Work and Wealth.

Edward Atkinson, at the opening of the Exhibition of the New England Manufacturers and Mechanics' Institute in Boston, summarizing the conditions of work and wealth in this country as compared to those abroad, concludes that ninety per cent of our working population earn their daily bread by their daily labor. The great problem is to make the struggle for life easier, and the first requirement toward its successful solution is to develop hand and brain together so as to increase the purchasing power of every dollar. We are the most wasteful nation in the world, mainly because there is greater abundance here than elsewhere. Our crops might be increased one-half by applying the last discoveries of science to our methods of agriculture. Economy in machinery is the field that will yet yield the best results. The best steam-engine and boiler waste nine-tenths of the potential energy of the fuel it consumes. In our great locomotives and heavy trains of cars only one pound in a hundred of the fuel used is actually applied to the movement of the load. In the self-operating carding engine, spinning-frame, and loom, four-fifths of the power is wasted in operating them, and in putting cotton fiber into cloth three-fourths of its original strength is lost by rough treatment. Half our vast crops of food and more than half our fuel are wasted before their work is done. Saving in this and in every other form of production or transportation goes, for the largest part, to the benefit of consumers and helps them in the work of gaining their subsistence. Every application of science to manufacturing industry, to mining or agriculture, by which the aggregate of things is increased, while the labor is diminished, tends to increase the commodities to be divided among the laborers and enriches the workmen in far more rapid proportion than the capitalist. The great purpose of world's fairs and local exhibitions is to bring into prominent notice every new application of science by which production may be increased, and to develop the natural resources of the country. They are great object-lessons in human welfare. The first requisite, however, is to qualify boys and girls, men and women, to take advantage of the opportunities thus spread before them. If methods of industrial instruction can be added to the mental training of the public schools, if the hand and the head can be educated together, the causes of want may be wholly removed.

The greater the skill, the larger gain alike to workman and capitalist. The more effective the application of labor and capital, the larger the profit to the latter and the payment to the former. Abroad, a large proportion of the annual product of labor is taken from the people to maintain great standing armies. Measured by the standing armies of France and Germany, the United States, with its population of fifty-four millions, would have to keep seven hundred thousand men in arms, more than one in twenty of all the adult males in the country, who would be withdrawn from the producers to become consumers only, and one man in every nineteen of those remaining would be forced to labor in order to pay the taxes necessary to sustain the seven hundred thousand idle men. We keep that army to work in the field, the forest, the mine, the ship, the workshop, the office, the school, in building houses and railroads, etc.

The cost of the great European armies of destruction is more than equal to the sum of all the wages earned in this country by all the iron miners, all the iron workers, and all the men, women, and children in our textile factories put together. The wages and earnings in this country are higher than in any land burdened with great standing armies. The quantity of things to be divided, the true earnings must be just so much greater, and the cost of making them just so much less. The last man or woman discharged in hard times is the one earning the most. The first to be discharged is the one that does the least work and earns the least wages. As it is with persons, so it is with whole countries. Where the conditions are best, where the natural resources are the greatest, there will be found the most skillful workers, the best machinery, and the largest production. The lowest cost is always measured by the highest wages of those who do the work that is most important. Where mental capacity and manual dexterity are combined and applied to the best machinery, there will be found the largest production, the highest wages, and the safest and most adequate return for capital. This country has the advantage over all others in its natural resources, capable of being worked with the least effort, in its widespread education, which, even if it is imperfect, yet, on the whole, does qualify its pupils to apply the greatest versatility, and to combine mental and manual capacity to the greatest advantage, and, in its freedom from destructive taxation. Our higher wages are the sign of low cost, and the product of a single day's work of machinery, directed by one skilled man, will buy the product of fifty days' labor in the coffee plantations of Java or Brazil, or of one hundred days' labor in the tea fields of China, or of twenty days' labor in the sugar plantations of Cuba, or the hemp fields of Manila, or of ten days' labor in the wool-growing sections of South America or Australia. To utilize our strength, we must perfect our methods of instruction in the application of science to the useful arts. Every mechanics' fair, every Franklin Institute Exhibition, ought to be a convincing appeal to the successful manufacturer, the great iron worker, the large coal miner, to give of his abundance to the endowment and establishment of industrial schools. The best possible investment of present profits for future returns is in liberal aid to the struggling schools where the higher branches of technical education are taught, with manual instruction in the mechanic arts, and to the development of the great work of instructing the brain and hand to work together. The supply of skilled workmen has never yet been in excess of the demand. Boys trained in a knowledge of tools and in the principles that underlie all mechanics are needed in every workshop, and the country has need of all the skill that education can give.

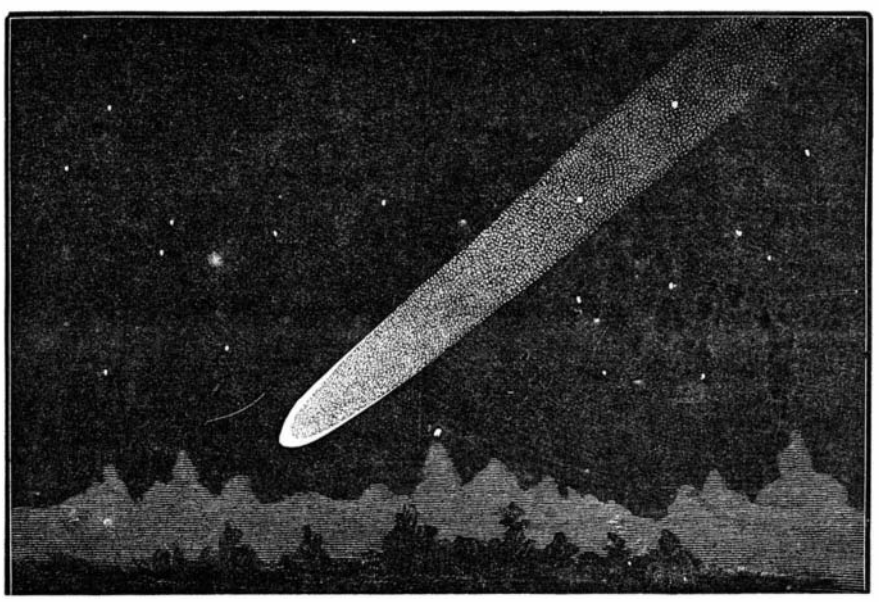
There is much in the above, put in such sententious and rather positive style, that is subject to dispute; but Mr. Atkinson being a practical manufacturer, well acquainted with the large industries of the country, and a broad and competent observer and thinker, what he says on such subjects is well entitled to the thoughtful attention of all who give intelligent consideration to these important matters.

THE GREAT COMET OF 1882.

Telescopic and naked eye observations were made at my observatory of this fine comet on the mornings of the 24th and 25th inst. The comet was discovered by Cruls, at Rio Janeiro, on the 14th of September, and was at one time so brilliant as to be seen with the naked eye within a few degrees of the sun at noonday. It is now passed perihelion, and has moved so far west of the sun as to be visible in the eastern sky before sunrise.

The accompanying drawing represents the comet's appearance as seen by me on the 24th of September before sunrise. Its appearance was magnificent, the head and peculiar shaped wings glowing like burnished silver on the bright yellow twilight of the eastern sky. The tail, even in the brightness of approaching day, could be seen extending upward, and nearly parallel to the ecliptic, to a distance of from twelve to fifteen degrees, and by glimpses much further. As it moves west, and after a time rises before dawn, the tail will doubtless be visible to a great distance from the head. It is believed by some eminent astronomers to be identical with the great comets of 1843 and 1880—the latter discovered by Gould in South America—and by some powerful influence is having its period rapidly shortened, but this as yet is not conclusive. As it will be visible some time to the naked eye, and much longer telescopically, it will be attentively observed. WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Sept. 25, 1882.



COMET ACCORDING TO BROOKS' SKETCH.

A Glacier on Sale.

The enormous glacier Fonor Svartisen, on the Senjen Island in Norway, which is the northernmost of its kind in Europe, will shortly, says *Nature*, be made the object of a remarkable enterprise. It appears that a number of speculative merchants in Bergen have obtained the right of cutting block ice for export from its surface. Some blocks have already arrived at the latter place, and as the quality of the ice has been found to be good, large shipments may be expected. The glacier is about 120 square miles, and as the distance from its border to the sea is only a couple of miles, the ice may be obtained very cheaply. A similar attempt to utilize the glacier Folgefonden was made some years ago, but failed, owing to the blocks in their downward course repeatedly breaking through the wooden bore or conductor in which they were slid down to the sea.

Electricity in the Shoe Factory.

An attractive feature of a model shoe factory in the Cincinnati Industrial Exposition appears in the application of electricity as a conveyer of power for driving the Goodyear Sewing Machines used in the manufacture of ladies' fine shoes. This is believed to be the first time that shoes have been bottomed by electricity.

Code of Rules for the Erection of Lightning Conductors.

The following rules, from the "Report of Lightning Rod Conference," 1882, published by Messrs. E. and F. N. Spon, have been abstracted under the directions of Major V. D. Majendie, H. M. Chief Inspector of Explosives, and sent by the Explosives Department of the Home Office to the occupiers of factories, magazines, or stores of explosive materials, and to the police authorities. Reasons, based on practical and theoretical evidence are given at length in the report for each rule and recommendation:

1. *Material of Rod.*—Copper, weighing not less than 6 ounces per foot run, the electrical conductivity of which is not less than 90 per cent of that of pure copper, either in the form of rod, tape, or rope of stout wires, no individual wire being less No. 12 B. W. G. (0·109 inch). Iron may be used, but should not weigh less than 2¼ pounds per foot run.

2. *Joints.*—Every joint, besides being well cleaned and screwed, scarfed, or riveted, should be thoroughly soldered.

3. *Form of Points.*—The point of the upper terminal* of the conductor should not have a sharper angle than 90 degrees. A foot below the extreme point a copper ring should be screwed and soldered on to the upper terminal, in which ring should be fitted three or four sharp copper points, each about 6 inches long. It is desirable that these points should be so platinized, gilded, or nickel-plated as to resist oxidation.

4. *Number and Height of Upper Terminals.*—The number of conductors or upper terminals required will depend upon the size of the building, the material of which it is constructed, and the comparative height above ground of the several parts. No general rule can be given for this, except that it may be assumed that the space protected by a conductor is, as a rule, a cone, the radius of whose base is equal to the height of the conductor from the ground.

5. *Curvatures.*—The rod should not be bent abruptly round sharp corners. In no case should the length of a curve be more than half as long again as its chord. A hole should be drilled in string courses or other projecting masonry, when possible, to allow the rod to pass freely through it.

6. *Insulators.*—The conductor should not be kept from the building by glass or other insulators, but attached to it by fastenings of the same metal as the conductor itself is composed of.

7. *Fixing.*—Conductors should preferentially be taken down the side of the building which is most exposed to rain. They should be held firmly, but the holdfasts should not be driven in so tightly as to pinch the conductor or prevent contraction and expansion due to changes of temperature.

8. *Other Metal Work.*—All metallic spouts, gutters, iron doors, and other masses of metal about the building should be electrically connected with the conductor.

9. *Earth Connection.*—It is most desirable that, whenever possible, the lower extremity of the conductor should be buried in permanently damp soil. Hence proximity to rain water pipes and to drains or other water is desirable. It is a very good plan to bifurcate the conductor close below the surface of the ground, and to adopt two of the following methods for securing the escape of the lightning into the earth: (1) A strip of copper tape may be led from the bottom of the rod to a gas or water main—not merely to a leaden pipe—if such exist near enough, and be soldered to it. (2) A tape may be soldered to a sheet of copper, 3 feet × 3 feet × $\frac{1}{16}$ inch thick, buried in permanently wet earth and surrounded by cinders or coke. (3) Many yards of copper tape may be laid in a trench filled with coke, having not less than 18 square feet of copper exposed.

10. *Protection from Theft, etc.*—In cases where there is any likelihood of the copper being stolen or injured it should be protected by being inclosed in an iron gas pipe reaching 10 feet—if there is room—above ground and some distance into the ground.

11. *Painting.*—Iron conductors, galvanized or not, should be painted. It is optional with copper ones.

12. *Inspection.*—When the conductor is finally fixed it should, in all cases, be examined and tested by a qualified person, and this should be done in the case of new buildings after all work on them is finished.

Periodical examination and testing, should opportunities offer, are also very desirable, especially when iron earth connections are employed.

A Taxidermists' Exhibition.

At a meeting of the Executive Committee of the Society of American Taxidermists, in Washington, Oct. 3, it was decided to hold the third annual exhibition in New York, from December 4 to 16, 1882, at Armory Hall, in Central Park. The following gentlemen were elected as a board of exhibition commissioners: Jacob H. Studer, President; Professor G. Brown Goode, Vice-President; Dr. Joseph B. Holder, Secretary; Andrew Carnegie, Treasurer; Professor A. S. Bickmore, Robert Colgate, James C. Beard, Dr. Wendell Prime, and Professor Henry A. Ward.

* The upper terminal is that portion of the conductor which is between the top of the edifice and the point of the conductor.