. There are, roughly, two ways in which men may increase their own wealth: by increasing or by decreasing production. Adult workers who have their youth and their training behind them have little power of doing the first, and fall back on the second. Through limiting output, erecting barriers against new-comers into their trades, they may successfully maintain or raise their own wages. From this point of view the objection of men to opening to women any new branch of industry is perfectly logical. If women be found capable of doing work formerly reserved for men, and are allowed to do it without let or hindrance, they will tend to have a depressing effect on the wage; not because of their sex, but because of their number. Their exclusion from many trades makes their entry to any single trade formidable; they are jealously excluded from one type of work because they are jealously excluded from others; thus they come to be considered natural blacklegs.

It is not profitable to pursue this subject further, however, without discussing the third aspect of wages, and considering not merely the wage that a man is worth but also the wage that he needs. Wages, in addition to directing labour and being a return of goods and services to labour in exchange for the goods and services it supplies, are expected to maintain the worker. The owner of labour alone among owners of any agent of production is supposed to live on the product of the thing he owns. The economic fact that to a great extent he does so has been exalted, like many other economic facts, into a moral obligation; and when the normal wage is low without any discernible fault on the part of those who earn it, the moral obliga-

tion is shifted and it is said that the wage ought to be large enough for the worker to live on.

It being assumed that the worker lives on his wage, we concern ourselves greatly with the question of how far wages do or can be made to respond to needs. We are challenged daily, by proposals for minimum wage rates, cost of living standards, family allowances, contributory insurance schemes, to consider the connexion between the normal wage and a wage adjusted to the needs of the worker. The question is a complicated one.

It is far easier to see the connexion between the wage and "training and sustaining" the worker's energy than between the wage and the cost of rearing the worker. If labour be not adequately sustained during the period for which the worker is engaged the product will suffer. Diminution in the number of workers available, or in efficiency, or both, follow swiftly on lack of sustenance. Further, the wage must bear some relation to the cost of training, since so long as there are occupations which demand no training, or less training than others, those needing most will lack recruits if the earnings they offer are not relatively high.

The cost of rearing the worker raises different questions. It is clear that the individual worker does not pay for his own childhood; no bill of the cost is presented to him when he begins to work. It is equally clear that the childhood of most wage-earners is paid for from wages; part, and a considerable part, of the wage of many workers is devoted to the maintenance of their children. It may be said crudely, therefore, that unless wages cover the cost of rearing workers, there will be no workers. It cannot, however, be asserted that because a worker pays certain expenses from his wages those expenses are the cause of his wage, or of any part of it.

There is a tendency to assume that, while the efficient sustenance of labour during working days and hours is a prime cost of industry to be covered by the wage, sustenance in non-working days and hours, in sickness, during unemployment, in old age, and the maintenance of wife and children not only during but also after a man's working life, is a kind of supplementary cost for which provision should be made in respect of work done. This presupposes a vast amount of calculation both on the side of the employer and the employee.

First let us take the employee, as being the party to any wage contract most likely to reckon such costs. Here, roughly, we find workers divided into the calculating and non-calculating classes, those who expect security and those who do not: an expectation which probably makes a far sharper class distinction than that made by riches and poverty.

Arrangements for contributory insurance schemes have long been common in the professions. Contributory insurance schemes for the provision of pensions have, with the exception of some of the less exalted branches of the Civil Service, in the past been made compulsory among those classes who before their introduction attempted to make similar provision voluntarily. The same classes have perhaps more than others calculated the number of children whom their earnings would maintain. The fertility statistics of the last census show that the professional classes, who are very largely the calculating classes, have a

lower fertility rate than any other occupied section of the community: 0.90 being the average number of children under sixteen for married men in the professional classes as compared with 1.27 among all married men. These classes who calculate the future are but a small section of the community.

For most earners the exigencies of present maintenance exclude considerations of future maintenance. With dependents the case is somewhat different; more and more every class of the community tends to consider the possibility of making good provision for its children, and more and more do the parents of every class recognise that they can provide for their own needs by limiting the size of their families.

The effect on earnings of calculations made by the worker, either for his own future and that of his dependents or for the present needs of his dependents, is not easy to trace. A stimulus to activity which in effect raises the wage-earner to a higher grade, increasing his productivity and general wealth, makes him worth a higher wage. A limitation of numbers is slow in its action on supply, and, since it cannot be assumed that each grade or occupation is entirely self-recruiting, no positive result can be ascribed to it, except in so far as it is thought that a general increase or decrease of population is likely to cause a general rise or fall in wages.

Let us now turn to the question of how far such calculations affect the employer, purely from the business point of view. Employers have not reckoned the whole of the worker's life or maintenance of his dependents as an overhead charge. They do not pay adult male employees at a high rate because they have families dependent on them or because they must make provision for the future, but because their productivity is relatively high and because they are strong and experienced workers. They do not gravely reckon the average family of an average worker: they reckon what the man's work is worth.

Nor do the needs of the worker provide him directly with additional bargaining power. It has generally been recognised in foreign trade that needs are a weakness and not a strength in bargaining. It is the same with the worker. So far as fighting strength goes, bachelors who are without dependents can fight more effectively than men with families. The mere acquisition of a new set of needs, unless it stimulates activities and so is part of a higher standard of life, adds to misery and not to wages. To a certain extent it is notorious that dependents do stimulate activity, married workers being generally steadier and more regular than unmarried ones. Their higher productivity raises their earnings. But it is to be feared that bargaining power is in no way enhanced by the number of dependents, and every one present will call to mind cases of men who dare run no risk of losing their job because of their wives and children.

In view of this, we may think it fortunate that the workers who get low wages so often have few needs. Young untrained workers whose productivity is low have no dependents. They have often, in fact, just ceased from being dependents themselves and become contributors to the family wage. If women are crowded into a somewhat small number of occupations with low rates of pay, it is some comfort to remember that they

have comparatively few dependents to suffer from those low rates.

If we agree that the normal wage in some cases rises above and in many falls below the wage required by the worker for his maintenance in the future as well as the present, and for the maintenance of his wife and family in both the present and future, what should be our attitude towards the many persons and bodies who are concerned with raising the wage rate, with charging provision for unemployment and the future on to wages, and with readjusting wage rates? It is clear that we cannot expect the approximation of normal wages to wages adequate for such maintenance to be the main preoccupation of social reformers or statesmen.

Measures concerned with wages may be put into three categories roughly coinciding with the three aspects of wages with which we began. First, there are those which are concerned with the mobility of labour, with seeing that labour is as swiftly as possible directed where it is most needed, by the dissemination of knowledge, by facilities for movement such as are offered by the employment exchanges, by vocational selection, by the efforts of trade unions to ensure that in every instance the rate received shall be at least the normal rate. Secondly, there are those which attempt to increase the productivity of the worker and raise him from one grade to another; such as measures of educational reform, improved social conditions, even, when wages are very low, minimum wage rates, which by improving the health of the worker increase his productive capacity. Thirdly, there are measures which attempt something further and try either to add to the normal wage rate or to "stretch" the rate so that it will pay for things that it did not previously pay for.

I do not propose to discuss the first two categories; their value is obvious. We are being forced, however, increasingly to discuss the third category. It includes schemes for fixing such minimum wage rates as do not increase productivity; cost of living standards when they attempt something other than the maintenance of the normal wage; schemes for subsidising certain sections of wage-earners, such as systems of family allowances; and schemes for stretching normal wages to cover certain costs, such as compulsory insurance schemes.

Where these schemes ensure a given rate of wages their advocates desire that it should be secured without unemployment ensuing. Where, as in compulsory and contributory insurance schemes, a charge is levied on employer and employed, it is presumably not desired that unemployment benefit should be provided by measures which, by making labour costs high, increase unemployment, or that hypothetical widows and fatherless children should be provided for by schemes which, by reducing wages, stint actual wives and the children whose fathers are living.

Minimum wage rates may be maintained without unemployment following when, as has already been suggested, through their reaction on efficiency they increase the value of the work done, and also where the demand for the labour employed is inelastic. Trade boards have proved this. It may further be argued that, when normal wages are too low to provide adequate maintenance for all workers belonging to a given grade,

it is better to enforce a wage adequate for the maintenance of a certain number, and, having so produced a certain amount of unemployment and defined the problem, take steps to deal with the unemployment.

When the question is one not of the minimum needed for efficient sustenance but of the relative rates in different occupations, according to the degree of skill required and the customary rates for work of a given kind, the problem becomes different, as in the case of cost of living standards. There is nothing sacred about relative wage rates; they are exceedingly arbitrary as between different occupations and between different types of skill in the same occupation. Wage rates normal in the past are not normal in the present and will not be normal in the future. They are subject to infinite variations. The balance is mobile and cannot be stereotyped. It is a pointed commentary on this fact that the Cave Committee reporting on the Trade Board Acts in 1922 advised that the boards should in future confine their activities to the settlement of wages when such wages are unduly low and no other adequate machinery exists for their effective regulation.

This report and consequent legislation marked the abandonment of one attempt to legislate on relative wage rates. But if one attempt was abandoned, others remain. The minimum wage rate in the coal-mining industry is being hotly discussed, and, apart from legislative enactments, cost of living standards as a basis not for wages but for fluctuations in nominal wages are commonly enforced by trade union action. A wage which is "above the normal" is in effect a subsidy given to the worker in respect of a particular type of work. In a sense, nomenclature matters little. We tend to call anything a wage which is given by an employer to a worker, and to call anything a subsidy which is given to a worker or an industry or any one or anything else by the State, and to dub as taxes revenue collected by the State. But when we analyse payments above or below normal wages, we find that we are generally tracing their incidence and dealing with transferences of wealth rather than with costs. Sir Alfred Mond's scheme is frankly a subsidy. Nor is there in effect much disguise about the "tax and subsidy" nature of the family allowance system, Bachelors are to be taxed, or to tax themselves, for the sake of men who have families. It is recognised that it is on the whole unwise to put the administration of the "tax and subsidy" in the hands of the employer, lest he should mistake a tax and subsidy scheme for a new wage system under which it would be greatly to his advantage to employ bachelors instead of married men. Once it is frankly admitted that large families neither force nor enable employers to pay high wages, we can if we wish settle down to a discussion of the ethical and economic advantages of family endowment; and we can contrast the advantages of making provision for families within each industry separately or through a more general scheme of taxation.

From the suggestion to tax certain wage-earners for the benefit of other wage-earners we may pass to the practice of taxing wage-earners for their own benefit, as embodied in unemployment and health insurance schemes, in the various pension schemes already adopted in the Civil Service, and as proposed in the Pensions Bill. It may be said that here we are not

dealing with taxation but merely with deferred pay; that the contributions, covering as they do the workers' own risks, are a forcible method of saving, but cannot fairly be called taxation. This is perfectly true when the saving would or could be made voluntarily. But when wage-earners are too poor to save, enforced saving leaves them for the time being poorer than before, and Mr. Neville Chamberlain's hope that the Pensions Bill "would encourage people to try to add to the benefits and thus achieve complete independence for themselves" is likely to be frustrated by the reduction in their means. We are agreed that the benefits of these schemes must be secured. We are, I believe, agreed that they must be augmented. But the provision of future benefits by taxes on present wages may not be the best method of giving such benefits when wages are low. The wage may be too small to be deferred. Nor does the fact that employers pay a larger proportion when the wage is exceedingly low help those who are on the verge of unemployment and may by this arrangement be pushed over it.

It is to be feared that if normal wages be not adequate to cover calculations for the future, contributory schemes, however advantageous, may make things more difficult than before for workers belonging to a grade in which numbers are great in proportion to demand. It cannot be assumed that the demand for such labour is inelastic. In many instances it is, as when labour paid at a low rate is employed in co-operation with better-paid labour and in industries in which its cost is but a small proportion of total cost. But frequently the demand is elastic, as in agriculture, where we are constantly told that labour cannot profitably be employed even at minimum wage rates which seem to many of us less than moderate.

Contributory insurance schemes have occupied much attention lately, probably more than they deserve. The contributions demanded by each individual scheme are no great matter; even taken together they do not amount to a vast charge per worker. But, small as they are, they are of interest as being attempts to stretch the normal wage to meet the needs of maintenance when, in terms of that wage, the worker is not always worth a rate which will enable him to meet all the demands made upon him for his own immediate support and that of his family.

The normal wage is defiantly rigid. It is also brutally erratic. It will not be stretched to meet any but the most immediate needs of workers in low grades; it is capable in times of depression of falling below even that low standard. In the process of asserting itself it drives men ruthlessly from occupations for the products of which demand has fallen. The secret of its mastery lies in the fact that it offers the one price at which all labour of any given grade can be absorbed in the occupations to which it is admitted. Whatever be the rights of the coal dispute, it is true that a point may come at which any industry or any single firm in an industry may be unable to pay a living wage to all those occupied in it. The normal wage commonly offered in other occupations for the same grade of labour will only be given in such an industry when enough men have left it to make the rate even throughout the grade. In the meantime labour may suffer greatly, and the productive power of all industry may suffer, since nothing is

so destructive to a man's capacity or more likely to force him into a lower scale of labour than a prolonged spell of unemployment.

There are those who hope that in time the normal wage may in all ranks of labour be at least adequate to maintain workers and their families through all uncertainties and vicissitudes. They believe that the progress of invention will immensely increase productivity; that improved business methods on one side and rising standards of work on the other will make each worker more productive; that ultimately education will raise all workers to the ranks of those whose work is worth much. But until that Utopia arrives it is well to recognise that, except by making wages abnormal, we cannot at present expect them in all cases to do what is required of them.

It is blindness to pretend that the normal wage must necessarily provide for all needs, or that the worker is necessarily to blame if it does not. Those more fortunately placed among the workers, as well as among other classes of the community, often gain by the cheapness of the goods made by workers whose work is worth little because their numbers are great. But the community as a whole does not gain, because the workers receiving low wages are part of the community.

It is roughly true that the normal wage distributes labour well through distributing wealth ill. Redistribution of wealth is therefore necessary. Redistribution in the name of wages tends to interfere with the distribution of labour; for this reason it might be well to leave wages to mean normal wages and to redistribute wealth by other methods.

Obituary.

SIR WILLIAM SCHLICH, K.C.I.E., F.R.S.

THE death of Sir William Schlich, who succumbed to an attack of bronchitis on September 27, at eighty-five years of age, removes from the world of forestry one of its outstanding figures of the past half-century. A native of Hesse-Darmstadt, Schlich studied at the University of Giessen, taking his degree of Ph.D. in 1866. The same year he was offered and accepted a post in the Indian Forest Department, then in its infancy, and was posted to Burma, where he served as deputy conservator of forests until 1870, when he was transferred to Sind, where he remained for two years. In 1872 he was promoted to the conservatorship of Bengal, which in those days comprised the present provinces of Bengal, Assam, and Behar and Orissa. For seven years he threw himself with energy and conspicuous success into the arduous work of organising forest operations in this huge tract. After a spell of leave to Europe, followed by a short period of service as conservator of forests in the Punjab, he was appointed towards the end of 1881 to act as inspector-general of forests to the Government of India: he was confirmed in this appointment in 1883, when his predecessor, Dr. Brandis, retired from the service, and held it until 1885, when he proceeded to England to take up the post of professor of forestry in the newly created forestry branch at the Royal Indian Engineering College at Coopers Hill.

During Schlich's period of service in India, the work to be done consisted largely of preliminary organisation, and the conditions were by no means easy. In the earlier years the superior staff consisted for the most part of men without any scientific training in forestry, although by the time he left India matters had improved vastly, owing to the steady flow of British recruits trained at the Nancy Forest School in France, and to a smaller extent in Germany. These earlier years of the forest department were marked by strong opposition, not only from the timber trade and other interested parties, but also from Civil officials, many of whom regarded the conservation and national management of the forests as an uncalled-for innovation. Perhaps the most important advance which marked Schlich's term as head of the department was the creation of a special working plans branch in the office of the inspector-general of forests; this provided for the expert

scrutiny of all forest working plans before they received final sanction, thus ensuring their preparation on correct lines.

So far as his work and activities were concerned, Schlich's appointment in 1885 to the professorship of forestry at Coopers Hill marked the beginning of a new era. From that year onwards he was destined to devote himself to the teaching of forestry, and it is in this sphere of activity that he was best known to the present generation. Combining sound knowledge and judgment with an enthusiasm for his subject which was infectious, and possessing a keen sense of humour and a remarkable capacity for winning the confidence and affection of his pupils, he was the embodiment of those qualities which go to make the ideal teacher. What the British Empire owes to him may be realised from the fact that his old pupils are to be found throughout its length and breadth. Immediately prior to the War, some ninety-five per cent. of the Indian Forest Service, from the inspector-general to the latest joined assistant conservator, were old pupils of his, while at the present time there is not a single senior officer of that service who was not trained by him.

Schlich became a naturalised British subject while at Coopers Hill. His educational duties there covered a period of twenty years, during which time he was responsible primarily for the training of recruits for the Indian Forest Service, although a few forestry students of the College obtained appointments in other parts of the Empire. On the abolition of Coopers Hill in 1905, its forestry branch was transferred to Oxford. Here Schlich, although sixty-five years of age, threw himself energetically into the work of organising the school of forestry in its new home and making it worthy of the great University which had adopted it. Through the generosity of St. John's College, aided by other benefactors, a building was erected with lecture rooms and a museum. In 1911 Schlich severed his official connexion with the India Office when he retired under the Civil Service rules; he was thereupon appointed reader and, by decree of Convocation, given the status of professor of forestry. By this time the Oxford school of forestry had fully established its reputation, and had become responsible for the training of numbers of forestry students destined not only for the Indian service, but also for many other parts of the empire. Schlich's