Chicago conferences aim to remove this lack of mutual understanding and appreciation, and to pave the way for a better state of things in that strike-ridden city. The conferences are to take place on successive Sunday evenings, and are seven in number. There are four representatives of the working-men to speak: namely, George A. Schilling, on 'The Aims of the Knights of Labor;' Thomas J. Morgan, on 'The Labor Question from the Standpoint of the Socialist;' Joseph R. Buchanan, on 'A View from the Labor Sanctum;' and A. C. Cameron, on 'An American Trades-Unionist's View of the Social Question.' The business-men are allotted three representatives: Lyman J. Gage speaks on 'Banking and the Social System;' Charles L. Hutchinson, on 'Is the Board of Trade Hostile to the Interests of the Community?' and Franklin MacVeagh, on 'Socialism as a Remedy.' Miscellaneous discussion is not to be allowed at these conferences, because of its obvious dangers; but at the conclusion of each address any one in the audience is to be at liberty to question the speaker on any point, provided the question is stated respectfully. It is hoped that such questions and answers will prove an instructive and profitable feature of each meeting. We shall await with considerable interest some account of these conferences, and their success.

SCHOOL OF MECHANIC ARTS AT THE ALABAMA POLYTECHNIC INSTITUTE.

SINCE manual training as a feature of general education is exciting increased interest, we are gratified to note the advance of this important movement in industrial education in the South, and present as a matter of interest to our readers the plan of the rooms and the scheme of work of the School of Mechanic Arts at the Alabama Polytechnic Institute, Auburn, Ala. This school is under the charge of Mr. George H. Bryant, a graduate of the Massachusetts Institute of Technology.

The department of mechanic arts at the Alabama Polytechnic Institute was organized in 1885, and during the summer of that year the motive plant for the whole department, and the machinery and equipment for the wood-working shop, were purchased and erected. The former consists of a 25-horse power Harris-Corliss engine, steam for which is supplied by a 30-horse power steel, horizontal, tubular boiler, for which a substantial brick boiler-house and chimney were erected.

The wood-shop occupies one half of a room 50 × 90 feet (the lower story of one of the college-buildings), the other half being taken for the machine-shop. The equipment for this shop comprises the following: 20 double wood-working benches, each with complete set of carpenter's tools; 20 turning-lathes, 10 inches swing, each with set of tools; 1 double circular saw; 1 band saw; 1 surface planer; 1 buzz planer; 2 scroll saws (power); 1 large pattern-maker's lathe; 1 36-inch grindstone. In addition to these, the tool-room is supplied with a variety of extra hand-tools for special work.

During the summer of 1886 a substantial brick building, 32 × 72 feet, one story high, with monitor roof, was built for the forge and foundery departments. This is divided into two rooms each 35 × 30 feet, each department occupying one room.

The equipment for the foundery consists of moulding-benches for twelve students, each supplied with a complete set of moulders' tools; a 14-inch cupola with all modern improvements; a brass furnace with a melting capacity of 100 pounds of brass at a heat, with a set of crucibles, tongs, etc.; also a full supply of ladles, large and small moulding-flasks, special tools, etc.

The forge-shop equipment consists of 12 forges of new pattern, each with anvil, set of smith's tools, etc. The blast for all the forges is supplied by a Sturtevant No. 3 steel pressure-blower (which also furnishes blast for the foundery cupola); and a No. 15 Sturtevant exhauster draws the smoke from the fires, and forces it out through the chimney.

In the machine-shop are the following tools: 6 14 inches × 6 feet engine-lathes; 2 16 inches × 6 feet engine-lathes; 1 22 × 22 inches × 5 feet friction-planer; 1 15-inch shaper; 1 20-inch drill-press; 1 Universal milling-machine; 1 post-drill 15 inches; 1 corundum tool-grinder; 1 bench emery-grinder. Chipping and filing benches for twelve students, each with vise, set of files, chisels, hammers, etc., are provided, one-third of the shop being set apart for this work. In the tool-room are found a good variety of cutting and measuring tools, shop appliances, etc. The full course in mechanic arts runs through three years, as follows: —

First Year. — First term, elementary mechanical drawing (one month), carpentry; second term, carpentry, turning begun; third term, carpentry and turning alternating.

Second Year. — First term, pattern-making (six weeks), foundery-work begun, moulding and casting; second term, foundery-work finished, smithing begun in forge-room; third term, smithing.

Third Year. — First term, chipping and filing; second and third terms, machine-work in metals.

During the second year, lectures are given on moulding and casting, and the metallurgy of iron and steel, and in the third year occasional lectures on mechanical subjects connected with the shop-work.

A special course in steam and mill engineering, with practice with the apparatus, is provided for advanced students who wish to take extra or special work in practical mechanics. The average yearly attendance in this department during the past three years has been about ninety.

SOME SOCIAL AND ECONOMIC PARADOXES.[1]

The Artificial is Superior to the Natural. — Reforms are Chiefly advocated and brought about by Those who have no Personal Interest in Them. — Discontent increases with the Improvement of the Social Condition, etc.

THE progress of science has always been jeopardized by two classes of persons, who, though the exact opposite of each other, are both constantly striving to circulate specious errors under its name. One of these classes of persons seeks to induce belief in improbable things, on the ground that most now accepted truth has once been held to be improbable. The other class seeks to shake confidence in established truths on the ground that they have not yet received mathematical demonstration. On the one hand, theories which are still awaiting proof, or which lie on the extreme confines between the known and the unknown, are taught as established truths; and, on the other hand, great principles whose establishment has cost ages of most laborious research are brushed aside as if they were but visionary hypotheses. The first class judges every thing by analogy; the second confronts every thing with a paradox.

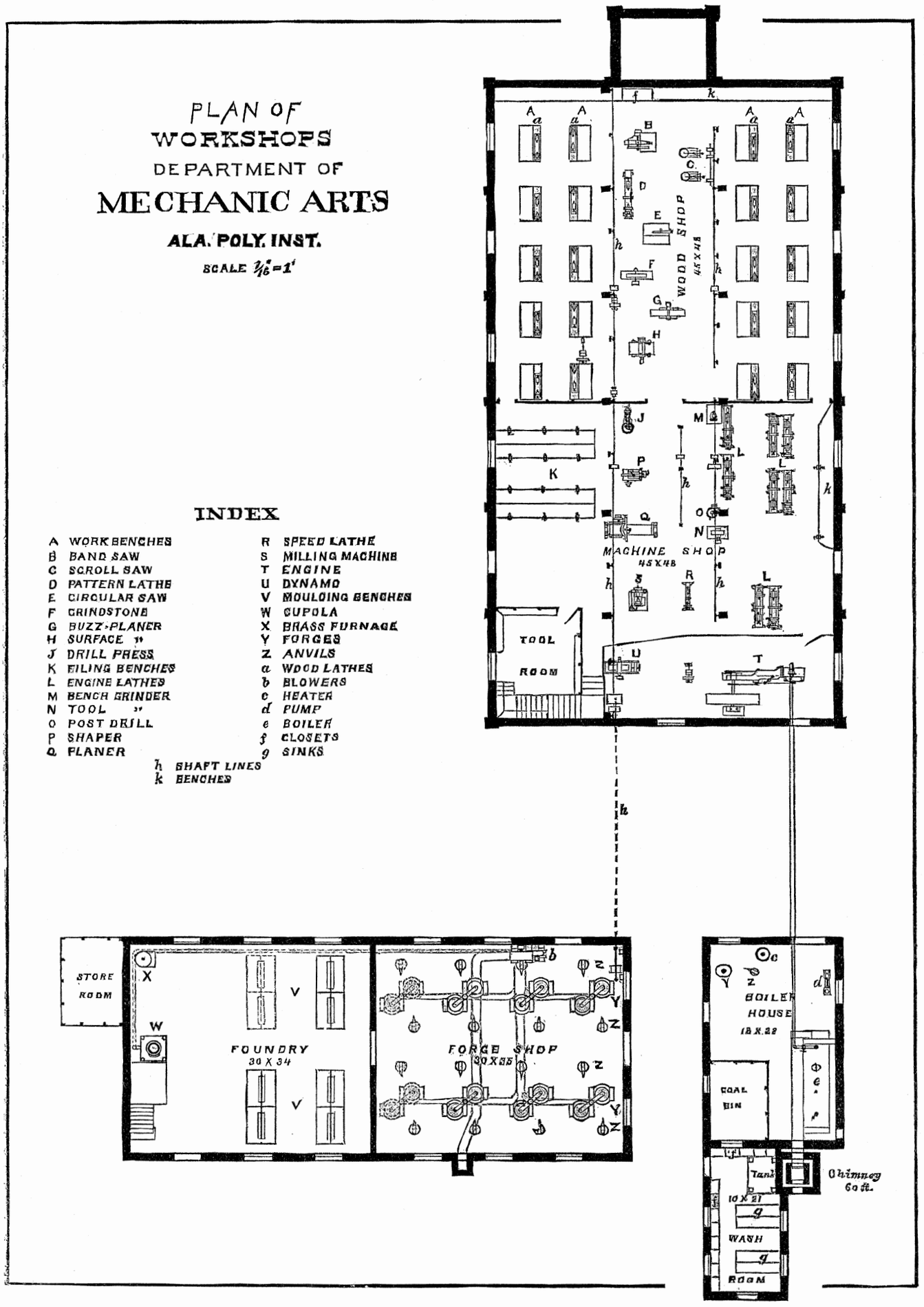
The sincere searcher after truth has much more to do than merely to acquire a knowledge of the truth that has been made known: he has to distinguish between real truth and apparent truth; and this when the apparent truth is presented to him under all the outward guise of real truth, and when the real truth is presented to him in the form of error to be shunned. The two classes may therefore be called respectively 'analoguers' and 'paradoxers,' between whom the honest and uninitiated inquirer must run the gauntlet; and strong indeed must be that judgment that comes through unscathed. There will always be Stokeses and Zöllners to offer specious proofs of what seem impossibilities, as there will always be Lobatschewskys and Dr. Deemses to question geometric opinion, and Dukes of Argyll to undo the work of Darwins.

When, therefore, we approach the subject of the paradoxes of nature, we must do so fully aware that we may be placed in the category of paradoxers in general, and fully prepared to have our paradoxes discounted accordingly. And while the physical paradoxes that the universe presents are most of them too well known in our day to admit of being called in question, as they all were when first announced, I fear that in the case of social and economic paradoxes there will be no body of truth to which appeal can be made.

. . . . . .

I propose to point out a few of those propositions in sociology, and especially in political economy, which are now on trial, and to indicate what I regard as the probable verdict of history upon their truth or falsity. But in this latter task I do not arrogate to myself

[1] Paper read before the Anthropological Society of Washington, D.C., March 20, 1888, by Prof. L. F. Ward.


PLAN OF
WORKSHOPS
DEPARTMENT OF
MECHANIC ARTS
ALA. POLY. INST.
SCALE 1/16"=1'
INDEX
A WORK BENCHES
B BAND SAW
C SCROLL SAW
D PATTERN LATHE
E CIRCULAR SAW
F GRINDSTONE
G BUZZ-PLANER
H SURFACE "
J DRILL PRESS
K FILING BENCHES
L ENGINE LATHES
M BENCH GRINDER
N TOOL "
O POST DRILL
P SHAPER
Q PLANER
R SPEED LATHE
S MILLING MACHINE
T ENGINE
U DYNAMO
V MOULDING BENCHES
W CUPOLA
X BRASS FURNACE
Y FORGES
Z ANVILS
a WOOD LATHES
b BLOWERS
c HEATER
d PUMP
e BOILER
f CLOSETS
g SINKS
h SHAFT LINES
k BENCHES
WOOD SHOP 45X48
MACHINE SHOP 45X48
TOOL ROOM
STORE ROOM
FOUNDRY 30X34
FORGE SHOP 30X35
BOILER HOUSE 18X22
COAL BIN
Tank
Chimney 60 ft.
WASH ROOM

any gift of prophecy, nor pretend that the judgment I shall offer upon any of the cases is to be considered infallible; for so complex or obscure are most of these problems, that it is of the utmost importance to recognize not only that much that seems to be truth is mere analogy, but that a large part of what seems to be false is merely paradoxical.

I shall speak chiefly of certain propositions of modern economic writers which are so much at variance with the current doctrines of political economy, that, if true, they are certainly paradoxic; but before coming to them, and as a sort of preparation for them, I will mention a few others of a much broader character, which, assuming their truth, may properly be called social, or sociologic, paradoxes. I have preferred to treat these propositions as paradoxes in analogy to the paradoxes of physical nature to which I have referred, rather than to treat the better-known and generally accepted dicta which are contradictory to them as popular errors or fallacies, because I deem it less important to lay stress on the error contained in the latter than upon the truth contained in the former, and also because this method of treatment possesses a certain novelty which may lend some interest to a subject which at its best will be regarded as dry, even if it be less 'dismal' than the orthodox political economy has acquired the name of being.

Perhaps the broadest of the paradoxes which can be claimed as sociologic, and which certainly applies to the next lower stage of biologic law, and still more obviously to physical phenomena, is embodied in the theorem that *the artificial is superior to the natural*. Certainly this proposition does not seem true, and, on the contrary, seems to contravene all our common instincts and intuitions; but when subjected to careful study or candid thought, its truth is invincible, at least in those more simple periods of action. For even a well-shaped club is superior to the fists, not to speak of bows and arrows and Springfield rifles. So are houses better than caves; and clothing, however coarse, better than nakedness. The same is true for nearly every material thing to which any value is assigned. And in the organic world the vegetable and animal products which have most value are those which have been perfected by human culture, and are, in so far, artificial.

It is therefore only in the higher stage of sociologic phenomena that this proposition admits of being disputed by the candid student. Here some of the highest authorities stoutly maintain that nature is not to be interfered with, with impunity. But the curious part of their case is, that they base it upon the general negation of our original proposition; viz., upon the ground that the natural is superior to the artificial, — the proposition which in physics and biology is clearly false. It is therefore a *petitio principii*.

The sociologic paradox may, then, be put in this form: *the arbitrary control of the social forces is economical.* Or the converse: *the normal action of the social forces is wasteful.* The orthodox economists maintain that the normal action of laws that govern the social and industrial world are not only economical, but are the very best possible, and cannot be interfered with without injury to the interests of society. And the philosophers of the individualist school take the same view of it. They even deny the expediency of sanitary regulation in cities, and maintain that mortality due to bad drainage is a sufficient inducement to individuals who own the property to combine and perfect the drainage. I cite this merely as an example of the absurd lengths to which this favorite theory leads such writers. In the light of the sanitary progress of the nineteenth century, due entirely to organized social effort, such statements can scarcely be supposed to emanate from the sane mind.

Starting from such extremes, it would not be difficult to show that the general doctrine of *laissez faire* is unsound when contemplated as a universal principle of sociology; and so much has latterly been said upon this point, that all the best writers, even in England, who still desire to hold on to the doctrine, are giving up its universal applicability, and only contending for it on the ground of expediency. Nothing more could be asked, since no fair-minded person will deny that it is often better to allow the most absolute free play to the natural agencies, not merely of society, but of physical nature as well. But that even free trade may sometimes be a very costly policy is as clear as that manufacturers should be authoritatively forbidden to adulterate drugs and articles of food. But not to dwell upon such broad principles and generalizations, and coming nearer to the domain of economics and modern questions of social reform, I will, at the risk of some abruptness, state another paradox in the following words: *reforms are chiefly advocated and brought about by those who have no personal interest in them.*

I do not claim that this is universal, and there usually comes a time in the history of every reform when the victims of the evil to be reformed join in the work, and help to secure its consummation. But in some cases, like the abolition of slavery, even this does not take place. And any one who will take the trouble to inquire into the constitution of those assemblies and associations that meet and organize for various charitable, benevolent, and reformatory objects, will find that they are composed almost exclusively of persons who are actuated by purely altruistic motives, and have nothing to gain beyond the approbation of their fellow-creatures. Even great political reforms are usually instigated and chiefly prosecuted by persons not at all interested in their success, except from some high moral point of view. So much is this the case that workingmen's parties are usually officered by lawyers, professors in colleges, clergymen, or writers on social topics. I do not deny that these men may often have selfish designs, but I am not misanthropic enough to doubt that their motives are primarily pure and disinterested. Certainly they are not usually men who would be pecuniarily affected by the success or failure of the reform.

But I have introduced this chiefly in order to lay more special stress upon one of its corollaries; viz., *discontent increases with improvement of the social condition.*

No one will deny to this proposition the character of a true social paradox. Certainly the normal mind would naturally reason, that, as the causes for complaint were removed, the discontent would diminish. But the most careful study of the history of civilization has shown that this is not the case. The reason for this, like the reason for all natural truths which are paradoxes when first stated, is clear when the explanation is given. We saw that in the case of slavery the reform must originate with a different class from the victims of the evil. We even hear of slaves who do not want their freedom. But, however much they may want it, they are in no position to advocate emancipation. And it is largely so with the industrial classes who are not slaves in the literal sense of the term. Virtually they are, up to a certain point, either incapable of realizing the need of reform, or powerless to act in the direction of improving their condition. Discontent is proportional to the degree in which the oppressed class realizes its condition, and increases as the hope grows that an improvement can be brought about by complaint or by concerted action. But this stage is not reached until external influences have already wrought an important change for the better: hence the paradox that discontent increases with improvement. It presupposes, however, that real hardship exists, and would not be true where entire justice was done.

The special importance of this law arises from the fact that one of the leading arguments against all attempts at industrial reforms has been that the condition of the laboring-classes is really improving. Mr. Henry George has greatly injured his case in denying this, such denial being implied in the title of his book, 'Progress and Poverty,' and repeatedly enforced throughout the work. Though bad for Mr. George, this course has proved useful in startling both classes, and spurring them on to investigate the facts. Both have now learned the truth, that the condition of the working-classes has improved, and greatly improved, in nearly all civilized countries. The opponents of further labor-reform point to these facts, and declare that there is no ground for complaint, and imagine they have closed the argument. But the wiser among the reformers perceive that it is just this improvement which has rendered discontent possible, and they rightly regard this as demonstrating that the reform is not yet complete, and propose to continue to agitate until the triumph of justice shall in a natural way put an end to all discussion.

I shall consider only one more of these broader sociologic paradoxes. This is embodied in the proposition that *the means of subsistence increases more rapidly than population.*

This, as you all observe, is the exact opposite of the Malthusian

law. The almost universal acceptation of that law is sufficient to stamp this as a paradox, provided it be true. Mr. Henry George was, I believe, the first writer who had the courage to formulate it and attempt its substantiation. In this, I must admit, he has been successful. After reading his argument, one is inclined to wonder how any other view could ever have been taken. Society is really a great co-operative institution, and as such it has succeeded in economizing the forces of production. All who understand what the value of co-operation consists in, know that the more general it is, the more effective. Society, though a very imperfect form of co-operation, is a very general one, and it results, defective as it is, in a greater production *per capita* than could be secured by individuals each working for himself; that is to say, the larger the population of any given community, the greater the amount of subsistence that each can and does produce.

There are two curious facts that result from this, both of which are decidedly paradoxical in their character. One is, that this is the very truth which has been so exultantly brought out by the chief defenders of Malthusianism when they showed that the condition of the disaffected classes is improving. It is improving, and has been improving, with a few interruptions, ever since the beginning of the industrial epoch; but this improvement has been the result of social co-operation, division of labor, employment of machinery and all the other agencies that result from social integration and the increase and massing of population. The more dense the population, the greater the friction of mind upon mind, the more rapid the development of intelligence, the quicker the action of the inventive faculty, and the more exact, methodical, and economical the outlay of energy in the production of wealth. Everybody is familiar with this law in the obvious contrast between intelligence and thrift of city and country population. As Mr. George has well said, the world has never yet reached a point at which the population was too dense to create wealth, not merely in proportion to the subsistence required, but in excess of it. Thus far all experiments which history affords have proved the law above formulated in diametrical antithesis to the so-called 'law of Malthus,' and shown that production increases with population in some ratio greater than unity. The second curious result of this truth so successfully established by Mr. George, is that it serves as a flat contradiction of the fundamental theorem of his book; viz., that poverty increases with wealth. It would, of course, be easy to find isolated cases, perhaps important departments of industry, in which the haphazard development of modern wealth-producing agencies has worked severe temporary hardship; but that they tend, using the old phrase, "to make the rich richer, and the poor poorer," in any permanent or systematic way, may be regarded as apodictically disproved. Coming next more nearly within the field of political economy as that science is usually defined, let us note a paradox which may be regarded as a corollary of the one last considered. It may be stated in this form: *capital is more effective than labor in the production of wealth.*

In the view of the popular belief that labor creates all wealth, this, if true, must certainly rank as a paradox. To understand its truth we must consider what constitutes capital. To do this we must loose entirely from all the current definitions which may, however, also be true, and look at it from one special point of view. It is a common thing to hear it said that in the modern industrial world it is not human power that produces most of the wealth, but natural forces. This is true, and is one way of looking at it. It is equally common to hear it said that it is not muscle, but brain, that accomplishes the principal results. This is also true, and another way of looking at it. Brain, i.e., intelligence, organizes and directs natural forces, and the latter do the work. Still a third point of view is expressed when it is said that it is machinery which does it. Machinery is the material embodiment of intelligent direction of natural forces. But very few, I imagine, have taken the fourth step in this train of reasoning, and attributed the result to capital. Yet this view is perfectly legitimate, and a necessary sequence of logic. The term 'machinery' is too narrow. Much of the force will not admit of being referred to it. The expression 'natural forces' is often not strictly applicable. Animals often supply the motive power. 'Intelligence' is too vague a term to reduce to economic language. But 'capital' includes every possible agency, and it is really to this that all production beyond what could have resulted from naked human muscle is due. This, I need not tell this society, is the greatest bulk of all that makes up civilization. We thus come back to the paradox with which we started out, of the artificial over the natural.

We will next consider the proposition that *wages are drawn from products, not from capital.*

The old economists all maintain that there was a particular part of capital, called the 'wages fund,' from which all wages were paid, and without which, or beyond which, no wages could, under any circumstances, be paid. Mr. Henry George has shown that there is nothing of the kind; and so clear is his demonstration upon this point, that Professor Clark, in his admirable little work on the philosophy of wealth, pronounces his reasoning as clear as any thing in mathematics. Capital, as we have seen, consists in the machinery, tools, appliances, and other labor-saving agencies, employed to increase production. Money, except when used for these purposes, is not capital. The idea that the manufacturer lays aside a certain sum of money to pay for his labor, which he keeps distinct from his profits, as a wages fund, is sufficiently absurd to need no disproof. What he really does is to count the sum needed to pay his laborers out of his profits as current earnings devoted to production, and it is out of production that this sum must come from week to week or from day to day. For myself, however, I can see no distinction between this and the money devoted to the purchase of tools or machinery. It is capital in the true sense of the term as wealth applied to production.

We are now prepared to consider what I regard as the most important, as it is the least unequivocal, of all economic paradoxes. It may be expressed in the following form: *profits rise with wages*, or in the stronger form; *increase of wages results in increased profits.*

Surely this proposition would stagger an old-time political-economist; and very few employers, with all their mercantile sagacity reputed to be so unerring, could be brought to accept it. In fact, not only is the exact opposite theory the only one taught in the books, but the business of the whole world has always been conducted upon it, and to the normal mind the statement that profits will diminish as wages increase seems to be self-evident. How, then, can the opposite be maintained? We owe to Mr. George Gunton, the author of a recent work entitled 'Wealth and Progress,' the full elaboration of this new theorem; and any believer in the old one who will carefully read this book, provided he be really seeking the truth, can scarcely fail to admit that there are two sides to the question. For myself, I can scarcely resist the acceptance of the new doctrine, though, of course, with certain qualifications and reservations. It is something like the argument for non-resistance. Any one who understands it must admit its truth; and yet for those who believe it, so long as their number is small, to undertake to apply it, would be ruinous to themselves, and would seem to disprove the doctrine itself.

Mr. Gunton's method of exposition is something like the following: political economy, as expounded in all the books, teaches that industrial society is divided into two great classes, — producers and consumers. In this classification the wage-receivers are uniformly classed as producers. The consumers are a class who go into the market, and purchase the products wrought by the wage-receivers. They are vaguely conceived, illy defined, never distinctly located, and, except that they actually buy the goods and consume them, they are a sort of economic myth. But Mr. Gunton asks, "Who are these consumers? Where are they? What are they?" A consumer is a human being. He is part of the population. Somewhere in the population he is to be found. In fact, the consumers are the whole population. The wage-receivers must therefore also be consumers; and when we take the census of population, we find that they, with their families, constitute the greatest majority. Therefore, in all calculations based upon the nature of the market, not only must they not be ignored, but they must be regarded as the prime factor. But it may be said that they consume much less than the other classes of people. Their humble rank and simple wants make them scanty consumers, and therefore it is necessary to bid for the wealthy classes, and neglect the laboring-classes. No one will claim that they consume as much *per capita* as the

rich, certainly not of certain products. But here, again, Mr. Gunton asks, "Why?" The obvious answer is, "Because they have not the means." But will any one claim that the working-classes consume all they would if they had the means? Surely not. There may be some so low that they could make no use of any thing more than they have, but this is hardly conceivable. With scarcely an exception, they want much which they cannot have because they have not the means to purchase it. But their means consist wholly in their wages. To increase their wages is to supply their wants. This is all they think of. But the employer is apt to look at the question as though all money paid for labor beyond the minimum possible would be hoarded in the cellar and lost to industry. This view, tacitly shared by the economists, is obviously false. What is supplying wants to the laborer is furnishing a market to the manufacturer or the farmer. The vast number of laborers, and the certainty that all increase of wages will be expended and not hoarded, make even the smallest general rise in wages an important stimulus to production. It expands the market for all classes of products. Statistics show that periods of high wages have uniformly been periods of increased production, and increased production means prosperity to the manufacturer; i.e., profits rise as wages rise.

Time fails me to elaborate this important principle as it has been done in Mr. Gunton's book, and I can only recommend those interested to read his argument for themselves. From this, however, as the fundamental theorem, a large number of new and striking truths, most of them in the nature of paradoxes, arise. Only a few of them can be considered here. One of them is that *prices fall as wages rise*. This is maintained by Mr. Gunton, in face of his general law that the price is determined by the cost of production. Surely one would suppose that the cost of production would be greater if the cost of labor were increased. Just here lies the paradox. Doubtless this would be true for an isolated case, but it would not where the rise of wages was on a large scale. The reason is, that, with the increase of wages, the market is increased and production is increased. As the production was at the minimum for existing methods before, the increased production must now be brought about by an improvement in the methods; i.e., by introduction of improved machinery. This always lessens the cost of production; and this, according to the law above stated, will sooner or later compel a reduction in the prices of commodities thus more cheaply produced.

Another of these statements which Mr. Gunton claims to establish by statistics is, that *rents rise with wages*.

One would naturally suppose that rent, as the price paid for lodgings or business-offices, or space to build or work upon, or for agricultural purposes, would follow the law of prices, and fall as wages rose. Mr. George virtually asserted this in maintaining that the rent was taken out of wages, so that the higher the rent the lower the wages. But Mr. Gunton shows, that, as rents have risen, wages have risen; that the highest wages are paid where the highest rents are charged, i.e., in cities; and that the lowest of all wages are received by those who pay no rent, but occupy the soil without let or hindrance. The argument is scarcely fair, and the truth seems to be, that, as wages rise higher, rents will be paid, but better tenements will be occupied; so that the case is on a par with the last, that increase of wages increases consumption, which is seen in better habitations, the same as in better clothes and furniture.

But perhaps the most important of Mr. Gunton's conclusions are those relating to the hours of labor. Two of these may be briefly considered. One of these is that *a reduction of hours tends to increase production*.

This, perhaps, sounds more paradoxical than any of the preceding propositions. Surely one would naturally suppose that there would be more produced in ten hours than in eight. Not so. The laborer remains a consumer the same after as before the reduction. Unless new machinery is introduced, the same amount of labor will be required after the reduction as before: hence a larger number of laborers must be employed. These, in the present condition of society, are always to be had. The number of able-bodied persons constantly seeking or out of employment is equal to one-fifth of the whole. These unemployed persons would at once find employment. While unemployed, the amount consumed by them is at an absolute minimum. As soon as they begin to receive wages, they begin to consume more, and thus the demand for various kinds of commodities is increased. This demand is sure to be supplied by increased production, which will be secured by the introduction of improved machinery if it cannot be done otherwise.

But this is not the only way in which a reduction of the hours of labor works the increase of production. By affording a little leisure to the workingman, it gives him a taste, or rather an opportunity to indulge taste already possessed, for certain elements of culture and social refinements, which he will then begin to demand, and which will be accordingly supplied by the general law of demand and supply, which supply consists in increased production. But, assuming that all his earnings were previously expended on necessities, this would be impossible, and hence arises a final paradox that *the reduction of hours tends to increase wages*.

But for the foregoing explanations this would be strange enough. Whenever there is a demand for a reduction of hours, it is always met by the reply, that, in the state of business, it can only be granted on condition that wages be correspondingly reduced. And this would doubtless be necessary with many isolated industries, at least at the outset. A reduction of hours is considered equivalent to an increase of wages. But a general reduction of hours, continued long enough to have its natural and final effect upon society and upon industry, will create an increased demand for all classes of commodities requiring the introduction of improved machinery for their production, thus cheapening the cost of production, increasing the profits of the manufacturer, and enabling him to pay higher wages and still enjoy greater profits. This, under free competition, he will be compelled to do, and will do in harmony with the economic laws of society.

Without further argument of these several propositions, I will close this paper with a single comment. If any considerable part of what is claimed is true, it proves in a most conclusive manner what I have so often insisted upon, — that to the power of production there is practically no limit, and that all that is needed to place in the possession of every member of society every object of his most cherished desire is the power to purchase it. Very few indeed are there who possess, or can possess, every purchasable object of desire. The present production of industrial society would not be equal to a tenth, probably not a hundredth, of what would be consumed if every one could supply at will every proper and legitimate want of his nature. It is therefore useless to talk of increasing production except by the increase of the power to consume. This is demand in its true economic sense, — the demand which will be supplied by the natural operation of industrial laws. We have therefore narrowed down the great economic problem to the one single point of how to enable the members of society to secure for an equivalent the objects which they desire to consume. Mr. Gunton has sounded the keynote of the solution of this problem in demanding increased wages and reduced hours of labor for the great consuming class of workingmen, — in popular phrase, the 'toiling millions.' It remains for other economic philosophers to show how this principle can be extended to include all mankind.

ELECTRICAL SCIENCE.

Electric Tramways in Great Britain.

THE paper on the Bessbrook and Newry tramway, read by Dr. Hopkinson before the Institute of Civil Engineers, has brought forward some valuable information as to the status of electric tramways in Great Britain. Last year there were eight tramways operated by electricity in Great Britain. The longest is 6 miles; the shortest, $\frac{3}{4}$ of a mile; the average being $2\frac{3}{4}$ miles. The power for the two shortest of these is from gas; for two of the longest, from water; for the rest, from steam. The electricity is transmitted by rails, — in some cases specially insulated central or side rails, — or accumulators are carried on the cars; the overhead system so generally adopted in this country and in Germany being in no case used.

The Bessbrook and Newry line is $3\frac{1}{4}$ miles long, with an average gradient of 1 in 86, a maximum gradient of 1 in 50. The conditions are, that ten trains run in each direction per day for a daily traffic of 100 tons each way, and a maximum capacity of 200 tons per day, in addition to the passenger traffic. The electrical loco-