Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year, postage included.....$3 20
One copy, six months, postage included..... 1 60

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Overten copies, same rate each, postage included..... 2 70

☞ By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribingwill please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the formeraddress is given.

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 11. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, MARCH 11, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 11.

For the Week ending March 11, 1876.

TABLE OF CONTENTS.

THE publishers of *Forest and Stream* have opened, at their office, 17 Chatham street, in this city, a "Kennel Stud Book," or register for recording the pedigree of thoroughbred dogs. This work will undoubtedly in time occupy the same important position among the owners and breeders of pointers, setters, and spaniels that the "Herd Book" now does among the admirers of fine cattle.

THE COMING EMPEROR.

When the sovereign of a great country visits a sovereign people, not imperially, to conquer or conciliate, but as a private gentleman, to study their works and ways for the benefit of his own subjects, it is obvious that a new order of royal entertainments is called for. The greeting which a barbaric empire like India accords to its future ruler may fitly be characterized by barbaric shows, parades, illuminations, and festive entertainments; but from a free people, to an enlightened sovereign like the Emperor of Brazil, such things would be out of place, and utterly distasteful.

He comes for information, not to be bored with windy speeches or pretentious dinners. Our local cooks and officeholders have few charms for him, compared with the achievements of our explorers and pioneers, our engineers and inventors, our scientific and industrial leaders. We shall, therefore, entertain him most royally by furthering to the utmost the real objects of his visit, showing him, in the most unobtrusive and sensible way, our physical and industrial resources, our works of internal improvement, the means by which a great wilderness has been conquered for man. The great region which he is doing so much to improve is still very largely similar in condition to what the Great West was a few years ago—a land of fertile plains untilled, broad rivers barren of commerce, mountains of precious metals undisturbed. He has railways to build, internal navigation to develop, immigration to foster, and a wild country to subdue and make tributary to the needs of men. His expressed desire is to study on the spot the means and methods by which this country has been so rapidly and enormously developed, withal so largely brought under the dominion of science and civilization. And we may be sure that he will not thank us for any attentions which may draw him away from the grand purpose of his visit.

We may be equally sure that he will be royally grateful for any proper assistance that may be given to the prosecution of his studies. There is talk of his entering the country by way of the Mississippi. That course would be singularly happy, since it would lead him straight to an engineering enterprise in which he cannot but take the highest interest; and at the same time his visit would give *éclat* to the completion of a work which may do very much to increase the social and commercial relations of the two countries. It is morally certain that, by May, the Mississippi will be open to navigation by vessels of the highest class, and nothing could be more appropriate than for the ruler of the Amazons to be the first to demonstrate the freedom of the Mississippi to the commerce of the world. It requires no prophet to foresee that the largest river of the world and the longest are plainly destined to furnish each the principal market for the productions of the other. The one extends, from north to south almost across the temperate zone, draining the heart of the most productive valley—and likely to be the most populous—in the temperate regions of the globe. The other drains a vast basin, almost wholly within the tropics, and extending across a tropical belt covering thirty degrees of longitude. Between the two there can be no rivalry, for their products are wholly diverse, yet each produces what the other lacks. Before the next Centennial celebration of our country, the trade between these two regions will be vast beyond the wildest dreams of to-day.

A passage from New Orleans to St. Louis, on one of the floating palaces of the Mississippi river, will show the Emperor, as no other journey can, the future aspect of his own great river when it shall have become the highway of a boundless commerce. How many of the cities of the West he proposes to visit, we cannot say: enough, no doubt, to enable him to study the working of our railway system, and other great works of internal improvement. Compared with these, the Exhibition, great as it promises to be, will be but a secondary attraction.

The termination of his visit may be as happy as the beginning, for he will take his departure from this city just about the time when the Hell Gate improvement will be ready for the finishing stroke, and we venture to say that no ceremony of state could give him half the pleasure, as to witness the final victory of Science over Nature, in opening up a new and better channel for the commerce of our metropolis. It is to be hoped that obtrusive placemen will respect his wish to travel as a private observer, and leave him free to enjoy a most unconventional "royal" welcome by the scientific and industrial magnates of the land.

THE FATHER OF WATERS.

We publish, in this week's SCIENTIFIC AMERICAN SUPPLEMENT, a remarkable document written for our paper by James B. Eads, C. E., of St. Louis, being a review of the Report of the United States Levee Commission, made in 1875. This board was appointed, by authority of Congress, to report a permanent plan for the reclamation of the alluvial lands of the Mississippi river. The subject is one of extraordinary importance, as will be readily understood if it is considered that the area of the lands that might be saved to agriculture, by a proper system of reclamation, is estimated at about 70,000 square miles, of unsurpassed natural fertility, and capable, if peopled as thickly as Belgium, of supporting a population of over 300,000,000.

In this aspect of the subject, the work of reclamation may be justly regarded as perhaps the most useful and important engineering enterprise now before the civilized world. Its successful accomplishment would vastly add to the prosperity of our own country, and benefit all nations, by enlarging the special domain of food supply, besides opening the Father of Waters to the free commerce of the world, floating the largest vessels for an inland distance of fifteen hundred miles.

By reference to the review, it will be seen that Engineer Eads and the Levee Commission have arrived at diametrically opposite conclusions, not only as to the best method of executing the work, but as to the results that might be expected from the adoption of their respective plans. The subject is a grand one, but the principles involved are simple, and their relative correctness would seem to be capable of determination without serious difficulty. The most curious thing is that practical engineers should disagree about the matter.

The Levee Commission aver that the volume of the Mississippi is too great; hence the overflow, to prevent which they recommend a reduction of the river volume by means of side channels. These are expected to conduct large portions of the water to the Gulf, and thereby reduce, as they allege, the flood discharge to the limits of the levees. They further advise the raising of the hight of the artificial banks or levees, the cost of which they estimate at forty-six millions of dollars ($46,000,000). This expense, although large when exhibited in figures, is as nothing compared with the gain to be derived from a successful reclamation.

The chief questions to be settled are: Is this plan practicable? Will a reduction of the river's volume diminish the flood discharge? What has been the experience on the Mississippi and on other rivers having analogous bottoms? Is it not a fact that, below the points where side channels have been formed and water drawn off, the river bottom has become filled up, and the flood level raised? Is it not true, in respect to other rivers, that their flood levels have been lowered by increasing rather than by diminishing the river volume, by stopping up old side channels rather than opening new? Is it not plain that, in an alluvial bottom like the Mississippi, the quickest and best way to lower the flood level is to deepen the bed of the river?

Will not the river deepen its own bed if its volume is increased?

The weight of evidence, derived from past experience on the subject, clearly gives an affirmative answer to the latter question, and this, substantially, is the position taken by Engineer Eads. He declares that the recommendations of the Levee Commission are founded in error. He avers that the proper way to lower the flood line of the Mississippi is to do the very opposite of that recommended by the Commission. He advises that the side channels be closed, so as to increase the volume of the water; and that, excepting repairs, the levees be not raised, because the increased flow will deepen the river bed, rendering the artificial building-up of the levees unnecessary. He adduces an array of practical evidence, in support of his position, that seems unanswerable.

We shall recur to the subject hereafter.

SOME ANNALS OF A SUCCESSFUL INVENTION.

If we may judge from *Punch's* frequent cartoons, and from the attention paid to the subject in the English journals, all England is undergoing a skating mania, which outrivals the velocipede *furore* of six years ago. It is not gliding over the ice on glistening steel blades which has captured the British fancy, for frozen lakes and rivers in England are of rare occurrence, and it is now several years since any regular skating club has had its winter carnival. Asphalt floors have replaced the ice; and over their smooth surface John Bull cuts "spread eagles" and "figure eights," and otherwise disports himself on that ingenious Yankee invention, the roller skate. There is an interesting history connected with that device and its inventor, which may here be reviewed. It is a record of how an enterprising man has managed, and is managing, an invention so as to make it yield a fortune, how he has fought and triumphed in protecting his right; and, at the same time, it conveys suggestive thoughts as to the value of popular devices, not merely at home but abroad, emphasizing in brief our oft-repeated assertion that the inventor's field is not restricted to any one country, but is as wide as the world itself.

It was about eighteen years ago when a then-termed "parlor" skate *furore* broke out in this vicinity. Halls in various parts of the city were fitted up with smooth floors, and one part of the public flocked thither and hired the skates at so much per hour, while another portion paid for the privilege of viewing the others learn how to manage the new invention. Education in that direction, though vastly amusing to lookers-on, was just the reverse to the learners; for however good skaters on ice the latter might be, they soon found out that managing roller skates was a very different affair, that gliding straight ahead was easy enough, but to attempt to guide oneself by turning the foot was to invite sudden and painful precipitation to the floor. Perhaps for this reason public interest in the first forms of parlor skate soon waned. Meanwhile, however, Mr. J. L. Plimpton, of this city, perceiving the difficulty, set to work to remedy it by devising a skate which would keep the floor without reference to the angle of the body or the sharpness of the curve turned. With remarkable perseverance he labored on for several years, expending some $25,000 in fruitless efforts. Finally, however, he produced a device which a learned English judge has recently pronounced "almost as ingenious as the wonderful adaptation of bones to be found in a horse's pastern and fetlock." In the center of the sole of the skate, he fixed a spherical spring of india rubber, yielding to the slightest inclination of the foot, a mere change of motion by well known mechanical means causing the axles of the roller wheels to converge. This invention was patented in this country, through the Scientific American Patent Agency, in January, 1863, and subsequently in England, in 1866.

His device perfected, Mr. Plimpton began its introduction

in certainly an ingenious and novel way. He first fitted up a hall adapted to his purposes in this city, and for a long time practised himself, and taught invited friends to use his skates. Afterwards he took with him a few of his best drilled pupils to other cities. In lieu of hiring a room and trusting by general advertising to draw a promiscuous throng, he would, after preparing his establishment in any town, issue neatly printed cards of invitation to the most influential people in the place. These would usually accept from curiosity, and, finding a genial, pleasant gentleman ready to tell them something new without apparently aiming at their pockets, would become interested, try the skates, and in a very short time "set a fashion" which would speedily be followed by the remaining townsfolk. No long period would elapse before the skating rink would be doing a thriving business, and enterprising investors would speedily seek a share in so profitable a concern. Then Mr. Plimpton would dispose of the lease of his hall and fixtures, with the right to use the invention within certain counties and States. His next step would be to locate in another town, and repeat the operation of introducing the invention; and thus he continued until he had sold rights for ten States to one firm, besides territory in all parts of the Union. Since 1867 he has realized $50,000 for State rights alone, and this sum is nothing beside the profits of the lucky purchasers, who generally followed the inventor's novel plan of introduction, as already described. One man bought the right in the State of California for $4,000, and resold it for $36,000; and the purchaser of the right for San Francisco, it is stated, made $45,000 in one year at the rink in that city. It would take far too much space to recapitulate all the instances of this kind, therefore we may turn to the inventor's efforts toward the introduction of his skate in England. Mr. Plimpton had already an agent in Great Britain, whose success had been very great; so the inventor concluded to join him. The presence and tact of Mr. Plimpton resulted in measures which kindled the present *furore* abroad. Rinks have been established all over England and France. In a single rink in London $500,000 is said to be invested, and in Brighton $40,000 has been refused for the establishment by its owner. Paris has a magnificent rink in full operation. The skates are manufactured in Brooklyn, where a new and large factory is shortly to be erected for this special purpose. We are informed that $60,000 worth of the skates have been made during the past six months, and that the average weekly shipment to Liverpool is now 2,000 pairs.

It could hardly be supposed that so successful an invention would lack infringers, and the latest attempt in England has resulted in a patent suit, considered so important in a legal aspect by the press of that country that whole columns of the London journals are given to *verbatim* reports of its proceedings. One Malcolmson, it appears, substituted a steel spring for the movable rubber spring in the Plimpton skate, and started rinks on his own account. He, out of a dozen infringers, was selected as the typical offender. Celebrated counsel were engaged on both sides, and Sir George Jessel, Master of the Rolls, himself a scientist and a mathematician of great ability, presided at the trial. The questions to be settled were: First, was or was not the Malcolmson skate a colorable imitation of Plimpton's device? And if it was, was Plimpton's skate "new within the realm," so as to come under the protection afforded by the patent laws to all novel inventions? His Lordship disposed of the first point by deciding that Malcolmson's device was "a simple mechanical alteration, which is, if anything, a little worse than the plaintiff's, as it cannot be adjusted," and rendered a decision at once in favor of Plimpton on that issue.

On the second question came the tug of war, and (as is usual in most patent litigations in this country) the SCIENTIFIC AMERICAN came into prominence, forming part of the defendant's evidence. When Mr. Plimpton obtained his first patent in 1863, we, in accordance with our usual custom, printed a brief abstract of the claim, and prefaced it by an editorial note describing the gist of the invention. A copy of the SCIENTIFIC AMERICAN was sent to the British Patent Office, where it was open to public inspection. At the same time the proprietors of *Jewett's Illustrations*, in which was a drawing of Plimpton's skate, together with other patent drawings used in our Commissioner of Patents' annual report, found its way to the same place. But this book, it appears, was lost; at all events, it was not discovered until during the progress of the trial. But the book containing the patent drawing and the paragraph from the SCIENTIFIC AMERICAN, which was published in connection with the claims, comprised the evidence of the defendant in his efforts to prove that the invention of the plaintiff had been introduced by publication into England before the patent of Plimpton was applied for. The courts declared against the defendant's evidence as insufficient, decided in the plaintiff's favor on all the issues, and granted an injunction restraining the defendant from using the plaintiff's invention, or any part thereof, and from selling or letting for hire any roller or runner skates not made by the plaintiff or his licensees, or differing only colorably therefrom by the substitution of mere mechanical equivalents, ordering him at the same time to deliver up or destroy those in his possession, and to pay the costs of the suit. To afford the defendant an opportunity of presenting an appeal, the judgment would, however, be suspended for six weeks; and in the meantime, though restrained from making or selling skates in infringement of the plaintiff's patent, the defendant would be at liberty to continue his rink at Brighton, keeping an account of the proceeds.

Apart from the importance of this trial to the parties in direct interest, it has a bearing of significance in relation to the rights of American inventors in England. At the present time, printed copies of all American patents, which include both the drawings and full descriptions of the inventions, are forwarded, directly after each week's issue, to the British Patent Office. From the proceedings in this trial, and the ruling of his Lordship, there can be but little doubt but that the introduction of these copies into England constitutes a publication, and therefore, in the eye of the law, an introduction of the invention, which would prevent a patent subsequently taken there from being sustained in the British courts.

But, on the other hand, this very apparent disadvantage is met and counteracted by that admirable provision of our patent law which accords to every inventor six months delay between the allowance of his patent and the payment of the second government fee. Not until that payment is made does the patent issued; and hence, during the above interval, the inventor, at once knowing that his right is secure and at his disposal at any time during the half year on his paying $20, and besides that it is kept secret from all the world, has abundant opportunity to proceed with his applications for foreign protection. Should he neglect to avail himself of that opportunity, then the unfortunate result noted in the preceding paragraph might well occur, but he can then blame only himself. There is not so great and beneficial a safeguard in the patent law of any other country; it is a standing monument to the wisdom and good sense of those who framed it.

There is one more suggestive point to be noted by way of conclusion to this already over-long article, and that is that this successful invention is one out of fifty of similar nature. Moreover it is an unimportant device, one which offers no such large benefit to humanity as does a sewing machine or an electric telegraph; it is little else than a plaything, and yet look at the money that is being made out of it! If a little thing like this, properly managed, yields a fortune what should be the proportionate returns from a great or highly useful invention—one not out of fifty, but standing alone in its value, novelty, and utility?

CYLINDER CONDENSATION.

We have recently received from the author, Mr. George Basil Dixwell, a pamphlet bearing the above title, and containing much that is of interest to engineers. Mr. Dixwell, if we may judge from his treatment of the subject, is not an engineer, but he states that he has been aided by the advice of an eminent expert; and all his experiments seem to have been carefully conducted. We could wish that he had followed the example of Mr. Isherwood, which he commends so highly, and given full details of the apparatus employed and the results obtained, in his many experiments. But it will doubtless be more interesting to our readers, if, instead of criticising, we proceed at once to give a summary of Mr Dixwell's views.

Most persons who have devoted any attention to the question of the expansion of steam are aware of the very great economy that might be realized by high grades of expansion in perfect engines, and know also that this economy is far from being attained in practice. Mr. Dixwell devotes a considerable portion of his pamphlet to discussions of the reasons for this difference, which is chiefly illustrated by the results obtained from experiments with the United States steamer Michigan: results which have been, as he states, confirmed by fifty other examples. The reasons for the enormous condensation shown by these experiments are detailed under the following heads:

External radiations, which he considers very slight in general, and which may be almost entirely prevented by covering the cylinder properly.

Conversion of heat into work. Under this head, Mr. Dixwell has given some remarks which are well worthy of attention. He discusses the point as to whether the whole work is to be considered in estimating the condensation from this cause, or only the work performed during expansion, and decides, as a corollary to some experiments which he details, that the latter measurement is the correct one. We think he could have drawn a more logical proof from Régnault's experiments on the properties of saturated steam, or from the fundamental principles of thermo-dynamics; but he is entitled to great credit for giving prominence to a truth that is too often disregarded by experienced engineers.

Internal radiation, or alternate cooling and heating of the cylinder, and re-evaporation of the steam condensed for work, is another of the causes of condensation, and Mr. Dixwell shows that the maximum amount due to this can readily be calculated. Mr. Dixwell, in common with a great many others who have examined the subject, is disposed to look with little favor upon Mr. Isherwood's theory of condensation from "expansion *per se*," and gives some pertinent reasons for accepting an opposite conclusion. Having disposed of these generally received causes of cylinder condensation, which he finds far from sufficient to account for the whole loss, the author gives his theory of the manner in which the principal loss occurs, and which he calls 'cumulative action." Suppose, for the sake of illustration, that the cylinder is so much cooled, from the causes enumerated above, that 4 ozs. of the entering steam are condensed, up to the point of cut-off, and that, during the remainder of the stroke and during exhaust, 3 ozs. are re-evaporated: the cylinder will thus be cooled to such an extent that during the next stroke 7 ozs. will be condensed, and some of it re-evaporated. At each successive stroke, the amount of condensation will be increased, until the amount of heat received by the metallic surfaces from the entering steam, up to point of cut-off, is just equal to the amount of heat lost from condensation due to causes previously enumerated, increased by the amount of heat required for re-evaporation. Hence this action, which multiplies the effect of primary condensation, may properly be called "cumulative."

In his interesting review of the causes of cylinder condensation, we think that Mr. Dixwell is somewhat in error when he assumes that the results obtained from the Michigan experiments are generally applicable; and we think that he overlooks some important elements, notably the effects of the relation between diameter, length of stroke, and piston speed. As far as he has gone, however, his views are very reasonable. Having discovered all the causes of cylinder condensation, as he imagines, Mr. Dixwell next discusses the means of preventing it, showing the effect of steam jackets, compounding, and the use of superheated steam. He has devised a pyrometer which can be placed in a cylinder, and will give the temperature at various parts of the stroke, by means of suitable connection with a dial on the outside. We regret that the author did not devote more space to a description of this instrument, but he merely states that it is a thin strip of copper, rolled up into the form of a hollow cylinder, and pierced with many holes. By the aid of this instrument, he discovered that, when using highly superheated steam, it parted with all or the greater portion of its extra heat as soon as admitted into the cylinder, and that the temperature in the cylinder remained nearly constant throughout the stroke. This is a genuine discovery, so far as we know; and were this the only fact stated in the pamphlet, it would be enough to make it an important addition to engineering literature. The general supposition is, as our readers well know, that superheated steam does not immediately have its temperature reduced, when admitted to the cylinder, and that there is in consequence some danger of overheating the working parts of the engines. Mr. Dixwell explains the sudden cooling by reference to experiments, in which it was shown that a highly polished metallic surface, when covered with a thin film of a powerfully radiating gas, like steam, is itself converted into a very energetic radiator; and he makes a calculation to determine the thickness of metal that was alternately heated and cooled in one of his experiments. On this theory, it is evident that the proper degree of superheating is dependent upon the conditions under which an engine is running; and this Mr. Dixwell finds to be the case in practice. He is thus led to recommend two plans, for the purpose of preventing condensation and increasing the efficiency of an engine: one, superheating the steam just enough to enable the internal surfaces to repel the spray formed by condensed steam, or, secondly, superheating the steam to a degree that is found safe for any given cut-off. He takes the limit of safe temperature in the cylinder at about 400° Fah. The experiments do not appear to have been carried far enough to determine the proper degree of superheat for each point of cut-off; and the author suggests that it can be conveniently ascertained, in any given case, by the use of his pyrometer.

It has been impossible, in this brief notice, to do more than call attention to the most prominent points discussed in this interesting pamphlet, which treats in a rational manner of one of the most important matters connected with the design and management of steam machinery.

PATENT RIGHTS VS. STATE RIGHTS.

We have heretofore had occasion to call attention to the unconstitutionality of the various attempts, by State legislation, to interfere with the rights of inventors and patentees in the disposition of their patents. In some States, laws have been passed which practically authorize the citizens of such States to cheat the inventor out of his fees if he sells on credit. Such laws provide that a note given in purchase of a patent must state on its face that it is given for the patent, the number, date, and other particulars whereof must be designated on the note, otherwise such note shall be void and the holder debarred from receiving payment. All such laws are, under the constitution of the United States, void. A note given for a patent right will be binding if drawn in the usual manner, all State laws to the contrary notwithstanding.

So in the case of that class of State laws that require the taking out of licenses in order to sell patents, or that require, under penalties, the filing of copies of patents with county or State officials as a condition precedent to selling patent rights within the boundary of any State—all such laws are unconstitutional and void. We have heretofore published the decisions of the United States courts declaring their nullity.

Another decision against the applicability of State laws to patent rights has lately been made by the United States Circuit Court, in Massachusetts. We publish the decision in this issue. This was a recent action to recover damages for an infringement which took place as far back as 1863, up to 1867. The defence was that under the the State laws of Massachusetts—statute of limitations—the plaintiff could not recover, he not having brought the action within six years from the time of the alleged injury. This defence was not allowed. The court ruled as follows:

"Should the legislature of a State pass an act in express terms limiting the time for bringing an action in the federal courts for infringement of patent rights, there can be no reasonable doubt that such a statute would be unconstitutional and void. The policy of the Government to provide a uniform system of rights and remedies throughout the United States upon the whole subject matter of patents for new and useful inventions and discoveries, by placing it under the control of Congress and the federal courts, would be frustrated if such State legislation could directly or indirectly limit, restrict, or take away the remedy."

Fine gold will melt at 2,016° Fah.; pure copper at 1,994°; fine silver at 1,873° and pure spelter at 773°.