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Contents.

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TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 167,
For the Week ending March 15, 1879.

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SCIENCE TO SOLVE INDUSTRIAL PROBLEMS.

In a recent address to the Workingmen's Lyceum, at Cooper Institute, Parke Godwin said that society presented many problems—war, crime, pauperism, intemperance, and a thousand others—but the profoundest of all was that which related to the condition and prospects of labor. After reviewing the conditions of labor and of laboring men in the past and at present, the speaker said that the real social problem was to maintain the freedom of labor, and with it the equilibrium of the industrial forces, and of their results. Many solutions to this problem have been offered, chief among them these three: the moral solution, the political solution, and the economic or social solution—all important, but only one efficient.

The moral solution failed for two reasons: it could not reach the object of its solicitude—individuals; while the evils to be remedied were many of them organic, and could be cured only by organic remedies.

The political solution was but the old form of state intervention, another name for despotism. Not a government on earth can take charge of itself, much less the people; all of them are bankrupt. The people must take care of themselves. The duty of government is to maintain the conditions of liberty, justice, and progress, but there to stop; every step beyond is either toward anarchy or tyranny.

There is but one way of meeting the evils of society, the speaker went on to say, and that was to learn scientifically the laws of social phenomena, and to apply them to all social arrangements and procedures. Do such laws exist? Who can doubt it that has studied statistics, or watched the uniformity of social results? Because man is a being of free will, he is none the less a source and subject of law. His processes, especially the action of large numbers acting together, are not wholly arbitrary and capricious. They can be counted on generally with as much confidence as we count on the rise of the tides or the revolutions of the stars. Because these phenomena are more complicated than natural phenomena, we know less about them; but we shall know more of them in time. How many great minds and noble hearts are now at work to find the key of social science, to unravel its mysteries, to bring the seeming chaos into order? Something has been done in this direction, but much more remains to be done. The publicists and the economists have given us glimpses of the field—the scientists will soon open it to the husbandman and his golden harvests.

ECONOMY IN GAS BURNING.

True economy in gas burning implies the use of burners capable of developing as nearly as possible the full illuminating power of the gas consumed. Judged by this standard, it is safe to say that the great majority of those who think they are most economical in the use of gas are really the most wasteful. In the majority of New York houses the burners used are old and small. When new such burners were not capable of developing half the actual illuminating power of the gas that passed through them, and, worn and rusted as they are in the average house, it is a question whether it would not be an overstatement to say that they get one third as much light from the gas they burn as proper burners would give. In other words, multitudes who are constantly complaining of the magnitude of their gas bills are simply wasting twice as much gas as would suffice to light their apartments. Properly burned, the gas they pay for would give them three times the light they now have; or the same amount of light could easily be got from one third the quantity of gas that passes through their burners. When the burners are inclosed in old-fashioned globes with narrow openings at the bottom, the illumination is still more reduced.

A few weeks ago, Dr. William Wallace, F.R.S.E., read before the British Society of Arts a long paper, giving the results of some hundreds of careful tests of all the leading burners in the English market, under varying conditions of pressure and quality of gas, proving most conclusively that the light obtained depended not so much upon the quantity of gas consumed as upon the conditions under which it was burned.

For example, with 26 candle gas and a series of fish tail burners of the same pattern but of differing sizes, Mr. Wallace obtained the best results with the largest burner at a comparatively low pressure. With this burner and a pressure of half an inch, 7·1 cubic feet of gas gave an illuminating effect of 40·63 candles, or 28·6 candles for 5 cubic feet. The smallest burner of the series, burning 2 cubic feet of gas at 1½ inch pressure, gave an illuminating effect of 3·21 candles, or 8 candles for 5 cubic feet.

Thus, with burners of the same type, a difference in size with difference in pressure may enable one burner to develop three and a half times as much light as another from a given amount of gas. With precisely the same burner, twice as much light was got from a given volume of rich gas at the pressure of ½ inch, as at the pressure of 1½ inch. With common gas the difference was found to be still more remarkable, in some instances only one fourth the obtainable illumination being developed. This with approved burners in good condition. With poor burners out of condition, such as we commonly see in this city, the waste of illuminating power must be much greater.

In his experiments with rat-tail burners, under the most favorable conditions of size and pressure, Mr. Wallace failed to secure more than 60 per cent of the illuminating power of the gas consumed. Fish-tail burners did much better, though those of the bat's-wing type showed greater economy on the whole. A great variety of German and English bat's wings, with tips of various material, was tested, the results ranging between 18·35 candles and 25·56 candles, with 26 candle gas under varying conditions of size and pressure. A number of Argand burners gave results ranging between 17·80 to 25·61 candles, with a 26 candle gas.

Experiments were also made in order to ascertain the loss of light resulting from the use of globes of different kinds and of various shapes. The loss is always considerable, in many cases excessive, and it results partly from the absorption of light from the material of the globe, and partly from the draught caused by the ascension of the heated air in the confined space. As regards material, a piece of clear window glass, held in front of a gas flame, diminishes the light to the extent of about 10 per cent; but in the case of a clear globe it is, in some cases, less, owing to the reflection from the surface furthest from the photometer. Globes frosted or ground all over, technically known as "moons," absorb about 25 per cent of the light when well shaped, and opal or "cornelian" globes, 40 to 50 per cent, according to the thickness and quality of the glass. The following results were obtained with globes of different sizes ground all over, and show the effect of increased draught in diminishing the light

	Per Cent.
6 inch globe caused a loss of.....	25
7½ " " "	27½
10 " " "	38

All these globes had the usual opening at bottom, 1¾ inch in diameter. In another series of experiments, to determine the effect of the opening of the globe on the amount of light made available, clear 7½ inch globes were employed, giving the following results, the same burner being used at uniform gas pressure:

	Candles.	Per Cent.
The naked flame gave a light of	16·8	
With clear globe, opening below 2⅜ in.,	15·4;	loss 8·3
" " " 2¼ "	15·2;	" 9·5
" " " 2 "	13·6;	" 19·0
" " " 1½ "	13·0;	" 22·6
" " " 1 "	12·0;	" 28·6

With openings less than two inches the light was unsteady; at one inch it was practically useless. The best results were obtained with globes having a four inch opening at bottom.

EMIGRATION AND MIGRATION.

The annual report of the New York State Commissioners of Emigration for the year 1878 shows there came to this port from foreign ports during the year 121,369 persons, of whom 75,347 were aliens who had never before entered the United States. These figures show a large and unexpected increase, and indicate for the whole country an immigration of not less than 150,000.

During the same year there was an unprecedented movement of population within our national borders, a heavy migration taking place from the East to the South and West. On the basis of information obtained from government reports and a large amount of special inquiry the *Tribune* gives the following table of land sales during recent years:

Year.	Government Sales for Fiscal Years ending June 30.	Railroad Sales for Calendar Years.	Sales in Texas, Calendar Years.	Immigration, Calendar Years.
	Acres.	Acres.	Acres.	
1872	7,324,725	1,000,000	1,500,000	449,483
1873	6,288,264	980,000	1,500,000	437,004
1874	5,610,243	1,060,000	Not known.	277,593
1875	3,712,420	850,000	Not known.	209,036
1876	4,264,544	1,160,000	Not known.	182,027
1877	3,338,479	1,800,000	3,000,000	130,000
1878	7,564,246	2,950,000	3,500,000	145,000

Of the immigrants of 1878 about 80,000 went West; during the same period the westward migration of Eastern people, was, according to the *Tribune's* calculation, at the least 520,000.

"The heaviest migration took place from New England, the Middle States, and Virginia. These regions have been the most troubled with a surplus of unemployed labor, and they have been of late the scene of active canvassing for emigrants by Western land agents, who, while advertising their own lands, have also done much good by calling attention to the fertility and cheapness of the government lands, a thing they did not care to do particularly, but which was one result of their operations. Private advices received by the *Tribune* report that these persons, who have gone West and South, are in general citizens of intelligence and some small means, and mostly men of families. Many of them are thrifty farmers. A large proportion are mechanics, who, being out of work, have drawn their deposits out of the banks, and, rather than stay in the East and eat up their accumulations, have taken their money and furniture West and begun the world anew. They have gone out on the prairie, broken up the virgin soil, so rich as not to need fertilizing, planted crops and groves of timber, and made themselves independent of all the vicissitudes of labor and fortune in the East. They are all, like their predecessors in that region, in a fair way to make a competence.

"The regions to which they have principally gone are Texas, Kansas, Dakota, Nebraska, Minnesota, and California, in the order named; but some have gone to Florida, Arkansas, Colorado, Iowa, New Mexico, and the regions beyond the Rocky Mountains."

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Subscribers to the SCIENTIFIC AMERICAN will be entered on our books to commence at the date the order is received; but those desiring the back numbers to the commencement of the year will be supplied on their signifying a wish to have them. Volumes of previous years may be had in sheets by mail at regular subscription price, namely, $3.20.