culous than the prospect held out, of locomotives traveling twice as fast as stage coaches! We will back old Father Thames against the Woolwich railway for any sum." No engine, it was claimed, could be made to move when attached to a heavy load. "The wheels will but slip round on the rails"; besides, even admitting that the engine would move, "no railroad could be so constructed as to bear the weight of forty tuns running at the rate of twelve miles an hour; because the more rapidly a body moves the greater the momentum generated, and no railroad could stand this increase of momentum." Moreover, it was vehemently asserted that the engine running at twelve miles an hour could never be made to "run round curves"; either the curved rail would bend straight, or the machine leap the track.

When engineers, high in their profession, whose experience had been large and whose opinions on such matters was held to be of great moment, advanced such ruinous views, with nothing to refute them but the evidence of a self-educated mechanic of Northumberland, it is not surprising that men of other professions began to find objections based on their own professional learning. Sanitary objections were now urged against railways; and many wise doctors (never to be outdone at such a time) strongly inveighed against tunnels. Sir Anthony Carlisle insisted that "tunnels would expose healthy people to colds, catarrhs, and consumption", and others believed the noise would be injurious to hearing. But worst of all was the "destruction of atmospheric air", as Dr. Lardner termed it. This learned gentleman made elaborate calculations to prove that the provision of ventilating shafts would be altogether insufficient to prevent the dangers arising from the combustion of coke, producing carbonic acid gas, which was fatal to life. There was not, however, the same unanimity among the doctors as among the engineers. Indeed, the proverbial disagreement of the doctors was, in this case, productive of much good. Solemn documents in the form of certificates, signed by many of the most distinguished physicians of the day, attesting the perfect wholesomeness of tunnels, were prepared and published. There were not wanting some, however, who, in default of reasons of their own, carried the statements made by others to the last extreme, and asserted that the air along the routes of the railroads would become unhealthy, that birds would drop dead as they flew over the locomotive in consequence of the CO_2 discharged: and that the noise would cause cows to cease giving milk and women to miscarry!

Nor did the clergy and country gentlemen fail in this extreme. So violent was the antagonism of many patient and long-suffering men "of the cloth" to even a survey being made on their grounds, that the expedient was resorted to of performing this piece of work while the clerical gentlemen were in their pulpits.

By far the most persistent opposition, however, was undoubtedly that met with among those classes whose pleasures or interests were directly interfered with, or whose prejudices had been aroused through ignorance and false representations. For the opposition resulting from this latter cause, the press must to a great extent be held responsible. Thus in 1825, when the Liverpool and Manchester Company were preparing to introduce their bill to Parliament, the Leeds, Liverpool, and Birmingham canal companies appealed to the public to oppose the measure, and a Birmingham paper invited all to resist it to the last; and subscriptions were taken up to render this opposition more effectual. The farmer was told that his cows would be prevented from grazing and his hens from laying; that his sheep would no longer fatten, his horses would start and shy when at the plough, his houses and barns would be burned to ashes by the fire thrown from the engine chimney, and the air polluted by dense clouds of smoke; his hay and oats, usually so saleable, would rot in his fields and granary, his agricultural communications be destroyed, his lands thrown out of cultivation, and himself reduced to beggary. There would no longer be any use for his horses, and the breed, nay the very species, would soon become extinct! The poor rates would be largely increased in consequence of the number of laborers thrown out of employment. Every calling was to be utterly ruined. Hundreds of excellent inns would fall into decay; and in a shrot time, not a solitary house of this description would be found within the four kingdoms; posting towns would become depopulated, turnpike roads deserted, and the institution of the English stage coach destroyed for ever. The noble sport of the chase, the love of which was born in every true Englishman, must be ended for all time in order that a few merchants and cotton spinners might build railroads, and send their engines screaming through the heart of the fox covers and game preserves. It was another deplorable illustration of the leveling tendency of the age. It put an end to that gradation of rank in traveling which was one of the few things left to distinguish a nobleman from a Manchester bagman. There was, however, one consolation left; none but fools would trust their persons to the conduct of explosive machines like the locomotive, and the canals would beat them after all.

It may well be believed that such a doleful picture of evils as this was not without its effect on those most interested. In the large towns, meetings were held denouncing the railway system as a delusion, similar to the many other absurd projects of that madly speculative period, when balloon companies proposed to work passenger traffic through the air at forty miles an hour, and road companies projected carriages to run on turnpikes at twelve miles an hour, with relays of bottled gas for horses. In the country, however, where not one man in five hundred knew anything about the railroad, other than that he had been told it would assuredly pass through the heart of his cabbage patch and his bean field, the fury of the opposition lead to blows. When Mr. Stephenson was making the preliminary surveys for the projected Liverpool and Manchester railroad, many of the nobility stoutly refused him permission to enter their lands. At Knowsley, Mr. Stephenson was driven back by the keeper and threatened with rough handling if found there again; Lord Derby's farmers turned out all their men to watch the surveyors; guns were discharged over the property of then Duke of Bridgwater, and men armed with pitchforks, were stationed at the gates; while at St. Helen's, as a chainman was clambering over a gate, a laborer ran at him with a pitchfork and thrust the prongs through his clothes into his back; others of his party coming to his assistance, the laborers, who had now gathered in force, poured in a volley of stones and finally completely demolished the harmless theodolite. Finally, in order to protect both his surveyors and his instrument, Mr. Stephenson was forced to make his surveys at night with the aid of dark lanterns, and to employ a "noted bruiser" to carry the theodolite.

Forty-nine years have passed since George Stephenson finished his first railroad, and all doubts of the merits of this great invention were set at rest forever. Fifty years ago it was the dream of a mechanic; today it is a great, almost the greatest, achievement of human ingenuity and human skill, the great civilizing agent of the nineteenth century, increasing the means of public intercourse, removing national and provincial antipathies and binding together all the branches of the world family.

Never did so marvelous an invention pass through more vicissitudes, or struggle up through more bitter opposition to a more glorious triumph never was courage tried by more reverses and disappointments that was George Stephenson's; yet that background of disaster only sets in brighter relief the spirit that bore up under all, the faith that never gave way, and the patience that never was weary.

Premium for Fireproof Construction.

The Merchants', Farmers', and Mechanics' Savings Bank, of Chicago, Ill., offers a premium of $1,000 for the best plan for two fireproof buildings, subject to conditions, among which are the following:

"One building shall be a dwelling house of not less than 18 feet front, with 5 rooms, and shall contain not less than 5,500 cubic feet; of which a complete building as per plans must be erected, at expense of the bank, by the successful competitor; also a building of not less than four rooms for dwelling, with store on ground floor, of a cubic capacity of not less than 30,000 cubic feet, subject to the same requirements as the foregoing. The successful competitor will be required to erect, at prices specified in his plans, one or fifty buildings, at the option of the bank, anywhere within the corporate limits of Chicago. The model erected by the successful competitor shall undergo a thorough test as to its fireproof qualities, and also as to the action of water upon the material when heated. All damages resulting from such test will be at the expense of the successful competitor.

The main purpose of this offer is to secure an approximately fireproof cottage; but other things being equal, preference will be given to the best arranged building in the matter of symmetry, convenience, ventilation, heating, and drainage, and which, as the purpose is mainly for the benefit of employees, falls in price not above $1,000 when ready for occupancy."

The competition will be open till January 1, 1875. We are curious to know if the bank really expects to have all the specified conditions filled, for one thousand dollars. Guess not, gentlemen.

A Question for American Steel Manufacturers.

The ordnance bureaux of both the war and navy departments have just ordered from Mr. B. B. Hotchkiss, the inventor of the well known rifle projectiles and of the revolving cannon not long since illustrated in these columns, two of his new breech-loading metallic cartridge steel field guns, with equipments complete, the same to be exported from Europe. The trials of these weapons, we understand, are to be held in April next. Mr. Hotchkiss informs us that he cannot obtain steel blocks, large enough for the manufacture of his guns, from any foundery in this country, and that therefore he is compelled to have resort to foreign productions. It strikes us that the necessity existing, of making arms for service of the nation outside our own borders, is a condition of affairs to which American steel manufacturers may profitably devote their serious consideration.

Recent Walking Feats.

A walk of thirty-two miles, in seven and a half hours, from New York city to Bronxville, N. Y., and return, was lately performed by James A. Crozier. The wager was $250, and eight hours time was allowed.

E. P. Weston lately completed in this city his third attempt to walk 500 miles in six days. On the second day, after about 200 miles had been walked, one foot was attacked with erysipelas, and he had to rest for a day for treatment. At the end of the six days he had walked 346 miles.

THE New York *Christian Intelligencer* says: Among all our exchanges, none is valued more highly than the SCIENTIFIC AMERICAN. We never open its pages without finding something useful, instructive, or entertaining to reward us for so doing. It is a most valuable educator to youth; while to those who have a practical advanced knowledge of matters relating to art, science, mechanics, chemistry, and manufactures, it is an invaluable aid, keeping them thoroughly posted on whatsoever is doing, or has been accomplished, in those important branches.

Invisible Ink.

If we write with a very dilute solution of chloride of copper, which has scarcely more color than pure water, the characters are invisible; but if gently heated, they become distinctly yellow, and are easily read. Let the paper cool, and they vanish; and they may be made to appear and disappear an indefinite number of times. If heated too strongly, the compound is decomposed, and the writing becomes permanently brown from the deposition of the copper. The chloride of copper may be conveniently made by mixing solutions of ammonic chloride (sal ammoniac) and of cupric sulphate (blue vitriol).

The change of color in this and kindred cases is due to the removal of the water of crystalization by the heat. In chemical combination with the water, the salt is transparent; without the water, it is opaque. The salt, being very deliquescent, rapidly absorbs moisture from the air when cool.—*Boston Journal of Chemistry.*

DECISIONS OF THE COURTS.

Supreme Court of the United States.

THE GREAT CORN PLANTER PATENTS.—GEORGE W. BROWN, APPELLANT, *vs.* RUFUS B. GUILD, EXECUTORS, ETC.; AND GEORGE W. BROWN, APPELLANT, *vs.* JAMES SELBY *et al.*

[Appeal from the Circuit Court of the United States for the Northern District of Illinois.—October Term, 1873.]

Bradley, Judge:

These cases arise upon separate bills in equity filed in the court below by the appellant against George J. Bergen and Frederick P. Sisson, in the one case, and James Selby and others in the other case, charging them, respectively, with infringement of certain letters patent granted to the complainant for improvements in corn-planting machines, being reissues of previous patents, and praying for an account of profits, for injunctions, and for general relief. The defendant in the first named case filed an answer, and two amended answers, setting up, in general, that the complainant was not the original and first inventor of the improvements patented to him, but that the same were previously known and used by various other persons named in the answers; and that the reissued patents of complainant were fraudulently obtained; and they denied that they infringed the complainant's patents. The pleadings in the other case were substantially the same. Much testimony having been taken, the causes were heard together before the Circuit Court, and the complainant's bills were severally dismissed. These appeals are from those decrees. * The principal question in these causes is, whether the appellant was the original and first inventor of the improvements claimed by and patented to him, or whether he was anticipated therein by other persons named in the answers of the defendants.

As set forth in the bill, the first patent obtained by the complainant for one portion of his alleged invention and improvement was granted to him on the 2d day of August, but antedated the 2d day of February, 1853. This patent was surrendered on the 16th day of February, 1858, and a new patent was issued in lieu thereof, upon a corrected specification. This reissued patent was also surrendered on the 11th day of September, 1860, and in lieu thereof five new patents were issued upon five several corrected specifications, which new patents were numbered, respectively, reissues 1,036, 1,037, 1,038, 1,039, 1,040, each one being for a distinct and separate part of the original invention alleged to have been made by the complainant.

On the 8th day of May, 1855, a patent was granted to the complainant for certain improvements on his corn planter, which patent was, on the 10th day of November, 1857, surrendered, and a new patent was issued in lieu thereof on a corrected specification. This last patent was also surrendered on the 11th day of December, 1860, and five new patents were issued in lieu thereof on five amended specifications, each being for a distinct and separate part of the improvements intended to be secured by the patent of 1855. The last-mentioned patents were respectively numbered reissues 1,091, 1,092, 1,093, 1,094, and 1,095. Copies of all the reissued patents of both series were annexed to the bill. Upon the taking of proofs in the cause copies of the two original patents, and of the first reissues thereof, as well as the reissued patents on which the bill was founded, were put in evidence, together with full detailed drawings and models of the complainant's original and improved machines.

The defendants, in their answer, and the several amendments thereof, referred to many machines, patents, and applications for patents which, as they alleged, embodied all the improvements of the complainant's machine, and antedated the same.

The Supreme Court reverses the decrees of the Circuit Court and declares that the Brown patents are valid and the defendants infringers. The following points were held by the Court:

If an alleged prior invention was only an experiment, never perfected, but abandoned, it cannot prejudice a patent for a similar improvement obtained by a subsequent inventor.

An application for a patent which stands rejected will not, in such a case, avoid the subsequent patent.

The question of fraud in obtaining a reissue must be regarded as settled by the Commissioner of Patents in granting it.

An inventor cannot claim such parts of a machine as another had previously devised, and which worked well after the machine was perfected, although this was not until after the other had perfected his.

But he may claim them in a new combination of them with devices of his own which result in a useful machine.

If a patent describes the invention as embodied in a cheap and rude form, this will not relieve those who construct the machine with more expensive fixtures from the charge of infringement, however useful they may be.

The summary of the patentee's claim, usually annexed to the specification, admits that all that is not included is old, and it is a sufficient compliance with the law requiring the new to be distinguished from the old.

A claim for "mounting the attendant upon a seed-planting machine in in such a position that he can see the marks made on the ground and operate the dropping of the seed accordingly" is void as a claim for a result irrespective of the means of accomplishing it. But if qualified by the words "substantially as herein set forth," and the means are described in the specification, it is no longer open to the objection.

A patent is void which claims substantially the same thing which is claimed by the same party in a prior patent.

A peg or stop, to prevent the rear part of a machine from tipping so far as to dump the driver on the ground, is too frivolous a device to be regarded as an invention, and a patent for it is void.

NEW BOOKS AND PUBLICATIONS.

THE TRANSIT OF VENUS. By George Forbes, B. A., Professor of Natural Philosophy in the Andersonian University, Glasgow. With Numerous Illustrations. New York: Macmillan & Co., 21 Astor Place.

This work gives a most lucid explanation of the expected observations of the transit, pregnant as it is with results of the highest importance to physical science. The particulars of the various parties of observation and the engravings of the instruments, many of which latter are especially designed for this occasion, are replete with interest, and will repay the student, as well as the general reader, for a careful perusal.

A FOURTH CATALOGUE OF DOUBLE STARS, giving Forty-Seven Double Stars Newly Discovered by S. W. Burnham.

In December, 1873, Mr. Burnham published his third catalogue of the double stars, and shortly afterwards followed up with the present publication, first given to the public in the June issue of the Royal Astronomical Society's "Notices." Mr. Burnham's observations were, in all but one instance, made with a 6 inch Clark reflector, the exception being *tau Orionis*, a star so distant that the 18½ inch refractor of the Dearborn Observatory was necessary to reveal its duplicity.

THE AMERICAN EDUCATIONAL ANNUAL, a Cyclopædia or Reference Book for all Matters Pertaining to Education. Volume I., 1875. New York: J. W. Schermerhorn, 14 Bond street.

A valuable book of statistics, carefully compiled and well arranged.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 18 to September 28, 1874, inclusive.

ANVIL BED.—A. Hitchcock, New York city.

ELECTRIC ALARM.—A. S. Howe, Utica, N. Y.

HEATING FEED WATER, ETC.—R. Berryman (of Hartford, Conn.), Newcastle-on-Tyne, England.

HORSESHOE.—R. F. Cooke, New York city.

KNITTING MACHINE.—J. Bradley, Lowell, Mass.

MAKING ASPHALTUM MASTIC.—R. Skinner, San Francisco, Cal.

MAKING GAS.—F. H. Eichbaum, Detroit, Mich.

ORDNANCE, ETC.—R. R. Moffatt (of Brooklyn, N.Y.), Liverpool, England.

REVERBERATORY FURNACE.—E. Heiligendorfer, Eureka, Nev.

TELEGRAPH.—M. Gally, Rochester, N. Y.

TILTING COAL WAGONS, ETC.—J. W. Upsan, Tallmadge, Ohio.

WEAVING FRINGE HEADINGS.—J. T. O'Brien *et al.*, Brooklyn, N.Y.