

forms that combine delicacy with strength, and to abhor the loading of any structure with material that, performing no useful function, merely adds dead weight, an ultimate source of weakness.

The influence of conditions like these is radical; and American carriage building has, therefore, followed its own lines of development, not only in perfecting styles originating abroad, but in creating other styles specially adapted to the varying requirements of different parts of the country, and the preferences of individual minds untrammelled by fashion or undue deference to established forms and usages.

As one of the foremost leaders in the development of this important industry the house of Brewster & Co., of Broome street, may fairly be selected as a representative in this series of illustrations of American industry.

The factory and warerooms of Brewster & Co., formerly on Broome street, are now situated on Broadway, extending from 47th to 48th street. In this building, a five story structure, 200 by 175 feet, is built every description of pleasure carriages, from the massive four horse drag introduced by Colonel Kane for fashionable coaching, to racing sulkies weighing no more than forty-three pounds.

To obtain a comprehensive idea of this establishment, one must take the elevator and ascend to the top of the building; thence in gradual descent visit each department, beginning with the body making, continuing with the painting of the bodies and running gear, and ending with the finishing department on the second floor, where the parts of the vehicle are put together and given the finishing touches.

At the upper left corner of the illustration is shown a powerful bending machine, in which those portions of the framework requiring curvature are brought to shape. Hickory, ash, elm, oak, and whitewood are used, according to the service the part is to undergo; and the machine gives the desired shape without breaking the grain.

At the lower corner the body of a leather-topped landau is shown in process of construction. When complete, the woodwork of the body is transferred to the blacksmith shop in the basement to be hung and ironed.

After ironing, the body is submitted to the inspection of the superintendent, and then taken to an upper floor for painting—an important part of the work, but one calling for no special description here. The testing of the finished carriage is the only scene that breaks the general gravity of the entire process.

It must not be forgotten that, while they have been leaders in the development and perfecting of the art of carriage making, Brewster & Co., of Broome street, have always been quick to adopt improvements made by their own workmen or by outside inventors.

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Table listing contents of the supplement including sections on Engineering and Mechanics, Technology, Chemistry and Metallurgy, Electricity, Light, Heat, etc., and Medicine and Hygiene.

KEEP TO THE POINT.

In very much of the talk in Congress and out of it about the proposed amendment of the patent law, there is a tendency on one side to neglect, on the other to adroitly conceal, one vital feature of the entire patent system, namely, that a patent is not a grant of privilege, but a contract on the part of the government to secure to the inventor for a prescribed period a right which exists by virtue of the inventor's creative act.

The sole object of the patent system, as announced in the Constitution, is to promote the progress of science and the useful arts; the only method by which this end is to be gained is by securing, for limited times, to authors and inventors the exclusive right to their respective writings and discoveries. The right is recognized as inherent: Congress is to secure that right for a term of years, on condition of its free surrender at the close of the term.

The experience of this country has been that the surest way to promote progress in the arts is through the encouragement of invention; and that inventions are best encouraged by securing to the inventor his right to his own, at the least expense in time and trouble and money. As Commissioner Hoyt has expressed it: "From the very foundation of this government, it has been its settled policy to secure a just reward to all inventors; and it is to the inflexible maintenance of this policy that we are indebted for the unparalleled advancement which, as a people, we have made in the useful arts."

That the policy of the nation has been wiser as well as juster than many people (even among the agents of government in Congress, in the courts, and in the Patent Office) have always approved, is only too true. Witness the grievous injustice that has been done to some of the noblest and most beneficent of our inventors in the markets and in the courts; witness the grievous injustice to all inventors threatened in the proposed changes in the law now before Congress; but the constitutional principle remains. Congress has power only to make the inventor's exclusive right secure. Congress has no right under the Constitution to impose needless burdens upon the patentees, or to interfere with the patentee's unrestricted right to the use and profit of his invention after he has surrendered his specification.

That the proposed amendment of the law undertakes in various ways to accomplish both these unjust and impolitic ends has been shown repeatedly in these columns, particularly with reference to sections two and eleven. Indeed the hand of the infringer is so plainly visible in these, and to a less degree in section one and some of the other sections, that the bill should be overwhelmingly defeated unless these features are stricken out. The single fact that the parties chiefly interested in its passage are not inventors, but those who wish to profit by the inventions of others without being called to account therefor, should arouse inventors, and the public so greatly benefited by their labors, to the necessity of bringing public opinion on this important matter to bear forcibly and promptly upon their representatives in Congress. The American patent system is intended to benefit the public, as a whole, through the protection of inventors. The obnoxious features of the proposed amendment are intended to benefit a few, through the protection of infringers, through the limitations of inventors' rights, through the summary confiscations of the inventions of poor men. The choice between the system as it is and as the change would make it, would seem to be an easy one to make by all clear headed and honest men.

THE ESTABLISHMENT OF PUBLIC TOWN LIBRARIES.

At the late Conference of British Librarians in London, the last resolution adopted was, that "the Council be recommended to take all opportunities of influencing public opinion in favor of the Public Libraries Act." The power given by this law of 1851 to towns, annually to raise money by local tax to maintain free libraries, has been very acceptable to the people; and it is an evidence of it that, at the end of twenty-five years, every large town in Lancashire has established one. At the last conference of American librarians also, the same spirit was manifested. A committee was appointed to devise measures for the increase of town libraries, and to report a suitable form of law in respect to them adapted for enactment by those States which have not yet had any law upon the subject.

readers of the SCIENTIFIC AMERICAN. They have the education, the energy, and force of character to produce the most substantial results; while, at the same time, there is no class who would reap more solid advantages from these institutions than they would. In such a library, maintained in a village of, we will say, not more than two thousand inhabitants, there would be provided, besides the books for circulation to be read at home, for the public reading room, the best encyclopedia of a general character at the outset, and gradually afterwards encyclopedias of specialties, of agriculture, civil engineering, and all the arts and the natural and physical sciences.

It must be acknowledged that though we have reason to suppose that all would echo their approbation of the project of a library to be maintained at the expense of the town, yet in each locality the impulse must be given and sustained by the activity of one or two earnest minds. Thus in Massachusetts, more than a third of the three hundred and forty-six towns have availed themselves of the powers and privileges of the public libraries law, also like the English of the year 1851. But Texas, which has also passed a law allowing towns to tax themselves for the like purpose, lacks the zealous citizens in each large town to make the law effective.

It is not known to more than a very small proportion of the voters of the State of New York, that for seven years past, since 1872, there has been a law on the statute book giving the towns and villages of the State the right to tax themselves to sustain a public library. We should be happy to obtain the name of any town where a public library has been founded and maintained under the provisions of that law. This result shows that merely to secure wise legislation is but a small part of the work which is necessary to be done to secure reading for adults as public and free as is the public school for children.

Men who are longing for libraries for their own towns may often find that existing laws give greater facilities for action than they have supposed. Let them seek for active co-operators among their fellow citizens; let them seek for donations and bequests, or the transfer of some library association to the town, that the new enterprise may start off on a broad and solid foundation.

FOREST CULTURE PAYS.

That in the long run it would pay to reclothe the waste and untillable lands of our country with forest trees, no one doubts. Future generations will need wood and timber, need it badly, we fear; and it will be doing the future good service to make provision for their wants now. No one doubts that; but very few care to labor for that end in the absence of more immediate remuneration, and very few are aware that it is not necessary to wait a hundred years for a timber crop to pay. The writer has not yet struck the downward slope of age, yet he has seen large areas of timber land cleared three times; and the second and third growths have yielded a larger body of wood than the original forest. This without specific cultivation.

With cultivation, Mr. Richard S. Fay, in Essex county, Massachusetts, has demonstrated that a forest crop will begin to pay expenses in a very few years, and in the course of ten years will bring in a handsome profit on the whole capital expended. Some thirty years ago Mr. Fay planted an untillable portion of his estate near Lynn with European larch and other forest trees. Up to a year ago the thinnings from this plantation, according to the Massachusetts *Ploughman*, yielded some seven hundred cords of firewood, besides a large amount of fencing material. Last winter the thinning produced:

175 cords of firewood, sold at an average of \$5.50	\$962.50
500 larch posts, 25 cents	125.00
51 larch telegraph poles, \$1	51.00
100 larch railroad sleepers, 50 cents	50.00
	\$1,188.50

The area planted is not given; it was, however, worthless for regular agricultural uses, and as the crop of last year is likely to be repeated from year to year, without diminishing the final crop, the investment is looked upon as fairly profitable. We are happy to believe that in many portions of the Eastern States the area of timber land is greater than existed twenty years ago. Still there are thousands of barren acres in almost every county, that would speedily become a source of profit, if the owners could be made to realize the advantage of planting trees, or of protecting the early natural growths from the depredations of sheep and cattle.

HARBOR OF REFUGE ON THE PACIFIC COAST.

There is a project before Congress to build a harbor of refuge somewhere between San Francisco and the Strait of Fuca. These points are over 700 miles apart, and yet between them there is not a single harbor that can be entered in a southerly gale. There are, it is true, many open anchorages scattered along the coast between these places, which afford reasonably good protection for vessels against the northwest winds and seas that prevail in summer, but there are none that a vessel can enter in heavy weather when the wind is south, southeast, or southwest, as it frequently is in the winter season. The want of such a harbor of refuge will be seen when we state that since January, 1861, no less than 427 disasters have occurred to the shipping on the Pacific coast north of San Francisco, whereby hundreds of lives and millions of dollars were lost, many of which might have been saved had there been a suitable harbor of refuge.

There are three convenient places where a harbor might

be made, namely, Port Orford, Coos Bay, and Foulweather Cape. The first of these is just about half way between San Francisco and the Strait of Fuca; Foulweather Cape is 120 miles to the north; and Coos Bay between the two. Surveys have been made by government engineers of Port Orford and Foulweather Cape, but for some reason not explained Coos Bay has not been examined, or at least no report on it seems to have been made.

Port Orford appears, from its geographical position, to be the best place for the harbor. It is easily accessible, presents a deep and capacious roadstead, offering secure anchorage from gales from all points except south, southeast, and southwest; the land around is high and prominent and presents all the materials easily accessible for a stone breakwater. All that is now needed to make it a secure harbor of refuge at all seasons is a breakwater, behind which vessels can ride safely at anchor during gales from the south, southwest, and southeast.

The government engineer, Major Wilson, states that a breakwater 5,000 feet long would secure a harbor of about 300 acres, and would give ample protection to a large fleet during the heaviest gale. Such a breakwater is estimated to cost \$9,405,000. It is thought, however, that for present purposes a shorter one could be built of about 2,000 feet, for \$3,427,000, and this could be extended when necessary.

Cape Foulweather, the other place proposed, is a promontory whose crest line runs from east to west at right angles to the general line of the coast, making bays to the north and south. On the north the shore line is crescent shape, the outer extremity pointing north, a reef making out from it in a direction north-northeast a distance of about 5,000 feet, terminating at a lone rock about 1,800 feet from the beach. The depth on this reef varies from 10 to 30 feet, except for a distance of about 1,200 feet near the cape, over which there is a channel of that width and of a depth of from 30 to 40 feet. By building a breakwater from the extreme point of Cape Foulweather northward inside of the reef above described for a distance of 600 feet, a very good harbor would be secured. This would inclose an area of about 100 acres, under the lee of the cape, with good anchorage in from 4 to 8 fathoms of water. It is believed that this small breakwater could be built in that locality for about \$670,000, and that the harbor would be sufficient for the present. If desired at any future time it could be enlarged by extending the breakwater along the reef. This harbor with the 600 feet of breakwater would, however, only be available in south and southwest gales, but during heavy weather from the northeast vessels could anchor on the other side of the cape.

Another plan proposes that a breakwater some 9,900 feet long shall be built on the south of Cape Foulweather, starting from Zaquima Head below the cape, running west, and then curving to the north. This would inclose about 1,000 acres, but its cost would be very large—over \$11,000,000.

THE SOCIAL SCIENCE CONVENTION.

The annual meeting of the American Social Science Association was held in Boston, January 8. The meeting was opened by the reading of a letter from the president, David A. Wells, explaining his absence and reviewing the progress and opportunities of social science. Never before in the history of the world have so many and so important questions—fiscal, economic, educational, sanitary, and moral—pressed themselves upon the attention of the public.

The steamship, the railroad, and the telegraph are breaking down the old and formidable barriers of nationalities, and, for the purpose of business, are making the whole world one country, a condition of things under which the great fundamental truth of modern political economy, that nations and individuals are alike benefited and never injured by the prosperity of their neighbors, will be more than ever manifested. All methods of production and exchanging are also undergoing modification, with the certain result, which no legislation can prevent, even if it were desirable that it should, of economizing labor and material, and the cheapening of production. During, and in consequence of these changes, and for years yet to come, there will be much of discomfort, and undoubtedly also of suffering, from the displacement of individuals from occupation and their readjustment in new positions or locations. Millions of capital now useful and returning an income to their possessors, are certain, in the no distant future, to be also made worthless, as the course of improvement requires that they shall be, in order that protection maybe cheapened and made better. But the ultimate result will be undoubtedly greater abundance, less poverty, and a higher elevation of the race. To forecast the course of economic agencies and events; to help make the burden of disturbance and change in occupation less grievous to the people; to help overcome that moral inertia among the masses which greatly prevents them from helping themselves, and accommodating themselves with rapidity to the demands of progress, are all questions and problems pre-eminently within the domain of social science.

And if there is any advantage in associated efforts over individual and isolated effort, in the way of determining and disseminating truth, then, Mr. Wells concluded, the American Social Science Association has the largest of opportunities before it for future benefaction.

Perhaps the most remarkable paper read before the association was that of Mr. George T. Angell, of Boston, on "Public Health Associations in Cities," and it was remarkable chiefly as a tissue of extravagant assertions with regard to the adulteration of foods, drinks, medicines, and

so on. The single fact that men do eat and drink and live is proof that matters cannot be anywhere near so bad as Mr. Angell asserts. He says in one place:

"Several mills in New England, and probably many elsewhere, are now engaged in grinding white stone into powder for purposes of adulteration. At some of these mills they grind three grades—soda grade, sugar grade, and flour grade. I am told that thousands of tons of it have been ground in one town of Massachusetts. It sells for about half a cent a pound."

Statements like this would have had some weight if Mr. Angell had merely taken the trouble to procure some of the ground stone for exhibition, with samples of soda, sugar, and flour containing it. How does Mr. Angell know that the thousands of tons of ground stone furnished by his single Massachusetts town are not used for perfectly legitimate purposes?

Again, with regard to milk, Mr. Angell says: "It is not water alone that is mixed with milk. Thousands of gallons, and probably hundreds of thousands, are sold in our cities which have passed through large tins, or vats, in which it has been mixed with various substances. Receipts for the mixture can be bought by new milkmen from old, on payment of the required sum. I am assured, upon what I believe to be reliable authority, that thousands of gallons of so-called milk have been, and probably are, sold in this city which do not contain one drop of the genuine article."

Our knowledge of Boston milk is but the slightest. It may be very grievously adulterated; but a single pint of imitation milk containing "not one drop of the genuine article" would have been worth more as evidence of adulteration than twenty columns of Mr. Angell's unsupported assertion. On such points social science demands facts, not what any man simply believes. Again, Mr. Angell says: "A large portion of our California wines are made in Boston cellars." Mr. Angell ought to have been able to furnish a shadow of evidence of such an extensive industry—if it had any real existence.

If the Social Science Association desires to secure or sustain a reputation for scientific spirit and character, it should insist that the honor of American industry shall not be thus ruthlessly assailed at its conventions, without abundant proof that the speaker knows what he is talking about, and is not given to reckless exaggerations. It should not allow its meetings to be made the spouting place of sensationalists and fanatics. Personally Mr. Angell may be all that his name implies; we have no knowledge of him whatever; yet we do not hesitate to say that he has grievously overstated his case. The cause of honest dealing is not advanced by such wholesale charges of criminal misdoing on the part of traders generally. That more efficient means should be adopted throughout the country for detecting and punishing adulterations, we are ready to admit; nevertheless we are persuaded that it is easily possible to furnish our tables with pure and wholesome meat and bread and wine—even with pure coffee, and pickles without copper—in spite of Mr. Angell's assertions.

SETTLEMENT OF A DOUBTFUL GEOLOGICAL POINT.

The use of the term "Hudson River Group," proposed by the New York geologists to designate the upper two members of the Lower Silurian system—the Utica and Hudson river shales—has long been a debatable point among other geologists. This term was rejected some years ago by Messrs. Meek and Worthen, on the ground that these rocks did not reach the Hudson river, and hence it was a misnomer. They proposed the substitution of the term "Cincinnati Group," on the supposition that the Lower Silurian limestones were the equivalents of the so-called Hudson river rocks of New York. This change was accepted by Professor Dana and other geologists, and thereafter in the current classification of the Lower Silurian the upper members were called the "Cincinnati Group."

Subsequently, however, Professor James Hale and Sir William Logan made an examination of the Hudson river region, which led to a clear recognition of the slates and sandstones of the Hudson river group on both sides of the river, as originally designated and limited in significance by the New York geologists, and constituting by itself the entire mass of the formation. On the west side of the river they traced the formation as far as Kingston, and on the east side as far south as Rhinebeck, which they supposed to be its eastern limit. In the geological map drawn by these gentlemen and appended to the report of the Canadian Geological Survey, the rocks on both sides of the river, from Rondout on the west and from Rhinebeck on the east, extending southward, are designated as Calciferous and Levis. In regard to the latter rocks, Dana observes, in his *Manual of Geology*, that as they have afforded no fossils, their age is still doubtful. We learn now, however, from the Proceedings of the Poughkeepsie Society of Natural Science, that this doubt has been set at rest. Professor T. N. Dale, in a paper read before that society December 4th, stated that he had detected an abundance of fossils—brachiopods, univalves, crinoids, and fucoids—in both the rocks around Poughkeepsie and in those on the opposite side of the river. These Professor Hale identified as peculiar to the Hudson river group. This would seem to settle the fact that the New York State geologists were correct in their first determination of this formation. A statement of Professor Dale's discoveries also appears in the *American Journal of Science and Art*, for January, 1879.