

investigations on his own account. He went from New York to Montreal, and has since been reported at several points in the West gathering information about the cattle trade in the same indefatigable manner which characterized his efforts when he was laboring to secure the great reforms which have made him famous. He is now 67 years of age.

METAL AS A SUBSTITUTE FOR WOOD IN RAILROAD TIES.

The report of the Forestry Division of the United States Department of Agriculture on the consumption of wood for railroad ties seems to establish the fact that this consumption is a leading factor in the depletion of our forests. Besides many interesting statements regarding the destruction of young trees, the report also contains the results of an exhaustive inquiry as to the use of metal by railroad managers in this and many foreign lands, and this method of construction is suggested as one remedy for the denudation of our forests, which is generally acknowledged to be going on at the present time.

This portion of the report was prepared by E. E. Russell Tratman, C.E. The statistics are given of 25,000 miles of railroad laid with metal track out of a total mileage of the world (exclusive of the United States and Canada) of 187,721 miles, or a relation of 13.12 per cent to this total mileage.

In foreign countries the use of metal for wood on railroads has passed beyond the experimental stage. Practical tests are now being made in this country, and interest in the subject among railroad men is increasing.

A section of track on the New York Central and Hudson River road, about a quarter of a mile in length, was laid with the modified "Hartford" tie. Mr. Walter Katte, the engineer of the road, reports as follows regarding this experiment:

"The ties (metal) were laid in November, 1889. The line has the heaviest kind of freight and passenger traffic.

"Passenger engines, with a weight of 36 tons, on four driving wheels and a driving wheel base of 6 feet, pass over these ties at speeds of 40 to 55 miles per hour. The ties have not been in use long enough for the expense of maintenance to be determined. Apparently it is thus far no greater than with wooden ties. The reason for using these ties was the desire to secure economy over wooden ties, and to obtain a superior attachment of the rails to the ties. The result has so far been quite satisfactory. I am of opinion that the rolled metal tie is essentially a requisite for first class permanent way in this country. Having investigated the relative economy of metal and wooden tie systems for a term of fifty years, I am led to believe, as the result thereof, that upon the basis of 55 cents for a wooden tie and \$3 for a steel tie, and under the conditions of traffic and maintenance expense existing on this line, the relative economy is from 8 to 12 per cent in favor of the metal system."

The general adoption of metal in place of wood for railroad ties would check the enormous consumption of the young growth of our forests. On this point Mr. Fernow, of the Forestry Division, makes this forcible statement: "The use of wood, and the method of using it, are largely matters of custom everywhere. In the United States the enormous supplies which the native forests yielded have not only induced a very extensive, but also a very wasteful use of wood, until now we have reached a point when the prospect of reduced supplies makes the study of economics a matter of national concern, and within a not too distant time private interest will also be awakened to the need of it."

To inventors, a wide field of study and usefulness is open, in devising good and economical applications of metal for ties and rail connections.

The Lick Observatory.

The Lick observatory, with its large number of instruments and its famous telescope, is now one of the best equipped observatories in the world. The great telescope has proved to be all that was expected, and has repeatedly proved its unsurpassed power. A recent circular issued by the director, Prof. E. S. Holden, discloses the work in hand there, the great opportunities for future investigation, and unfortunately makes clear its absolute need of funds. It has only five observers, a small number when compared with twenty in the Greenwich, England, observatory, seventeen in Harvard College observatory, nineteen in the Washington observatory, and so on. The great glass, the triumph of Alvan Clark's life, needs better support than this. The demands specifically made are very modest; a computer and an assistant photographic astronomer are all that are asked for. An endowment of \$60,000 would secure these and provide for the increase of their rather limited salaries in the future.

We can but hope that Prof. Holden will find his demand attended to, and that success will attend his efforts for the Lick observatory.

Audubon.

Under the auspices of the New York Academy of Sciences a movement has been inaugurated to erect a monument to the memory of the great naturalist whose name heads this article. An Audubon monument committee has been appointed by the Academy, a design has been prepared for the monument, and it is now the desire of that body to raise a sufficient sum of money to erect it. It is estimated that \$10,000 will be required. Such sum is but a small tribute to the services of the incomparable Audubon, the prince *par excellence* of field naturalists, and one who combined with his scientific attainments the attributes of the refined sportsman. He studied bird-life in the field. He was not content to work within the closet, and to be a mere classifier of specimens. The scope of his researches included all the habits of birds, their food and even their characteristic positions. His unsurpassed illustrations were the result of study from life, not from specimens, and inaugurated a system of study of natural history that hitherto has had too few followers. Its laboriousness and the patience it exacts from its votaries have probably deterred many from its ranks.

To-day the remains of Audubon rest in Trinity cemetery, within a short distance of his home and of the park named after him. In 1851 the interment took place, and as yet there is no monument there. The neglect thus manifested should be soon disposed of. It is hoped that the monument may be erected this fall. The treasurer of the committee is Dr. Thomas Eggleston, of Columbia College, N. Y., who will gladly receive contributions from all interested.

Hindrances to Inventive Progress.

What are the chief discouragements to inventive progress? One of these is the hindrance imposed by the existence of inferior methods for accomplishing works of the same class to which improved means would apply. To this is allied the suppression of valuable patented devices in the interest of monopolies, their suppression in the interest of labor, and the competition among inventions themselves. Great as the influence of the patent system has been and is, in the encouragement of invention, it has nevertheless been very considerably abused in enabling the purchase and suppression of valuable inventions by parties interested in maintaining methods that the new means would otherwise supplant. Persons controlling corporations, or exerting, either directly or through connections, a powerful influence therein, are often enabled to secure a preference for one device over something that may be far superior. Great corporations enjoying monopolies of their business are likely to be indifferent to the improvement of their service in the interest of their patrons and the employment of better means for the convenience of the latter, unless they have been thoroughly taught that it is for their interest to do so. The telegraph and telephone monopolies in this country are instances of this; the former resting upon the assimilating capacity of a large accumulation of capital in one enterprise, and the latter upon the proprietorship of a basic invention. The practical adoption of any improvement in the telegraph or telephone would not at present be possible without the consent of these companies. The supplanting of one form of machinery by an improved form, and the injury or destruction of enterprises with their capital invested in the old, is one of the greatest elements of cost or waste in modern production, and manufacturers are obliged often to figure very closely to see whether it would profit them to adopt some improved method.

It frequently happens that no sooner has a new way of doing something been perfected and set in operation than some one else comes forward with still another means of reaching the same result, and either by his competition prevents the other from reaping fully the anticipated harvest of his skill, or supersedes the former method entirely and ruins the enterprise. The opposition of labor to the introduction of new inventions is very old. From the early days of the power loom and the railway down to the present time the story has been the same—on the part of the workers the most strenuous opposition to the employment of labor-saving devices, for fear of being thrown out of work. Experience has shown us that, on the whole, there has been no loss of occupation for the working classes from this cause, since the increased production attendant upon the use of labor-saving machinery and the creation of new industries causes a demand for labor under the new conditions at least equal to that existing before. Yet nearly every mechanical device that does the work formerly performed by several persons can hardly fail to effect great injury to many individuals, and even to large classes of workmen, by reducing them from the ranks of skilled to unskilled laborers, and disturbing the equilibrium of industry.

The progress of invention would be, doubtless, very much more rapid were it not for this opposition on the part of labor, and production would be correspondingly cheapened. Organized labor has of late years exerted a powerful influence against the substitution of mechanical processes for the more slow and costly hand work. That strong organization in the boot and shoe

industry, for instance, the lasters' union, forbids the employment of machinery to do any part of the work within its province, and, in consequence, some very costly devices in shoe shops have been compelled to stand idle. Owing to the objection of the Knights of Labor, the use of power presses in the engraving department of the National Bureau of Engraving and Printing at Washington is not allowed, although the cost of production is enormously increased to the government by the employment of hand presses. Labor cannot be blamed for this opposition in its own behalf, any more than capital can be blamed for combating any measures that tend to limit its liberty of action.—*Sylvester Baxter, in the Cosmopolitan for April.*

The Relation of Bacteriology to Nose and Throat Diseases.

At a recent meeting of the British Laryngological and Rhinological Society, Dr. John Macintyre, of Glasgow, gave an interesting lecture, introductory to the discussion on the relation of bacteriology to the diseases of the throat and nose. In the course of his lecture Dr. Macintyre discussed the general facts concerning bacteriology, such as classification, vital phenomena, etc., and stated the arguments for and against the vitalistic theory of disease. He demonstrated a large number of specimens of well known forms of micro-organisms under the microscope, as well as numerous micro-photographs on the screen, and made special reference to those of interest in throat and nose work. He showed several found in the mouth and nose of healthy people, which are apparently harmless, and others found in diseases where there is decomposing material such as in *ozæna*. He referred to the specific forms found in diseases of the lower part of the respiratory tract, as tubercle, lupus, diphtheria, pneumonia, and suppurative diseases. Lastly, he discussed the question how protection was to be got from the diseases associated with micro-organisms, noting the result of inoculation, and criticised the theory of phagocytosis. He explained some interesting experiments now being made in Glasgow with reference to the hypodermic injection of chemically pure carbolic acid, which bid fair to demonstrate the possibility of rendering the effects of certain pathogenic micro-organisms inoperative within the body. In considering the possibility of rendering the tissues unsuitable for the growth of organisms after their entrance into the system, he cautioned his audience not to be carried away too hastily by Koch's or Liebreich's methods of treatment for tuberculosis.

[The above, is from *The Lancet*, London, considered good medical authority. The remedy proposed for ordinary throat and nose diseases may be worthy the consideration of physicians who have cases of la grippe under their charge. It is a fact that the latter disease is very prevalent in a great many of our populous places, and that it seriously affects the nose, throat and respiratory organs, and it is not improbable that the cause may be produced by some form of bacteria which the remedy proposed may relieve. But persons should beware of the use of carbolic acid in the manner suggested, except under the direction of a skillful physician.—ED.]

Dangers of Bad Steering Gear.

A decision given out recently by Judge Swan, of the United States district court in Detroit, contains a warning to vessel masters to look after their steering gear. On April 28 of last year, the steamship Cayuga, entering the St. Clair River, met the propeller Wilson towing the schooner Manitowoc. The steamers passed all right, port to port, but the Cayuga had hardly passed the Wilson when she suddenly sheered, until she caught the tow line of the Manitowoc on her stern. She then scraped down the line until she struck and sunk the Manitowoc. The Cayuga's defense was that the accident was unavoidable. It was claimed that the chain of the Cayuga's steam steering apparatus became suddenly and inexplicably out of order, and that as soon as this was discovered she was reversed at full speed. Upon these proofs Judge Swan decided that the Cayuga was entirely to blame. The Manitowoc showed that the chain of the Cayuga was very improperly adjusted to the quadrant. The latter is a fan-shaped device attached to the rudder shaft, provided with grooves for the chain to run in. It was shown that when the helm of the Cayuga was put hard over one way or the other, the free chain would become so slack as to slip out of the groove in the quadrant and become useless when called upon again in putting the helm the other way, unless replaced in the groove. This Judge Swan held to be very clear negligence.

DECORATING WALLS.—A rich and brilliant effect, according to *Furniture and Decoration*, is obtained in walls intended to be decorated by mixing an equal quantity of marble dust with the lime used in making the plaster. This gives a softness of tint which cannot be obtained with ordinary plaster. In Italy it has long been the custom to give a final coating of marble dust to walls intended to be treated by the wet process.